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COMPUTER SCIENCE AND ENGINEERING

IOT BASED WOMEN SAFETY APPLICATION WITH LOCATION TRACKING USING GPS MODULE

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Abstract— The project presents a wearable safety device for women using the Arduino. The purpose of this device is to safeguard women in the event they might face any danger. The device uses wireless sensor network to communicate and to send alerts to them. The GPS and GSM are used to share the used to share the user's location directly to the relevant authorities and saved contacts. The switch in the device work for sending manual alerts in case of emergency and as panic switch to get the shock, then the Buzzer will also activate along laser diode. Keywords: Women Safety, Safety using Ardunio, IOT Based Women Safety.
Keywords: Arduino. GPS. GSM.

I. INTRODUCTION

In today's world, women safety has become a major issue as they can't step out of their house at any given time due to physical/ sexual abuse and a fear of violence. Even in the 21st century where the technology is rapidly growing and new gadgets were developed but still women's and girls are facing problems. Women are adept at mobilizing diverse groups for a common reason. They often work across ethnic, religious, political, and cultural divides to promote liberty. We are all aware of importance of women safety, but we must analyze that they should be properly protected. Women are not as physically fit as men; in an emergency situation a helping hand would be assistance for them.

The best way to curtail your probability of becoming a dupe of violent crime (robbery, sexual assault, rape, domestic violence) is to recognize, defense and look up resources to help you out of hazardous situation. Today's world, women safety has become a major issue as they can't step out of their house at any given time due to physical abuse and a fear of violence. Women are adept at mobilizing diverse groups for a common reason. They often work across ethnic, religious, political, and cultural divides to promote liberty.

II. SYSTEM ANALYSIS

Existing System: This method has many drawbacks as she need to unlock the mobile phone which may take more time during panic situations, and also these applications are installed only on smartphones with access to GPS and Web.

Proposed System: The proposed system consists of Push button, ESP32 microcontroller and Wi-Fi module, GPS and GSM module, ESP32 Cam module.

III. PROBLEM IDENTIFICATION

India is one of the fastest economic development countries and it also has super powers, still there are many crimes against women. So we are designing a system to reduce these kinds of atrocities on women who are facing many problems such as women abuse, Harassment, etc.

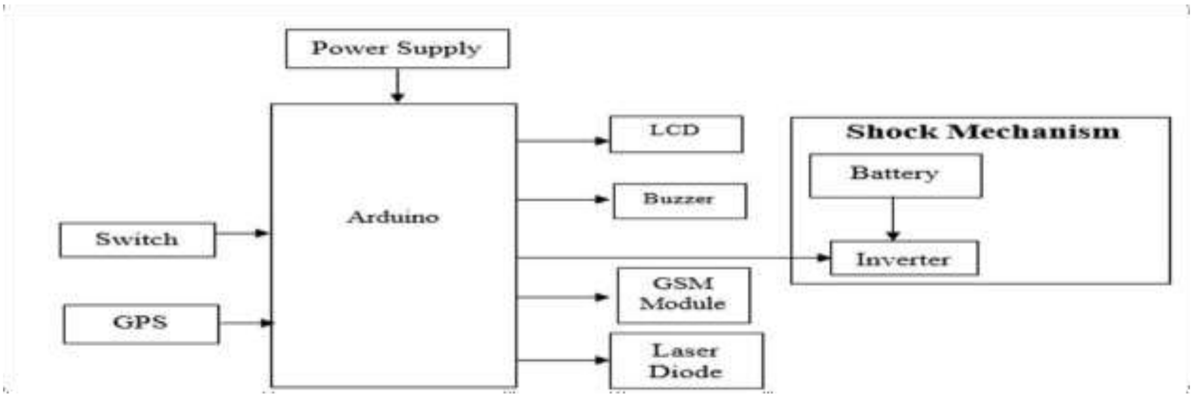
IV. OBJECTIVES

Women safety devices using GPS and GSM module are designed to alert family members or authorities in case of danger. These devices typically consist of a microcontroller, GPS module, GSM module, and a switch or sensor. The switch or sensor is used to trigger the device when the woman senses danger.

A. GPS (global positioning system)

GPS stands for global positioning system, which provides unequalled accuracy and flexibility of positioning for navigation. The GPS provides continuous three-dimensional positioning 24 hrs. a day throughout the world. GPS provides accurate location and time information for an unlimited number of people in all weather, day and night, anywhere in the world.

V. BLOCK DIAGRAM



▪ Fig. Block Diagram

COMPONENTS USED

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit

B. NEO-6M GPS Module with EPROM

- 5Hz position update rate.
- The cold start time of 38 s and Hot start time of 1 s.

- Configurable from 4800 Baud to 115200 Baud rates. (Default 9600).
- Super Sense ® Indoor GPS: -162 dBm tracking sensitivity.
- Support SBAS (WAAS, EGNOS, MSAS, GAGAN).
- Separated 18 x 18mm GPS antenna.

C. GSM

D. ULTRA SONIC SENSOR

Ultrasonic sensors work on a principle similar to radar or sonar which evaluates attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object. This technology can be used for measuring: speed and direction

VI. HARDWARE REQUIREMENTS

*A. Arduino Uno*The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P micro controller (MCU) and developed by Arduino.cc.The microcontroller board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits

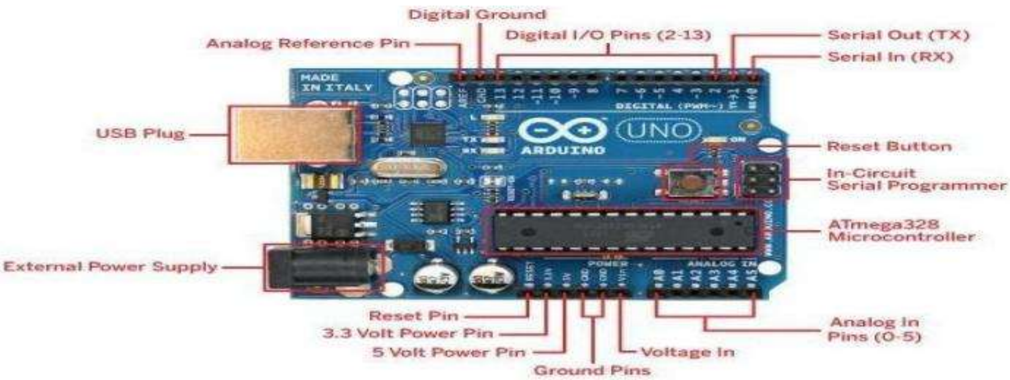


Fig 1: Arduino Uno

B. Regulated power supply

Every embedded system requires dc voltage and that will be 5v DC supply

So, the battery voltage needs to converted to 5V dc

Digital electronic devices need digital supply and we can get supply from regulated power supply block

Rectifier is used to protect the circuit from battery polarity reversal.

C. LCD Display

D. Buzzer

When a voltage is applied across the two electrodes, the piezoelectric material mechanically deforms due to the applied voltage. This movement of the piezo disk within the buzzer creates sound in a similar manner as the movement of the ferromagnetic disk in a magnetic buzzer or the speaker cone mentioned above

E. Oscillator

An electronic oscillator is an electronic circuit that produces a repetitive electronic signal, often a sine wave or a square wave.

PIC micro controller internally having 4mhz clock frequency.

We are giving the 20Mhz clock frequency as an external source for increasing the system performance

VII. SOFTWARE REQUIREMENTS

- Arduino IDE for compiling and dumping code into Microcontroller
- Express SCH for Circuit design.
- Proteus for hardware simulation
- .

VIII. ADVANTAGES & APPLICATIONS

ADVANTAGES:

- Compact in size
- Maintenance is very easy
- Effortless to use
- It can be used for security applications
- Pre – registered mobile numbers can be easily changed

APPLICATIONS:

- Can be utilized for the security of ladies, kids, impaired and matured individuals.
- Can be utilized as a legitimate proof of wrongdoing with correct.
- Location data for indictment

IX. CONCLUSION

In conclusion, the IoT-based women safety application with GPS-based location tracking emerges as a potent solution for addressing safety concerns. The integration of GPS modules enhances real-time tracking, providing a reliable and efficient mechanism to monitor and respond to potential threats. This application empowers women with a tool that not only offers precise location data but also ensures swift assistance in emergencies. The seamless connectivity within the IoT framework enables quick communication and intervention, fostering a safer environment. Moreover, the application's user-friendly interface enhances accessibility, encouraging widespread adoption. As society grapples with safety challenges, embracing technology-driven solutions like this offers a promising path forward. By leveraging the power of IoT and GPS technology, this application stands as a tangible step towards fostering a secure and supportive ecosystem for women, ultimately contributing to the broader goal of ensuring their well-being and peace of mind.

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GNDECB CAMPUS KEEPER

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Abstract - Campus Keeper is a cutting-edge mobile application designed to revolutionize and streamline the maintenance processes on college campuses. With its user- friendly interface and advanced features, Campus Keeper empowers students, faculty, and staff to report maintenance issues seamlessly, ensuring a swift and efficient resolution to campus-related concerns. This innovative app goes beyond traditional issue reporting by providing real-time updates on the status of reported problems. Users can track the progress of their submissions, fostering transparent communication between the campus community and maintenance teams. The incorporation of personalized reminders ensures that both users and maintenance personnel stay on top of scheduled tasks, contributing to a more proactive and organized approach to campus upkeep.

Keywords—Maintenance, Remainder, Task, Administration

I. INTRODUCTION

In the fast-paced and dynamic landscape of higher education, maintaining a well-functioning and aesthetically pleasing campus environment is paramount. Enter "Campus Keeper," a revolutionary mobile application meticulously designed to streamline and transform college campus maintenance. This innovative solution redefines the way campuses manage and address maintenance issues, offering a comprehensive platform that ensures efficient communication, real-time updates, and proactive task management. Empowering the Campus Community: Campus Keeper serves as a user-friendly and empowering tool for students, faculty, and staff. With its intuitive interface, individuals can effortlessly report maintenance issues, creating a seamless connection between the campus community and maintenance teams [1]. This user-centric approach not only expedites issue resolution but also fosters a sense of shared responsibility for the well-being of the campus environment.

Real-Time Updates for Transparent Communication: What sets Campus Keeper apart is its ability to provide real-time updates on the status of reported issues. Users can track the progress of their submissions, ensuring transparency in communication [2]. This feature facilitates a dynamic feedback loop, allowing maintenance teams to relay information back to the campus community promptly. By embracing transparency [4], Campus Keeper establishes a new standard for efficient and open communication in campus maintenance.

Personalized Reminders for Proactive Maintenance: Campus Keeper introduces a proactive approach to maintenance with personalized reminders. Users receive timely notifications, keeping them informed about scheduled tasks and upcoming maintenance activities. This proactive feature not only aids in preventing issues from escalating but also cultivates a culture of responsibility and mindfulness among the campus community. Faster, Efficient, and Centralized Communication: Centralization is at the core of Campus Keeper's success.

By consolidating issue reporting, updates, and reminders within a single platform, the app significantly accelerates communication between users and maintenance teams [8]. This streamlined communication process reduces response times, ensuring that maintenance issues are addressed swiftly and effectively.

Data-Driven Insights for Strategic Maintenance: Campus Keeper goes beyond immediate issue resolution by providing comprehensive analytics and reporting features. Administrators can harness these insights to identify recurring problems, allocate resources strategically [10], and implement preventive maintenance measures. The app empowers maintenance teams with the information they need to make data-driven decisions, resulting in a more resilient and well- maintained campus infrastructure.

RELATED WORK

As educational institutions embrace the digital era, there is a growing emphasis on leveraging technology to enhance campus management and maintenance. One notable related work is "Campus Connect Maintenance," a mobile application designed to facilitate streamlined communication between students, faculty, and maintenance teams. Similar to Campus Keeper, Campus Connect Maintenance offers a user- friendly platform for reporting issues, complete with real- time updates. However

Campus Keeper differentiates itself through its personalized reminders and proactive maintenance approach, providing a comprehensive solution that goes beyond issue resolution.

Another relevant solution is "Facility Sync University," a cloud-based campus management system that includes maintenance functionalities. This platform centralizes various campus-related tasks, from facility scheduling to maintenance ticketing. While Facility Sync University excels in providing an overarching management system, Campus Keeper stands out by focusing specifically on the intricacies of maintenance communication. The personalized reminders and data-driven insights within Campus Keeper create a unique value proposition, ensuring a holistic and user-centric approach to campus upkeep In the broader landscape, "Smart Campus Solutions" is an integrated suite of tools designed for efficient campus management. While it covers diverse aspects such as security, energy management, and maintenance, Campus Keeper stands out for its singular focus on revolutionizing the maintenance aspect. By concentrating on creating a seamless communication channel for maintenance tasks, Campus Keeper addresses a critical need in campus management that sets it apart from more generalized solutions like Smart Campus. This highlights the importance of tailored solutions in meeting the unique challenges of campus maintenance in educational institutions.

II. OBJECTIVES

Objective 1: - Develop a user-friendly interface: Create an intuitive and visually appealing user interface for the Maintenance and Reminder Application, ensuring accessibility and ease of navigation to enhance user experience and encourage widespread adoption.

Objective 2: - Transparent status tracking system. Implement a robust status tracking system within the application, providing users with real-time updates on the progress of their maintenance tasks. This transparency enhances accountability, allowing homeowners to monitor service provider activities seamlessly.

Objective 3: - Timely Maintenance Reminder. Incorporate a reliable reminder system that sends timely notifications to users, ensuring they are promptly alerted to upcoming maintenance tasks. This feature aims to prevent oversights and promote proactive home management, contributing to the overall efficiency of the maintenance process.

Maintenance Management.

Maintenance management is a critical aspect of ensuring the longevity and functionality of various systems, including those in residential properties. Research by Pantaloon and Parodi (2018) emphasizes the importance of implementing proactive maintenance strategies to reduce operational costs and increase the lifespan of equipment. Maintenance management software, such as Computerized Maintenance Management Systems (CMMS), has been extensively used in industrial settings to streamline maintenance processes.

Reminder Systems

Reminder systems have seen widespread application in various domains, from healthcare to personal task management. Research by Munshietal. (2020) discusses the effectiveness of reminder apps in enhancing compliance with medication regimens. In the context of home maintenance, reminder systems can be valuable for scheduling routine inspections, filter replacements, and other preventive tasks.

III. METHODOLOGY

Architectural Foundation:

The Maintenance and Reminder Application's system architecture is meticulously designed to establish a robust and scalable foundation. Embracing a microservices architecture lays the groundwork for modular and independent service components. This architectural choice enhances flexibility, allowing for easier maintenance, updates, and the seamless addition of new features. The decision to adopt Next.js as the frontend framework ensures a responsive and dynamic user interface, facilitating a smooth user experience. This architectural foundation sets the stage for a system capable of accommodating the evolving needs of users while maintaining a high level of performance.

Technological Stack:

The choice of technology stack plays a pivotal role in shaping the application's capabilities. The frontend, powered by Next.js, offers a modern and efficient user interface, while the backend is built on Node.js, known for its scalability and event-driven architecture. MongoDB serves as the primary database, providing a flexible and scalable solution for data storage. Prisma acts as the ORM (Object-Relational Mapping) tool, streamlining interactions with the database and simplifying data management.

This carefully selected technological stack ensures a cohesive and efficient synergy between different components, contributing to the overall robustness and performance of the application.

Database Management and Integration:

MongoDB, chosen as the primary database, allows for agile and schema-less data storage, accommodating the diverse and dynamic nature of maintenance and reminder data. Prisma, as the ORM tool, optimizes database interactions, simplifying queries and ensuring efficient data retrieval. This combination of MongoDB and Prisma establishes a responsive and scalable database management system integral to the application's functionality. Furthermore, the integration of blockchain technology enhances the security and transparency of transaction recording, adding an extra layer of data integrity to the system. This strategic integration ensures that the application not only meets the functional requirements but also upholds a high standard of data security and transparency.

Scalability and Future-Proofing:

The architecture's scalability is a key consideration in ensuring the application's longevity and adaptability. By adopting a microservices approach and leveraging technologies known for scalability, such as Node.js and MongoDB, the system is well-equipped to handle increased user loads and evolving requirements. The modular nature of microservices allows for the independent scaling of different components, providing a foundation that can grow seamlessly with the application's user base. This forward-looking approach to scalability and future-proofing ensures that the Maintenance and Reminder Application remains agile and responsive to the dynamic landscape of user needs and technological advancements.

IV. DEVELOPMENT TOOLS AND TECHNOLOGIES

The development process leverages industry-standard tools and technologies. Visual Studio Code is chosen as the primary integrated development environment (IDE) for its versatility and extensive plugin support. Git version control ensures collaborative development, and GitHub serves as the repository for source code management. Continuous integration and deployment (CI/CD) pipelines are implemented using platforms like Jenkins or GitHub Actions to automate the testing and deployment processes.

V.IMPLEMENTATION PROCESS

The implementation process follows an iterative and agile methodology. User stories are defined to capture functional requirements, and sprints are conducted to incrementally develop and test features. Next.js facilitates server-side rendering for enhanced performance, while Prisma ensures efficient interaction with the MongoDB database. Smart contracts on a blockchain network handle secure transaction, ensuring the integrity of user data

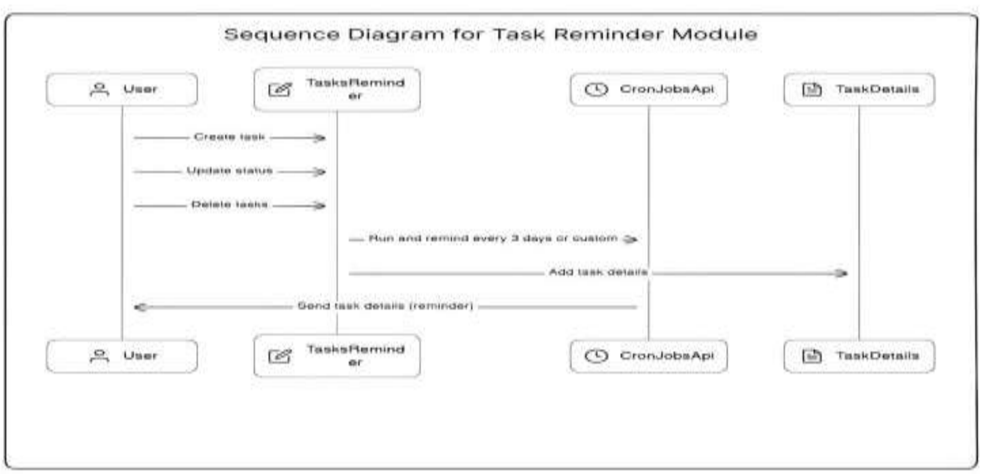

Fig 1: Sequence Diagram of reminders.

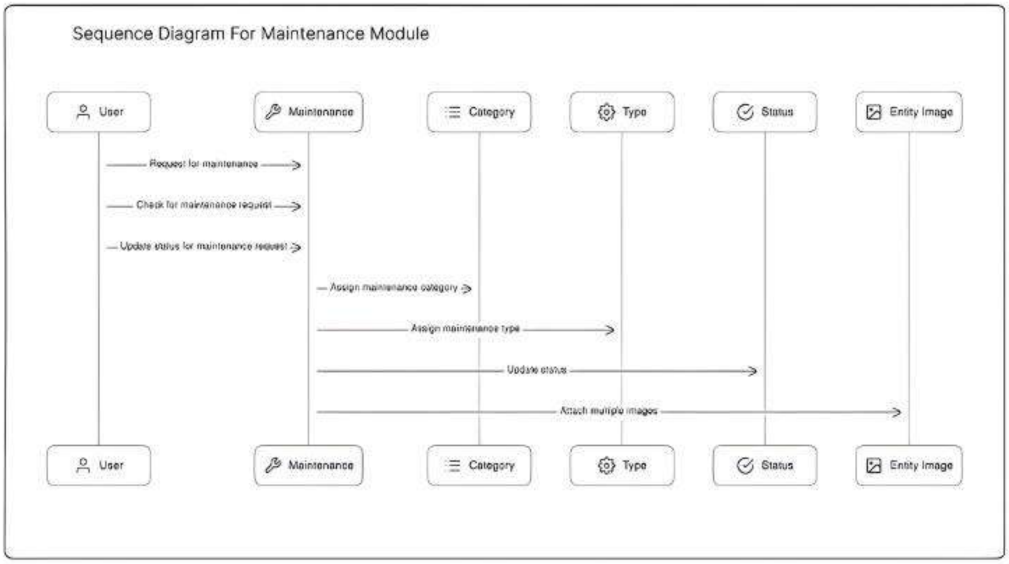

Fig 2: Sequence Diagram if Maintenance

VI. APPLICATION VISUALS

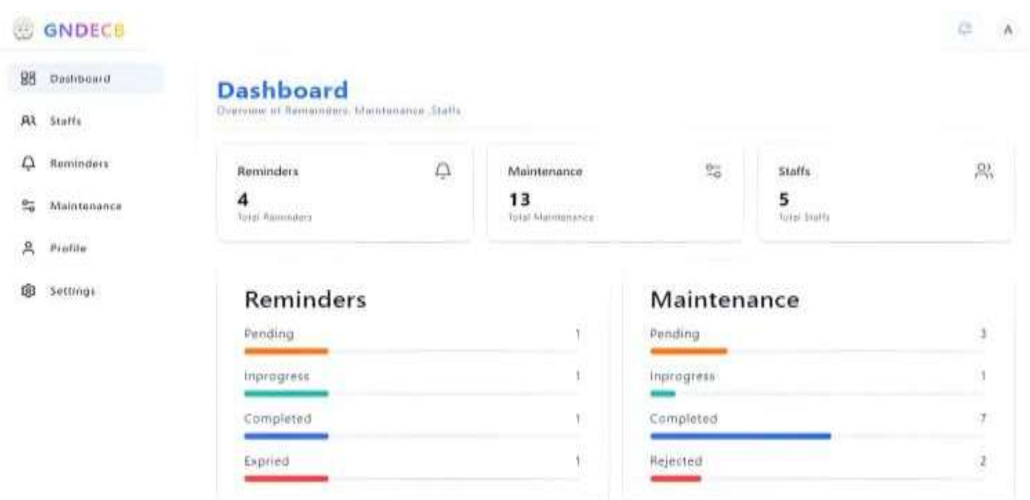

Fig 3: Application Dashboard

The Application dashboard which given the stats of the Reminders and maintenance like pending, in progress, completed and expired tasks.

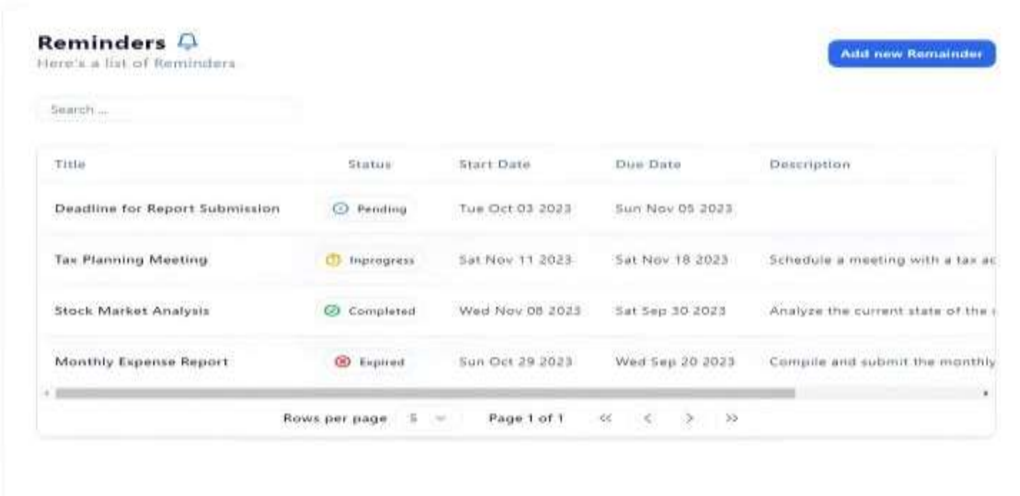

Fig 4: Reminders Records.

Structured representation of reminder tasks with their status which helps to visualize and maintain the reminders.

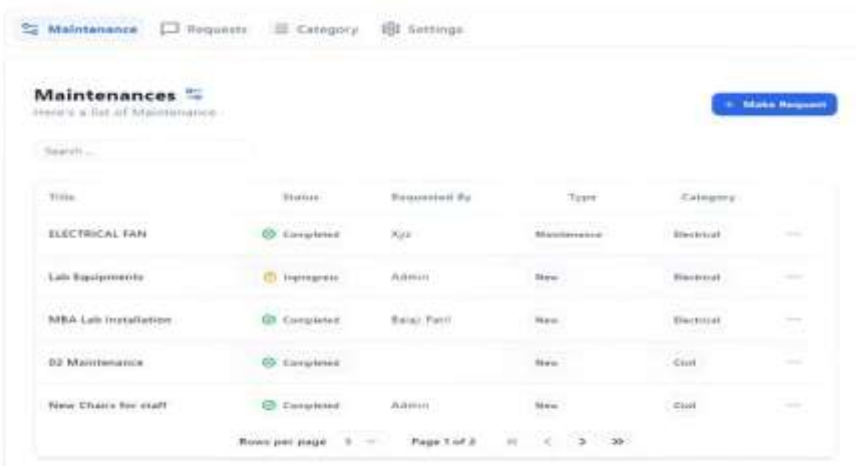

Fig 5: Maintenances Records.

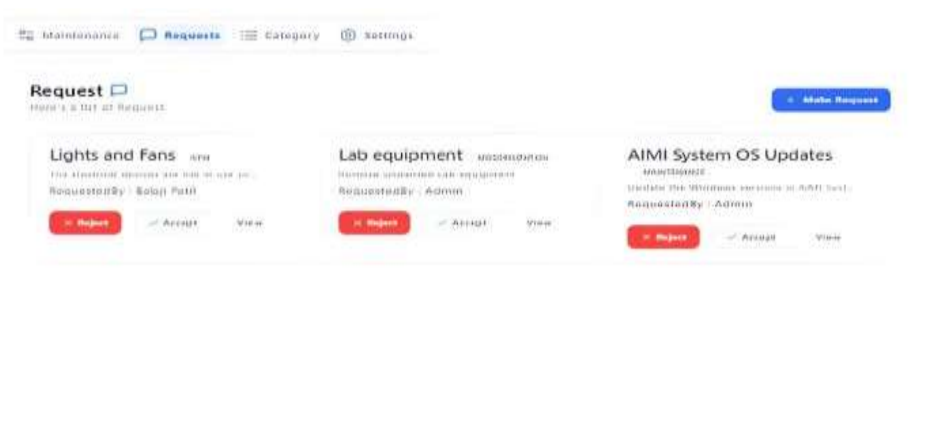

Fig 6: Maintenance Requests

The Maintenance requests which are requested by the staff. Requests are examined and made to accomplish their tasks.

Fig 7: Maintenance Categories

The maintenance is structured with multiple categories like Civil, electrical, system and software.

Fig 8: Staff Management

The staff management module enables the addition of staff members with defined privileges and permissions, ensuring a streamlined and secure administrative framework within the Campus Keeper application. This feature facilitates efficient task delegation and enhances overall organizational control.

VII. CONCLUSION

In conclusion, the Maintenance and Reminder Application stands as a testament to the successful fusion of cutting-edge technology and thoughtful design principles. The adoption of a microservices architecture, with Next.js driving the frontend and Node.js powering the backend, establishes a flexible and scalable foundation. This architectural choice, combined with MongoDB as the primary database and Prisma as the ORM tool, ensures not only optimal performance but also a responsive and adaptable user interface.

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MACHINE-LEARNING-BASED PREDIC TION OF STOCK MARKET PRICES

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Abstract - Investment corporations, hedge funds, and even individual investors must study financial models to understand market behavior and build profitable investments and trades. Investors usually produce educated guesses by analyzing information about old stock prices, the company's performance behavior, etc. The initial phase of revealing theories in the guesswork indicates that stock unit prices are entirely random and unpredictable. In the betterment of the guesswork, quantitative analysts get deployed to make prophetic models. The paper focuses on using machine-learning techniques to develop better models for enabling appropriate recommendations for financial investments.
Keywords: - Stock Price Prediction, Machine Learning, Random Forest Regression.

I. INTRODUCTION

The world's stock markets comprehend enormous wealth. As with the extended market, investors hunted for ways to amass data regarding the companies listed in the market. In the past, investors relied upon their expertise to spot market patterns, but this is not possible nowadays. Easily applied math analysis of financial information provides some insights. However, in recent years, investment firms have used numerous artificial intelligence (AI) systems to look for patterns in vast amounts of real-time equity and financial information. These systems support investment decision-making, and they have currently been used for a sufficiently long amount that their features and performance will be reviewed and analyzed to Identify those systems and improve prophetic performance compared with alternative techniques. When the prediction goes correct, the vendor and stock broker make enormous profits. Frequently when the prediction goes in unexpected ways it is expected by analyzing the history of several securities markets. Machine learning is economical, thanks to representing such processes. It predicts a market price value near the physical weight with increasing accuracy—the introduction of machine letups of research attributable to its economic and correct values measurements. Dataset is the important part of machine learning used in education. The information set ought to be as concrete as potential, resulting from which amendment within the data will uphold massive changes within the outcome. This project uses supervised machine learning on a dataset obtained from Yahoo Finance. This dataset has five variables: open, close, low, high, and volume. With nearly direct names, airy, compact, soft, and increased area units indicate different bid costs at other times. Throughout the fundamental measure, shares are passed from one owner to another. The test information is then used to develop a model. A regression model and an LSTM model are used to test this conjecture, one by one. During working hours, regression minimizes errors, and LSTM contributes to the cognitive process of information and result. Finally, yet importantly, graphs for the fluctuation of cost with dates (for the regression-based model) and between actual and expected prices (for the LSTM-based model) are planned.

Stock Market Prediction aims to predict the longer-term price of a corporation's money stocks. Market prediction technologies use machine learning to make predictions based on current exchange indices and coaching on previous values. By employing different models, machine learning creates more accurate and detailed forecasts. Our primary focus is on utilizing regression and LSTM machine learning techniques and developing a deep understanding of stock values. Several factors are considered, including the area of the unit, the low, the high, and the volume of stock values. This Paper introduces several techniques for calculating the prices like the R factor, Quantitative Analysis factor - The chance/praise ratio, often called the "R/R ratio," compares the capability income of a change to its capability loss. It is a calculation that uses the distinction between the access factor of a difference and the stop-loss to decide chance and the distinction between the income goal and the access factor to locate praise. Quantitative Analysis - Quantitative evaluation (QA) in finance is a technique that emphasizes mathematical and statistical evaluation to assist decides the price of a monetary asset, along with an inventory or option. Quantitative buying and selling analysts (additionally recognized as "quanta") use several data—including historical funding and inventory marketplace data—to increase buying and selling algorithms and pc models.

II. RELATED WORK

Stock price prediction can be predicted using AI and machine learning models in machine learning fields. It uses the SVM model for stock price prediction. Support vector machine which works on classification algorithms. It is used to get a new text as an output. Applying Multiple Linear Regression with Interactions to predict the trend in stock [1] Using data from stock markets around the globe, Beginner's checks whether the markets are efficient and whether there are any anomalies. Whenever a market anomaly is found, scholars first confirm the anomaly and then search for existing models to explain the anomaly. Suppose scholars are unable to estimate, evaluate, and forecast any model to explain the anomaly. In that case, scholars will use quantitative analysis, modeling, or even a new theory of information to explain the anomaly that led to Behavioral Finance. In the event of an unexplained anomaly, one may be able to exploit the monster in order to profit. Investors can get valuable investment advice this way, on the one hand [2] The real Gross Domestic Product reflects the relationship between the stock market and the economic activity of the five European countries: Germany, France, Italy, the Netherlands, and the UK. This analysis includes variables such as stock market returns, actual economic activity, and interest rates in addition to the variables commonly used in such analyses. In the empirical VAR model, the authors have included the composite leading indicator [3]. The weak-form potency and stochastic process behavior of the CIVETS stock markets throughout the amount 2002–2012. We tend to apply unit root tests, serial autocorrelation, and variance quantitative relation tests. Our unit root results imply that CIVETS follow a stochastic process [4]. To predict the stock value of NSE and securities markets, two leading stock markets worldwide, the authors use four-deciliter architectures. We tend to train four networks, MLP, RNN, LSTM, and CNN, with the stock value of TATA MOTORS from NSE. From the NSE stock exchange, the models were used to predict the stock values of MARUTI, HCL, and AXIS BANK, and from the securities market, BANK OF AMERICA (BAC) and CHESAPEAKE ENERGY (CHK). Based on the results obtained, it is clear that the models can describe the patterns found in each stock market [5]. The importance of predicting the securities exchange price is well known among financial specialists since they need to know what kind of return they will receive for their investments. Generally, specialized experts and intermediaries use chronicled prices, volumes, value designs, and basic patterns to predict stock costs. Stock value expectations today are even more baffling than before since the organization's money-related status, as well as the socio-practical state of the nation, political environment, and cataclysmic events, influence stock costs. [6].

III. PROPOSED SYSTEM

This paper introduced LSTM (Long Short-Term Memory) model in stream-lit, which will predict the values based on the old dataset. The Prediction values are High, Low, Open, and Close. It is a reliable application for students and beginners who want to trade. They can quickly identify the trends in the market, whether the market is going upward or downward, or else it will remain sideways. The model generates the confusion matrix for the classification report. This paper introduced the two regression and classification methods for stock market prediction. In the regression method, the closing price of company stock is predicted. The classification method will predict company stocks' closing price that will increase or decrease in upcoming days. Figure1 shows the proposed system design—this paper takes datasets from yahoo finance data. The first step is to train the data, and in the second step, data was tested, and with the LSTM model, forecast the values to get the prediction value.

The objective of the System

1. Explore Stock Prices.
2. Implement Basic Model Using Linear Regression
3. Implement LSTM Model with confusion matrix and classification report.

Proposed Architecture:

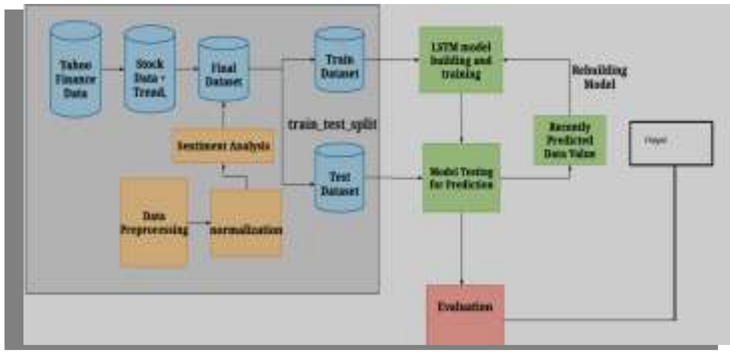

Fig.1. Proposed Architecture

Method of Implementation

1. R Factor

There are two types of equity market risks: systematic and non-systematic. Rising oil prices, currency movements, and changing government policies are familiar sources of frequent hazards. Unsystematic risks, however, are caused by factors unique to a company or industry. In addition, management and labor relations, increased competition, the entry of competing players, and customers' preference for a company's products all contribute to unsystematic risk.

2. Stock Analysis Candle Stick Chart

Candlestick charts show price movements of securities, derivatives, and currencies. As with a graph, each candle represents all four significant pieces of information for that day: open and close in the thick body; high and low in the wick. Two ways can be used to visualize buying and selling pressure using candlesticks.

3. LSTM Model

Long Short-Term Memory fashions are extraordinarily effective time-collection fashions. They can expect an arbitrary wide variety of steps into destiny. An LSTM module (or molecular) has five essential additives which permit it to version each long-time period and quick-time period data. Cell nation (ct) - This represents the inner reminiscence of the molecular, which shops each quick period of reminiscence and long-time period recollections Hidden nation (ht) - This is output nation records calculated w.r.t. modern enter, preceding remote country, and current molecular enter that you use to expect the destiny inventory marketplace prices. Additionally, the hidden nation can determine to handiest retrieve the short or long-time period or each variety of reminiscence saved withinside the molecular country to make the following prediction. Input gate (it) - Decides how many records from current enter flow to the molecular nation.

Forget gate (ft) - Decides how many records from the modern enter and the preceding molecular nation flows into the contemporary molecular country. Output gate (to) - Decides how many records from the modern molecular nation flow into the hidden government, so that if wanted, LSTM can handily select out the long-time period recollections or quick-time period recollections and long-time period recollections.

IV. MATHEMATICAL FORMULATION

Confusion Matrix is the visual illustration of the particular VS foretold values. It measures the performance of our Machine Learning classification model and appears sort of a table-like structure. This is. However, a Confusion Matrix of a binary classification downside sounds like

Precision: It may be outlined because of the range of correct outputs provided by the model or, out of all positive categories appropriately foretold by the model, what number of them were valid. It may be calculated as mistreatment by the below formula.

$$\text{Precision} = \frac{\text{TP}}{TP + FP}$$

Recall: - It is outlined because the out of total positive categories, however our model foretold properly. The recall should be as high as doable

$$\text{Recall} = \frac{TP}{TP + FN}$$

R factor

$$R_p = \alpha + \beta R_M + \epsilon \qquad \begin{array}{l} R_M = Market\ Return \\ R_p = Portfolio\ Return \\ \epsilon = Error\ Term \end{array}$$

Mean: - In other words, it is by far the most common of the datasets within the diverse fields of arithmetic. As a result, if we take five numbers in statistics set, say 12, 13, 6, 7, 19, 21, the suggestion system would be

$$\frac{x1 + x2 + x3 + \cdots + xn}{n}$$

Mode: - As a concept, mode refers to the number in a data set that is repetitive and occurs most frequently. The mode is also known as a modal value, which represents the highest number of occurrences in the group. A mode is also a value that represents the whole data collection, like mean and median. There may be more than one mode in a given data set in some cases, so it is imperative to keep this in mind. Bimodal data sets have two modes. As shown in the excel sheet, the mode can be calculated as follows:

Mode. SNGL (B1: B5)

Dataset Use: (https://www.kaggle.com/achintyatripathi/eda-autoviz-class-one-line-code-yahoo-stock-price?scriptVersionId=42446951)

Software requirement specification

- Python
- Stream lit web framework

Hardware requirement specification

- Laptop

RESULTS

1. New Actual Predicted Result

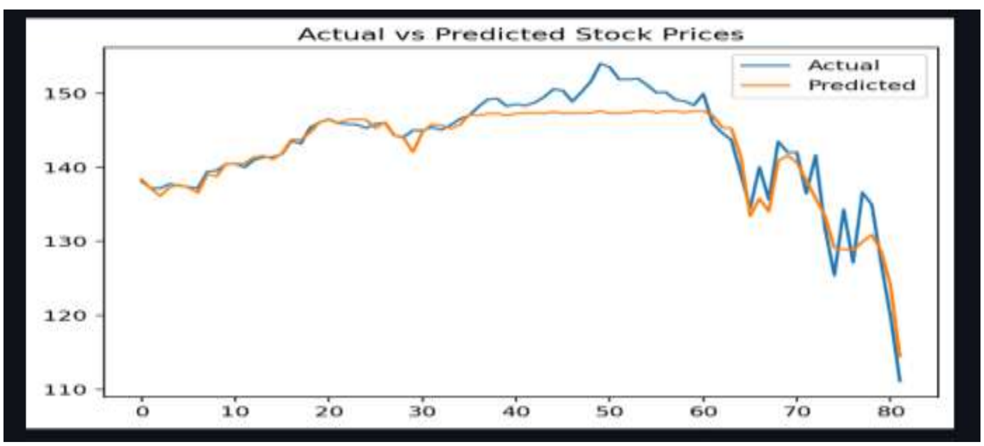

Figure2. Actual & Predicted Result

Figure2 shows the actual & predicted result.

2. R Factor

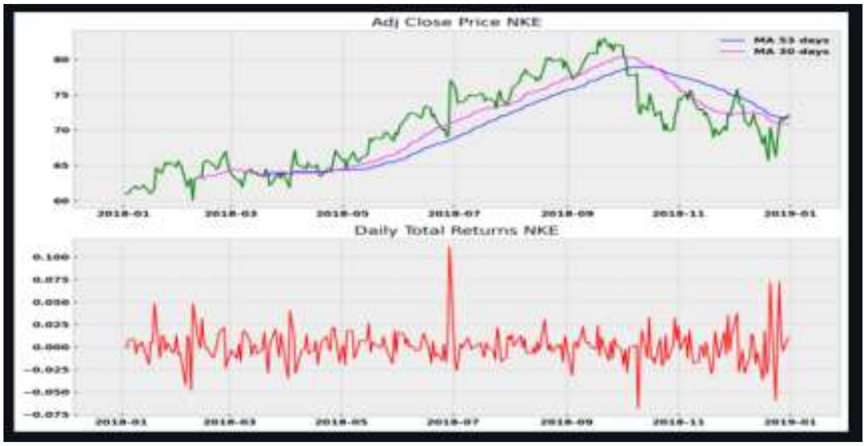

Figure3. R factor

The above Fig 3 graph shows the close Price of NKE (Nike) company with actual value denoted in green color and compared with MA (Moving Average), which has MA53 days characterized with blue color and MA30 days is marked with red paint. The graph shows the total daily returns of NKE (Nike) company. On the y-axis, the value is denoted, and on the x-axis, the year is denoted.

3. Stock Analysis Candle Stick Chart

Figure4. Stock Analysis candle stick chart

In above Fig 4 we see the candle stick chart, which is compared with Boll (Bollinger Band) denoted with red color, RSI (Relative Strength Index) denoted by blue color, and volume by gray color.On the y-axis price of the stock is denoted, and on the x-axis, month and year are denoted.

1. Quantitative Analysis

A quantitative analyst is the only one who designs a complicated framework for monetary establishments that aids them in charging and exchanging securities within the financial market.

Quants may be of types:

Front workplace quant: These are those who immediately offer the dealer the charge of the monetary securities or the buying and selling tools.

Back workplace quant's - These quants are there to validate the framework and create new techniques after research.

Following are the contents of the Quantitative Analysis of NKE (Nike) company.

1. Mean
2. Median
3. Mode
4. Maximum
5. Minimum
6. Variance

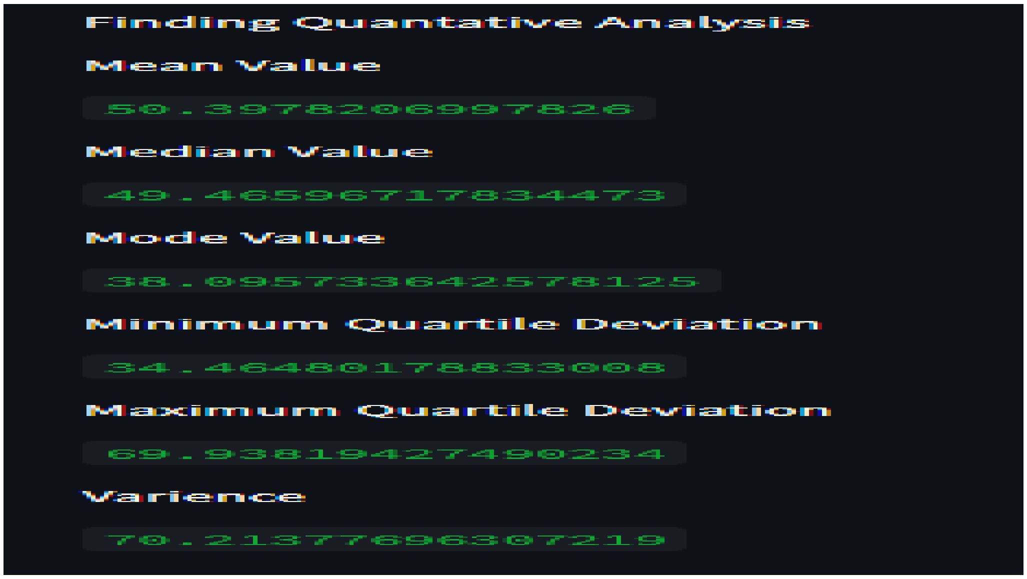

Figure5. Quantative Analysis

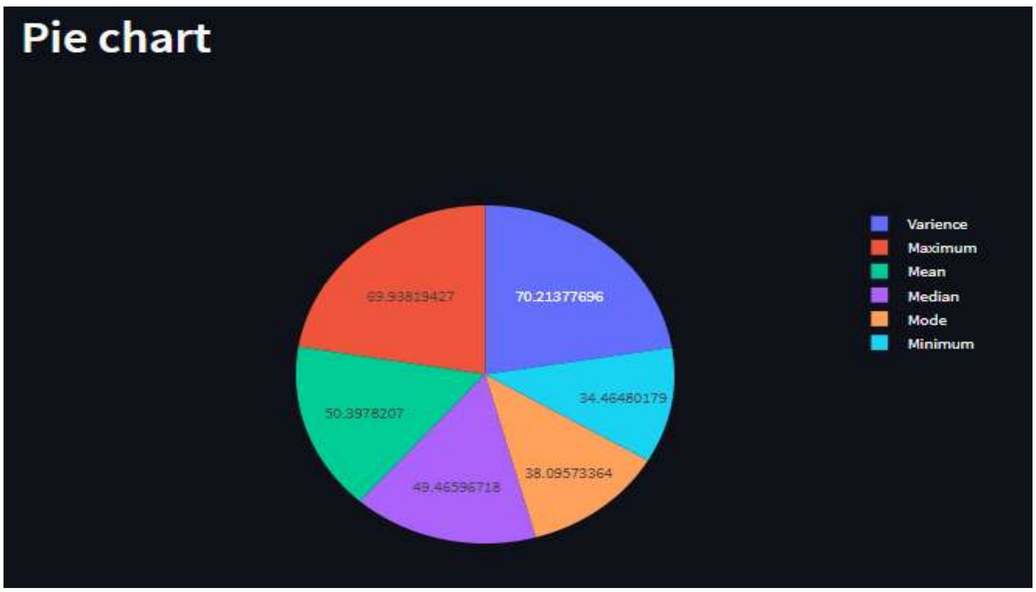

Figure 6. Quantative Analysis pie chart

In above Figure 6 we see Variance value denoted in blue color, Maximum value in red color, Mean value in green color, Median value in violet color, Mode value in orange color and Minimum value in light blue color.

1. Forecasting of Values

Forecasting is used for the time series to predict the value of the stock with the terms of the day like - short term (5-10 days), medium term (20-100 days), and long term (200 days). NKE stock forecasts on the testing set, testing error 17.41%. The Below Graph Show the predicted value for the previous data.

The Graph Shows value up to 24 April 2022.

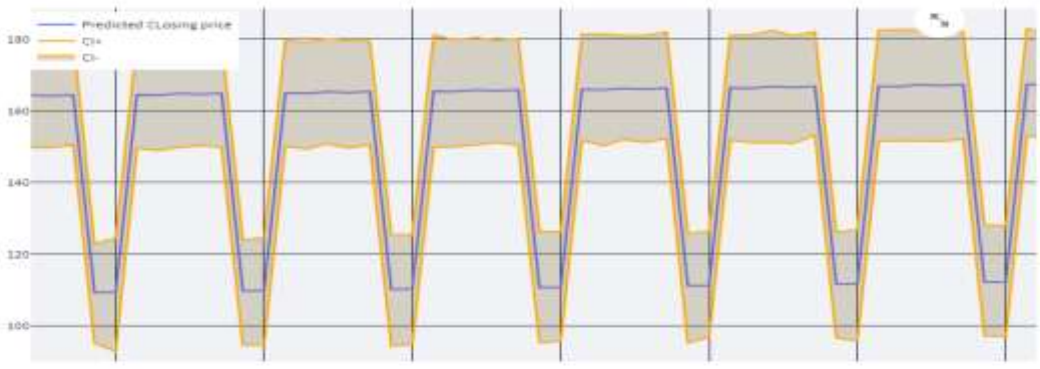

Figure7 forecasting of values

In above Figure 7 Predicted closing price is denoted with a blue color line, CL+ (closing positive) fee, which is above the predicted price and denoted with orange color and also, we see CL- (closing negative) price, which is below the expected price and denoted with orange paint.

1. Confusion Matrix

```
Classification report :
              precision    recall  f1-score   support

           1       0.67      0.50      0.57         4
           0       0.71      0.83      0.77         6

    accuracy                           0.70        10
   macro avg       0.69      0.67      0.67        10
weighted avg       0.70      0.70      0.69        10
```

Figure8 Confusion Matrix

III.CONCLUSION

By training with a broader range of knowledge sets, we may be able to improve prediction. It is also possible to analyze specific business aspects within the forecast of varied shares. In this paper, we examine the various patterns of share prices in multiple sectors. The algorithm might analyze a graph with various periods to improve its accuracy. A framework such as this can assist in marketing research and predicting growth for other corporations over several years. Prediction accuracy may be enhanced by incorporating alternative parameters (e.g., capitalist sentiment, election outcome, and government stability).

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IMPLEMENTING KNN FOR MOVIE RECOMMENDATION: AN EXPLORATION OF RECOMMENDER SYSTEMS

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Abstract— Movie recommendation systems play a vital role in the film industry, aiding users in finding new movies aligned with their interests and tastes. The past years have witnessed a substantial surge in the creation and implementation of such systems, owing to the accessibility of extensive data and advancements in machine learning and data mining methodologies. This paper provides an all-encompassing survey of movie recommendation systems, encompassing key approaches, algorithms, and evaluation metrics prevalent in the domain. Additionally, it delves into the challenges and prospects within the development of movie recommendation systems, pinpointing promising avenues for future research.

Keywords: Movie recommendation system, K-Nearest Neighbors (KNN), user ratings, personalized recommendations.

I. INTRODUCTION

In the contemporary digital era, the proliferation of extensive movie libraries and streaming platforms has inundated movie enthusiasts with an array of choices. However, this abundance often poses a challenge for users seeking movies aligned with their preferences. To address this issue, movie recommendation systems have emerged, utilizing advanced algorithms like the K-Nearest Neighbors (KNN) method to analyze user data, recognize patterns, and offer personalized movie suggestions. The significance of implementing an accurate and effective movie recommendation system using the KNN method lies in its potential to alleviate the challenges faced by users in selecting movies. Such a robust system can provide tailored movie suggestions, enhancing the overall viewing experience by minimizing the time and effort required to find relevant films. Beyond individual users, a well-designed movie recommendation system has broader implications for streaming platforms, movie rental services, and related businesses. Accurate recommendations contribute to increased user engagement, heightened customer satisfaction, and potential revenue growth. from a research perspective, exploring different recommendation algorithms, such as KNN, advances the field of recommendation systems. This research provides insights into the strengths and limitations of the KNN method in movie recommendations, offering valuable knowledge for future improvements. In summary, the development of a movie recommendation system using the KNN method holds significant potential for streamlining the movie selection process, enhancing user satisfaction, and benefiting movie-related businesses. Furthermore, it contributes to academic and research communities by expanding knowledge of recommendation algorithms and their application in the movie domain.

The core research problem addressed here is the necessity for an accurate and effective movie recommendation system to assist users in finding movies aligned with their preferences amid a vast array of available options. To meet this need, a recommendation system capable of providing personalized movie suggestions is crucial for improving user satisfaction and the overall movie-watching experience. The K-Nearest Neighbors (KNN) algorithm emerges as a popular and intuitive choice for various machine learning tasks, including recommendation systems. Operating as a non-parametric algorithm, KNN predicts or classifies the target variable of a new instance by considering the class labels of its K nearest neighbors in the feature space.The advantages of KNN in recommendation systems include its simplicity, interpretability, and effectiveness in capturing user preferences. However, challenges such as data satisfaction, scalability, and selecting an appropriate value of K necessitate consideration and resolution for optimal performance. Overall, the KNN algorithm provides a straightforward approach to generating movie recommendations based on the similarity between user preferences and movie attributes, rendering it a valuable method in recommendation system applications.

II. LITERATURE SURVEY

Movie Recommendation Systems: The role of movie recommendation systems is pivotal in aiding users in the discovery of movies that align with their preferences, providing a means to explore relevant and enjoyable content. These systems utilize a range of algorithms and techniques to analyze user behavior, movie attributes, and other pertinent data, ultimately producing personalized recommendations.

Recommendation Systems Utilizing K-Nearest Neighbors (KNN): The K-Nearest Neighbors (KNN) algorithm stands out as a favored choice in recommendation systems, valued for its simplicity and efficacy. Recommendation systems employing KNN leverage this algorithm to create personalized movie suggestions, taking into account user preferences and similarities between movies.

The last 3-year research paper methods and comparison:

1. In this 2017 paper authored by Xiang nan He and colleagues, the authors introduce a neural collaborative filtering method designed for movie recommendation utilizing implicit feedback data. The proposed model combines user and item embeddings with multi-layer perceptions, demonstrating state-of-the-art performance across various benchmark datasets.
2. Employing Convolutional Neural Networks for Film Recommendation" authored by Kiran Rama et al. (2019). In this study, the authors introduce a movie recommendation system that employs a convolutional neural network to acquire representations of movies derived from their posters. The system undergoes evaluation on an extensive movie dataset, demonstrating competitive performance in comparison to other contemporary state-of-the-art approaches.
3. Enhancing Movie Recommendations through a Hybrid Deep Learning Approach" by Ruiyang Song, et al. (2020). In this study, the authors introduce a hybrid deep learning approach for movie recommendation, amalgamating a matrix factorization technique with a deep neural network. The model is trained using a combination of user ratings and movie metadata, resulting in enhanced performance compared to conventional recommendation methods.
4. Utilizing Graph Convolutional Neural Networks in Movie Recommendation" by Zhang Yin Feng et al. (2021). In this research, the authors introduce a movie recommendation system employing graph convolutional neural networks to derive movie representations through their relationships with other movies. The system undergoes evaluation on various benchmark datasets, demonstrating enhanced performance compared to alternative graph-based recommendation methods.

III. METHODOLOGY

Dataset

For a movie recommendation system, the dataset typically encompasses information pertaining to movies, user ratings, and potentially supplementary metadata. The key components of the dataset include:

Movie Data:

1. Movie Title: The name of the movie.
2. Genre: The genre(s) associated with the movie (e.g., action, comedy, drama).
3. Actors/Directors: Details about the actors and directors involved in the movie.
4. Release Year: The year when the movie was released.
5. Plot Summary: A concise summary or description of the movie's plot.

User Data:

1. User ID: A distinctive identifier for each user in the dataset.
2. User Demographics: Information about user demographics, such as age, gender, location, etc.
3. User Ratings: Ratings provided by users for the movies they have watched. These ratings could be on a numerical scale (e.g., 1-5 stars) or in the form of binary feedback (liked/disliked).

Additional Metadata:

Popularity Metrics: Information regarding the popularity or engagement level of movies, such as box office performance, number of views, or online ratings.

External Data:

Additional information that could be integrated, such as movie reviews, tags, or social network connections (e.g., friends' recommendations).

It's important to note that the availability and size of datasets may vary. Some publicly accessible datasets for movie recommendations include Movie Lens, IMDb, Netflix Prize, or other movie review platforms. Depending on the scope of your research, you might need to obtain or preprocess the dataset to suit your specific requirements.

Data Preprocessing

The preparation of the dataset for constructing a movie recommendation system with the KNN method necessitates a crucial step known as data preprocessing. This step entails the transformation and cleaning of data to guarantee its quality, consistency, and compatibility with the algorithm. Below are several prevalent data preprocessing techniques applicable to movie recommendation systems:

1. Handling Missing Data:

Detecting and addressing missing values in the dataset, a critical step as it can impact similarity calculations and recommendation quality. Consider employing strategies like imputation, where missing values are estimated using techniques such as mean, median, mode, or regression-based methods. Alternatively, removal of instances or attributes with a substantial number of missing values is an option if they do not significantly contribute to the recommendation process.

2. Data Normalization:

Normalize the data to bring diverse attributes onto a comparable scale. This is particularly important when dealing with numerical attributes exhibiting different ranges or units. Common normalization techniques include min-max scaling, z-score normalization, or log transformation, chosen based on the distribution of the data.

3. Handling Categorical Data:

For KNN-based recommendation systems, proper encoding of categorical attributes, like movie genres or user demographics, is essential. Utilize one-hot encoding to represent categorical attributes as binary values, creating distinct binary features for each category. Alternatively, label encoding can be applied, assigning a unique numeric value to each category.

4. Data Sampling:

In situations involving extensive datasets, employ data sampling techniques to create a representative subset for experimentation and model development. Depending on dataset characteristics and research objectives, options like random sampling or stratified sampling can be applied.

5. Data Splitting:

Partition the dataset into training, validation, and testing sets. The training set is employed for building the recommendation system, the validation set for hyper parameter tuning, and the testing set to assess the final model's performance. Ensure that the splitting process maintains the representation of users and movies in each subset to prevent bias. These preprocessing techniques contribute to ensuring dataset quality, eliminating noise, and enhancing the performance and accuracy of the KNN-based recommendation system. Specific preprocessing steps and techniques may vary depending on dataset characteristics and research objectives.

Implementation of the KNN Algorithm

Implementing the KNN (K-Nearest Neighbors) algorithm for a movie recommendation system involves several steps:

1. Load the Dataset:

Load the preprocessed movie dataset, encompassing movie attributes, user ratings, and any additional metadata required for recommendations.

2. Split the Dataset:

Divide the dataset into training and testing sets. The training set is utilized to construct the KNN model, while the testing set is employed to assess its performance.

3. Calculate Similarity:

Identify a suitable similarity measure, such as Euclidean distance, Cosine similarity, or Pearson correlation coefficient, to compute similarity between movies or users. Calculate the similarity between each pair of movies or users based on their attributes or ratings.

4. Select the Nearest Neighbors:

Given a target movie or user, identify the K nearest neighbors based on their similarity scores. The value of K determines the number of neighbors considered in the recommendation process.

5. Generate Recommendations:

Based on the nearest neighbors, generate recommendations for the target movie or user. For user-based recommendations, suggest movies highly rated by similar users. For item-based recommendations, propose movies similar to those highly rated by the target user.

6. Evaluation and Performance Analysis:

Evaluate the performance of the KNN recommendation system using appropriate metrics like precision, recall, or mean average precision. Measure the accuracy and relevance of the recommendations generated by the KNN model.

7. Hyperparameter Tuning:

Experiment with different values of K to identify the optimal number of neighbors for the recommendation system. Perform cross-validation or use a validation set to assess the performance of various K values and select the best one.

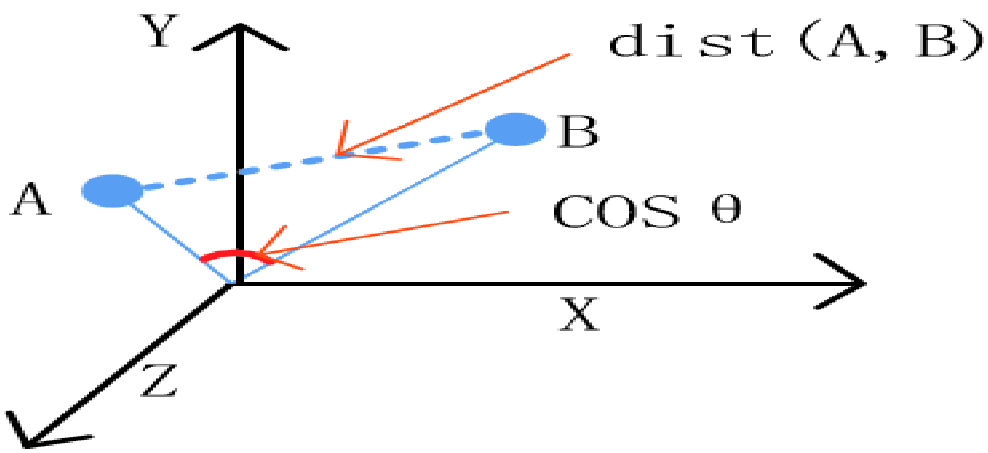

Fig.1. Cosine Distance

IV. RESULTS AND DISCUSSION

The KNN method utilizes collaborative filtering, a technique known for its effectiveness in capturing user preferences and providing recommendations based on analogous user behavior. This method excels at discerning patterns and similarities in users' movie preferences, resulting in precise and personalized suggestions. Notably, its simplicity makes it easy to comprehend and implement.

The straightforward nature of KNN facilitates interpretation and transparency, simplifying the explanation of recommendation generation to users. Additionally, KNN handles the cold start problem reasonably well, as it doesn't heavily rely on user history. Even for new users with limited or no ratings, the system can still generate recommendations based on the ratings and preferences of similar users.

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V. CONCLUSION

The KNN algorithm, employing collaborative filtering, excels in delivering personalized movie recommendations by leveraging user similarities and preferences. It effectively tackles the cold start problem for new users and movies, incorporating content-based features and item metadata for meaningful suggestions with limited data. Data preprocessing ensures dataset quality, and evaluation metrics validate the system's accuracy. Despite strengths in simplicity and transparency, scalability issues and reliance on explicit user ratings are limitations. This research showcases KNN's effectiveness while highlighting opportunities for improvement. Contributions include insights into recommendation techniques, scalability, contextual information, and hybrid approaches, aiming for more accurate and enjoyable movie recommendations and enhancing the overall movie-watching experience.

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HEART DISEASE PREDICTION USING MACHINE LEARNING

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Abstract- The most serious problems are heart-related ones. The death rate from heart attacks is rising daily. We need to discover heart problems early on, thus developing a system is essential. Manually diagnosing these diseases takes a lot of time and has low system availability. Numerous technologies are employed in the creation of this kind of system, which uses the data mining principle. We may create these kinds of systems, which are a subset of the data mining idea, using various machine learning techniques. We must identify the diseases and take the required precautions against them as soon as possible in order to reduce the danger of death. K-Nearest Neighbors, Logistic Regression, Random Forest, and Naive Bayes.
Keywords- ,Heart healthiness, machine learning, healthcare support, logistic regression.

I. INTRODUCTION

The heart is regarded as one of the most vital and significant parts of our bodies since it controls blood flow throughout our bodies. In the contemporary global, cardiovascular illness is among the primary causes of the majority of deaths. Heart failure or heart disease can be caused by modest threats to the heart. Hypertension can lead to heart disease, and fatty foods can cause hypertension. Heart disorders account for the majority of deaths, according to the WHO. The best defense against diseases linked to the coronary heart is a healthy lifestyle and early identification. Heart disease can be caused by a variety of factors, including stress, alcohol, bad diet, and smoking. The thread we have in front of us healthcare system is to effective diagnosis. It is possible to detect or predict heart diseases, for that many technologies are used like AI, ML and many more. Algorithms of AI and ML used for detection of heart diseases. ML algorithms are very helpful in the recent time, to determine the heart related diseases correctly. Data mining contains many more technologies Machine Learning is one of them. Many ML techniques used in detection or prediction of heart diseases at earlier stage. ML plays a totally critical function to discover the hidden discrete styles and thereby analyses the data. In medical field ML mainly used for prediction of different illnesses. Random forest, choice/decision Tree, Naive Bayes, Logistic Regression for predicting heart ailment earlier, these are some ML strategies used for pattern recognition or prediction of pattern based on previous data-set. A logistic regression version predicts a fixed-up records variable via the use of reading the relationship amongst one or many present independent variables. Detection or prediction of pattern, forecasting these domains uses logistic regression.

II. LITERATURE SURVEY

These days, machine learning and related algorithms are widely used in web apps and platforms. Because it provides predictions along with accurate and efficient results. Therefore, because of this precise result, the research in this field becomes significant and valuable. There are various machine learning algorithms available that forecast diseases. The severity of cardiac disease can be predicted from the patient's sample reports. Patients often undergo clinical examinations, and the reports that are produced include a variety of information that, when combined with machine learning algorithms, can be used to gauge the severity of cardiac disease. The accuracy rate of the heart disease prediction project using Naive Bayes and Random Forest (RF) classifiers is 85.48%. Additionally, there are methods like RF, classifiers in the heart disease prediction project have accuracy rate of 85.48%. There are also techniques like RF, Support Vector Machine (SVM), and learning models which also can be used in heart datasets. The study of

Mienye et al in this area states that the use of the mean based splitting method, classification and regression tree for divide the data set into smaller parts and perform predictions on that. There are different algorithms like logistic regression, KNN classifier, naive Bayesian we can use for classification of heart disease. The lot of research papers of Zameer Khan et al. all have accuracy rate of 85.71 of logistic regression. The main objective of proposed approach is to evaluate accuracy and error rate to identify the best feature. We select the feature and then we divide the data set as training data and testing data. We can have 80 % data as training data and remaining data as testing data. We can perform logistic regression or any other machine learning classification algorithms to predict the results. Then on basis of result, patients are suggested for further diagnosis. Cardiovascular disease is increasing daily in this modern world. According to the WHO, an estimated 17 million people die each year from cardiovascular disease, particularly heart attacks and strokes. ML is now an emerging field due to the increasing amount of data. ML makes it possible to acquire knowledge from a massive amount of data, which is very heavy for man and sometimes impossible. By using K-Nearest Neighbor, Support Vector Machine, Naive Bayes, Random Forest algorithms we can predict heart diseases. The purpose of this work is to compare algorithms with different performance measures using ML.

III.EXISTING SYSTEM

Heart problems pose a challenge to modern health system. Numerous existing methods primarily focus on data mining sets in addition to deep learning. Every clinical diagnostic plays a crucial role in accurately predicting the outcome. It is possible to forecast a patient's heart health using computer-generated reports. Additionally, it lowers the price of a physical diagnosis. Data mining is utilized in current systems to find patterns and dependability in data sets. Data mining was used in previous decades. Computers have a high probability of immediately classifying various traits, attributes, or categories. The current systems are aware of the risk factors linked to heart disease. Permit the patient's condition to be assessed for high risk and make a diagnosis based on that assessment. The current setup used patient’s heart disease family history and total cholesterol values by using mathematical analysis. Existing system predict the heart problem intensity.

IV.PROPOSED SYSTEM

The data set of patient heart health report parameters that the project possesses and subsequently using the Logistic Algorithm, it provides the heart disease severity. We shall refer the patient to the local doctors for additional therapy based on the severity of their heart condition. By examining the patient report and conducting data investigation, the outcome is predicted. Numerous machine learning methods exist, including logistic regression, KNN, and naive bays. However, research indicates that logistic regression yields a greater accuracy rate, thus we employed this algorithm in the proposed system. Utilize the sklearnlibrary in that system to determine the accuracy score rate. We employed a random search strategy to identify the optimal answer for the built model by combining random combinations of hyper parameters. Then used to assess the outcomes logistic regression algorithm, performing it on training and testing data we predict the intensity of heart diseases. The very first step is importing the data set to read the data set. Data contains age, gender, sex, chest pain, slope and target.

For information verification data should be explored. By creating temporary variables build a model for logistic regression. In proposed system, sigmoid function is used which helped in graphical representation of data which is classified. The accuracy in the proposed system is more as compared to existing systems as we are using logistic regression.

V. APPROACH AND METHODOLOGY

The World Health Organization reported that heart disease causes 12 million deaths globally each year.50% of deaths worldwide, including in the US, are attributable to cardiovascular disease. For high-risk patients, changing their lifestyle is essential, as is preventing issues early on by scheduling timely visits with physicians and cardiac specialists. The objective of the suggested model is to determine the risk factor for cardiac conditions and use logistic regression to forecast outcomes. In statistics, logistic regression is mostly used to predict the results of categorical dependent variables based on independent factors. In logistic regression, the dependent variable is always binary. A useful tool for risk prediction and probability calculation is logistic regression.

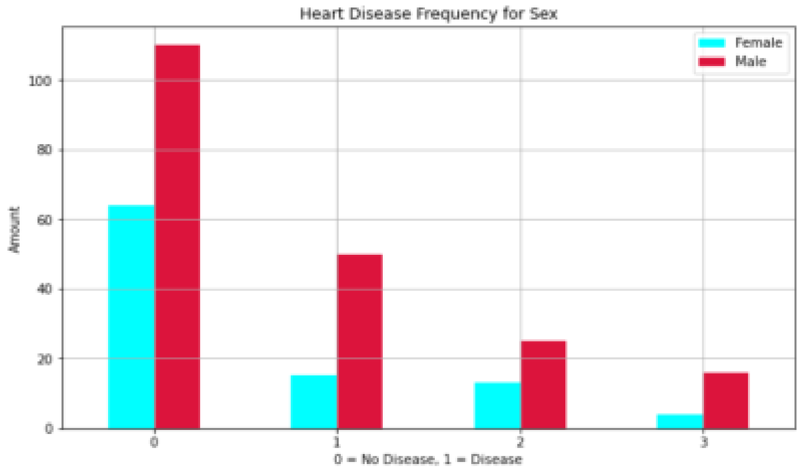

Fig.1 Heart disease frequency (Sex)

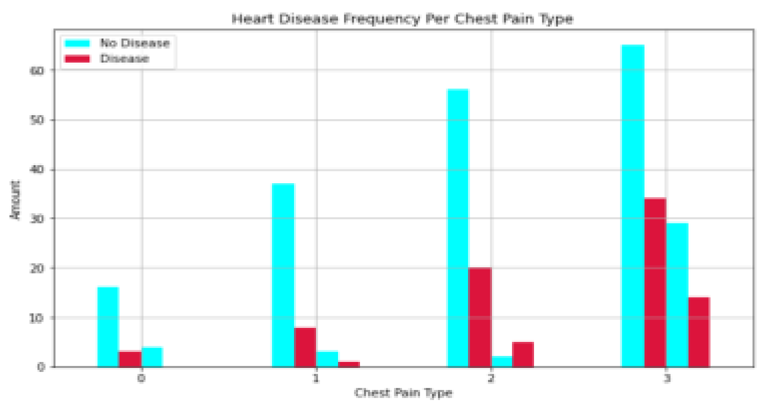

Fig.1 heart disease frequency (Chest pain type)

The symbols in data dictionary for different chest pain can be understand from following

cp - chest pain type:

This decreases blood supply to heart, related to heart pain agnail.

It's totally not related to heart atypical pain

This pain is not related to esophageal not related to heart non-agnail.

This is asymptotic it shows no symptoms

This chest pain type 1 shows it is not related to heart but it has more people as compared to person whom do not have chest pain. If data dictionary does not supply enough information, you might use google to know about agnail pain, atypical pain, and asymptomatic pain non agnail chest pain type. This research came from asking from cardiologist you can also google about it.

VI. ECG BASED HEART HEALTH ANALYSIS

Heart disease and other cardiovascular conditions are the major causes of death worldwide. More lives can be saved the earlier they can be predicted and categorized. Cardiovascular disease can be identified with an electro-cardiogram (ECG), a simple, affordable, and non-invasive method of detecting the electrical activity of the heart. In this study, the public ECG picture data set of cardiac patients was used to harness the potential of deep learning techniques to predict the four main cardiac abnormalities: abnormal heartbeat, myocardial infarction, history of myocardial infarction, and normal person classes. Squeeze Net and Alex Net, two low-scale pre-trained deep neural networks, were used to examine the transfer learning strategy first. A brand-new Convolutional Neural Network (CNN) architecture was also suggested for the prediction of cardiac abnormalities. Third, the previously described pretrained models as well as our suggested CNN model were employed as feature extraction tools for conventional machine learning algorithms, including Support Vector Machine (SVM), K-Nearest Neighbors (K-NN), Decision Tree (DT), Random Forest (RF), and Naive Bayes (NB). The suggested CNN model outperforms existing works in terms of performance metrics, according to the experimental results; it achieves 98.23% accuracy, 98.22% recall, 98.31% precision, and 98.21% F1 score. Additionally, the suggested CNN model uses the NB method to reach the best score of 99.79% when employed for feature extraction.

VII.CONCLUSION

To reach the maximum point, the number of heart diseases may surpass the current situation. Heart disease is a complex condition that claims the lives of many people annually. Manually calculating the probability of developing heart disease based on previously identified risk factors is challenging. One of the main limitations of this system is that its primary goal is to apply classifying techniques and algorithms for the prediction of heart disease. By studying different data cleaning and mining techniques, we can prepare and build a data set suitable for data mining, which allows us to use machine learning in logistic regression algorithms to predict whether or not a patient has heart disease. Any non-medical employee can use this software and predict the heart disease and reduce the time complexity of the doctors. It is still an open domain waiting to get implemented in heart disease predication and increase the accuracy.

VIII. FUTURE WORK

Today's, world most of the data is computerized and everything is in the cloud which can be accessed although it is not utilized properly. By analyzing the available data, we can also use for unknown patterns. The primary motive of this research is the prediction of heart diseases with high rate of accuracy. For predicting the heart disease, we can use logistic regression algorithm, sklearn in machine learning. The future scope of the paper is the prediction of heart diseases by using advanced techniques and algorithms in less time complexity.

IX. RESULT PARAMETERS

1. Abnormal heartbeat:

Any disturbance in the heartbeat's rhythm or pace is referred to as an abnormal heartbeat, or arrhythmia. Each heartbeat is generally regulated and coordinated by electrical signals that start in the sinoatrial node, the heart's natural pacemaker, and move through the electrical system of the heart. But occasionally, these messages can be interfered with, resulting in the heart beating too quickly, too slowly, or irregularly. Many symptoms, including palpitations, shortness of breath, dizziness, or fainting, may result from this. Arrhythmias come in a variety of forms, from minor and not harmful to acute and life-threatening. Atrial fibrillation, ventricular tachycardia, and supraventricular tachycardia are a few instances that are frequently seen.

2. Myocardial Infraction:

When there is a blockage in the blood supply to the heart muscle, it results in damage or death of the heart muscle tissue, which is known as a myocardial infarction or heart attack. The blood tube that supplies the heart muscle with oxygen-rich blood, the coronary arteries, usually becomes blocked when a blood clot forms in one of them. This can occur when plaque, a waxy substance that can gather in the arterial walls over time, causes the coronary artery to constrict or become blocked. Chest pain or discomfort, shortness of breath, nausea, dizziness, or pain in other upper body areas such the arms, neck, jaw, or back are all possible heart attack symptoms.

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SONOVISUAL: TRANSFORMING IMAGE DESCRIPTION INTO DYNAMIC NARRATIVES

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Abstract— Sono Visual is an innovative framework that revolutionizes static image descriptions by seamlessly transforming them into immersive, dynamic narratives. By integrating cutting-edge image recognition and natural language processing technologies, the project transcends traditional limitations of textual representations, conveying visual essence and emotional depth. Deep learning algorithms form the core of Sono Visual, extracting intricate details and contextual information from images. The system recognizes objects, scenes, and visual patterns, generating engaging narratives that offer a multisensory experience. Adaptive storytelling techniques enable Sono Visual to tailor its narrative style to diverse audiences and contexts, incorporating sentiment analysis for emotional resonance. The framework's applications span accessibility enhancements for the visually impaired, enriched educational materials, and augmented multimedia content. Sono Visual not only promises practical benefits but also opens new creative expressions and facilitates enhanced human-computer interaction through visually enriched storytelling experiences

Keywords: Machine Learning, TensorFlow, karas, pickle

I. INTRODUCTION

In the contemporary digital landscape, visual content is ubiquitous and forms a significant part of our online experience. However, for visually impaired individuals, accessing and comprehending visual content can be a challenging task. While various technologies exist for converting text to speech, the process of transforming images into vivid, comprehensive narratives has remained a complex and often unexplored domain. "Sono Visual" is a groundbreaking project that aims to bridge this accessibility gap by revolutionizing the way we perceive and interact with images. Leveraging cutting-edge advancements in artificial intelligence and natural language processing, Sono Visual introduces a novel approach to transforming static image descriptions into dynamic and immersive narratives. By seamlessly combining descriptive language with audio-visual elements, this project aspires to provide an inclusive and enriching experience for individuals with visual impairments, enabling them to engage with visual content on a profound and meaningful level. Through a unique combination of deep learning algorithms, semantic analysis, and audio rendering techniques, Sono Visual endeavors to empower users to perceive images not just as static entities, but as intricate stories waiting to unfold. By harnessing the power of technology, Sono Visual endeavors to redefine the boundaries of inclusivity in the digital sphere, fostering a more accessible and immersive environment for all individuals, regardless of their visual capabilities. This project proposal outlines the comprehensive framework and development roadmap for Sono Visual, highlighting its potential impact, technical innovations, and envisioned applications across various domains. With an emphasis on user-centric design and a commitment to pushing the boundaries of technological accessibility, Sono Visual is poised to set a new standard for inclusive digital experiences in the modern era.

III. LITERATURE SURVEY

A literature survey for a project titled "Sono Visual: Transforming Image Descriptions into Dynamic Narratives" would involve gathering information from various scholarly sources, including research papers, articles, and relevant publications, that discuss the intersection of image descriptions, narratives, and technology.

Image Descriptions and Narratives: Explore the existing literature on the relationship between image descriptions and narrative storytelling. Look for studies that discuss how visual descriptions contribute to the creation of narratives, both in traditional storytelling and in digital media.

Technological Integration in Narratives: Investigate how technology, especially artificial intelligence and natural language processing, has been integrated into the creation and interpretation of narratives. Look for examples where image recognition technology has been used to generate descriptive narratives.

Accessible Technology for the Visually Impaired: Review studies and projects that aim to make visual content accessible to visually impaired individuals. Analyse how existing technologies, such as screen readers and image recognition software, have been utilized to convert visual information into auditory formats.

Interactive Storytelling and User Experience: Examine research on interactive storytelling and user experience design, especially in the context of multimedia content. Look for studies that discuss how dynamic narratives can enhance user engagement and immersion.

Applications of Natural Language Processing (NLP) in Image Description: Investigate the use of NLP techniques in generating descriptive narratives from images. Focus on research that explores the challenges and advancements in using NLP for image analysis and description generation.

Ethical and Social Implications of Automated Image Description: Discuss the ethical considerations related to the use of automated image description technology. Look for literature that addresses privacy concerns, potential biases in image descriptions, and the impact of such technology on society as a whole.

Challenges and Future Directions: Summarize the key challenges faced in developing technologies like Sono Visual and provide insights into future research directions

IV. PROBLEM DEFINITION

The problem statement relates to the capturing the images of the actions and based on that images recognizing what will be the action. After that it converts it into the narrative format and then sound. There are many people who are suffering from the different disabilities. Majorly people are suffering from blindness problem. They need of every time someone to perform any activity. It means that without other person these people cannot do anything. It is a major problem with these people. It is not possible to every time they will get help of other people at right time. These people may have to wait until they get someone's help. Sometimes if these people need help and no one is with him/her then it is very dangerous for these people. People should get the help to perform the activities even if no one is with them. They should have to perform the activities by own and recognize the situation or the different actions which are performing around them.

IV.PROBLEM SOLUTION

Sono visual technology emerges as a powerful solution to address these challenges. It transforms image descriptions into dynamic narratives by seamlessly integrating audio and visual components. Here's how Sono visual offers solutions to some of the key problems:

Enhancing Accessibility: Sono visual technology plays a pivotal role in making visual content more accessible to individuals with visual impairments. By providing audio descriptions that supplement or replace traditional image descriptions, it allows everyone to engage with visual content more meaningfully. This inclusivity promotes a more equitable and accessible society.

Improving Education: The traditional educational landscape relies heavily on textbooks and visual materials, which can pose challenges for students with visual impairments. Sono visual technology bridges this gap by making educational content more comprehensible. Complex visual data in subjects like science, mathematics, and history can be made accessible through audio descriptions, ensuring a more inclusive learning experience. Enriching Art and Entertainment: Artists and entertainers can leverage Sono visual to create captivating and immersive experiences. Static artworks can come to life with the addition of audio narratives, ambient sounds, and music. This technology offers new opportunities for creative expression and storytelling, expanding the horizons of artistic and entertainment experiences. Engaging Marketing and Advertising: In the world of marketing and advertising, Sono visual technology has the potential to revolutionize customer engagement. Brands can use dynamic narratives to convey the story and emotion behind their products or services, fostering deeper connections with their audience. This innovative approach opens up fresh avenues for marketing creativity and impact.

Addressing Challenges: While Sono visual technology holds great promise, it also faces challenges, including the need for high-quality audio descriptions, compatibility across various devices, and privacy concerns. Solutions involve refining audio description algorithms, developing standardized formats, and implementing robust privacy protocols to ensure the responsible and equitable use of this technology.

Exploring Emerging Technologies: As technology evolves, Sono visual’s potential extends into emerging fields like virtual and augmented reality, further enriching the immersive experiences that can be offered. Researchers and developers must continue to explore and innovate within these realms to unlock new possibilities for dynamic narratives in the digital age.

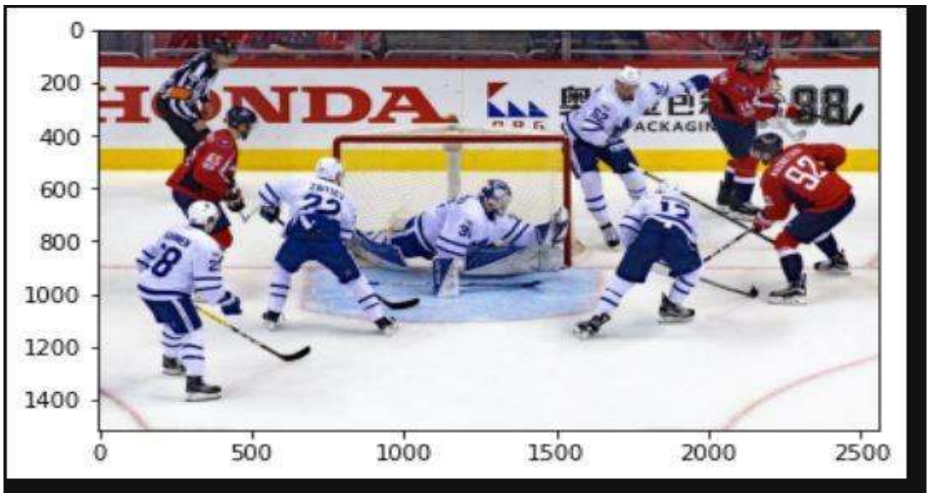

Fig. Image Analysis

V. METHODOLOGY

1. Understanding the Audience and Purpose:
Identify the target audience, including individuals with visual impairments, and understand their specific needs and preferences. Determine the purpose of the project and how Sono Visual can enhance the overall experience for the audience

2. Image Analysis and Description: Conduct a comprehensive analysis of the images involved in the project. Create detailed and accurate descriptions of the images, ensuring to capture essential visual elements, colours, shapes, spatial relationships, and any other relevant visual details.

3. Narrative Development: Develop dynamic and engaging narratives that not only describe the images but also evoke emotions, create visual imagery through words, and provide context to the visual content. Utilize vivid language, sensory details, and storytelling techniques to bring the images to life through the narrative.

4. Incorporating Audio Elements: Utilize audio technologies to integrate the dynamic narratives with the corresponding images. Ensure compatibility with various devices and platforms to maximize accessibility and reach.

5. Testing and Feedback: Conduct rigorous testing with individuals from the target audience to gather feedback on the effectiveness of the Sono Visual implementation. Incorporate the feedback to refine the narratives, audio elements, and overall user experience.

6. Accessibility and Integration: Ensure that the Sono Visual content is easily accessible through various platforms, devices, and assistive technologies. Integrate the Sono Visual content seamlessly into the existing project framework, ensuring a cohesive and user-friendly experience for all users.

7. Continual Improvement and Maintenance: Continuously assess the effectiveness of the Sono Visual implementation and make necessary improvements based on user feedback and technological advancements. Regularly update and maintain the Sono Visual content to ensure its relevance and accessibility over time.

V. CONCLUSION

In conclusion, Sono visual technology represents a groundbreaking advancement in the world of multimedia by seamlessly merging audio and visual elements to transform static image descriptions into dynamic narratives. This innovative concept has far-reaching implications, with applications spanning diverse domains. Sono visual's impact on accessibility cannot be overstated, as it provides an inclusive means for individuals with visual impairments to engage with visual content. By adding audio descriptions, it empowers these individuals to access and comprehend a wide array of images, from educational materials to artworks in museums. The educational sector also stands to benefit significantly from Sono visual technology. Traditional textbooks and learning resources can be enhanced with audio elements, making complex visual data more comprehensible and memorable. This is particularly advantageous for subjects where visuals play a critical role in conveying information.

VI. RESULT

Sono visual technology stands at the forefront of multimedia innovation, seamlessly integrating audio and visual elements to transcend static image descriptions into dynamic narratives. Its groundbreaking concept holds vast implications, spanning various domains. Notably, Sono visual's impact on accessibility is profound, offering an inclusive avenue for individuals with visual impairments to engage with visual content. Through the addition of audio descriptions, it empowers them to comprehend a diverse range of images, encompassing educational materials to artworks in museums. The educational sector is poised for significant benefits with Sono visual technology. Traditional learning resources can be enriched with audio elements, enhancing the clarity and memorability of complex visual data. This advancement proves particularly advantageous in subjects where visuals are integral to conveying information. Sono visual represents a transformative force, heralding a new era of accessibility, comprehension, and multimedia integration in education and beyond.

VII. FUTURE SCOPE

1. Educational Revolution: Sono visual will transform e-learning, providing dynamic narratives for enhanced understanding of complex subjects.
2. VR/AR Immersion: Integration with virtual and augmented reality will offer compelling and realistic experiences.
3. Cultural Enrichment: Museums and heritage sites can leverage Sono visual for interactive storytelling, preserving and sharing cultural narratives.
4. Accessible Online Content: Enhancing inclusivity, Sono visual will provide audio descriptions for images in online platforms.
5. Collaboration: Continued advancements in AI will enable Sono visual to offer even more accurate and emotionally resonant dynamic narratives.

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FAKE CURRENCY DETECTOR

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Abstract: The creation and circulation of counterfeit notes are on the rise right now, as a result of advances in color-printing technology. This is a serious issue that affects practically all of the nations. The economy is impacted. According to the research, this has had a highly negative effect on developing nations like India. This research suggests a method for viewing the fake currency through its image. Various Pre-processing techniques should be used after choosing an image. After that, the image is segmented, its features are measured, correlation is found, and classification is completed to determine whether the image is real or fake. Banks and other trading places have equipment available to verify financial validity. Nevertheless, the normal individual does not have access to such tools. This project provides a thorough explanation of a fake note detector that can be used by the average person. The Python programming language has been used to create the software in its entirety.

Keywords: Fake Currency, image processing, grayscale conversion, segmentation, pre-processing.

I. INTRODUCTION

Currency duplication or production of counterfeit currency notes illegally by imitating the actual manufacturing process is a huge problem that every country is facing. Fake currency can reduce the value of real money and cause inflation due to an unauthorized and unnatural increase in the money supply. Manual authentication of currency notes is a solution but it isa very time-consuming, inaccurate, and difficult process. Automatic testing of currency notes is, therefore, necessary for handling large volumes of currency notes and then, getting accurate results in a very short time span. In this project, we propose a fake currency note detection system using various image processing techniques and algorithms. The proposed system is designed to validate Indian currency notes of denomination 500 and 2000 rupees.

II. LITERATURE SURVEY

1. Ms. Monali Patil, Prof. Jayant Adhikari, Prof. Rajesh Babu they proposed a system which uses image processing to distinguishes between features of a real note and a fake note. They used K-means algorithm for feature clustering and SVM algorithm to train theirdata model. (Patil, 2018)
2. Mayadevi A.Gaikwad,Vaijinath V. Bhosle Vaibhav D Patil. In their research paper they have suggested a methodology of detecting fake currency from the real by comparing their visual features such as distance between Gandhiji's portrait and other notations. This methodology can be useful for a system purely based on software processing. (Gaikwad, 2017)
3. VigneshMK,SuryaV.In their paper they havesuggested image processing along with supervised machine learning to learn the distinguishing feature of a real note from fake one which will increase the precision of this method. (Kumar, 2023)
4. Akanksha Upadhyaya Research Scholar, VinodShokeen Associate Professor, Garima Srivastava. In their study they have proved that image processing along with logistic regression gives an accuracy ofabove 99%. (Upadhyaya, 2018)

III. METHODOLOGY

1. **Preparation of Dataset:**The first step is thepreparation of a dataset containing images of different currency notes (both fake and real) and images of different features of each of the currency notes • The dataset will contain the following repositories: – Sub- dataset for Rs. 500 currency notes 1) Images of real notes 2) Images of fake notes 3) Multiple images of each security feature (template) – Sub- dataset of Rs. 2000 currency notes (Similar structure)
2. **Image Acquisition**: Next, the image of the test- currency note is taken as input and fed it into the system.The image
3. should be taken from a digital camera or preferably, using a scanner. The image should have a proper resolution, proper brightness and should not be hazy or unclear. Blurred images and images with less detail mayadversely affect the performance of the system. (Refer Fig3.1)
4. **Pre-processing**: Next, the pre-processing of the input image is done. In this step, first the image is resized to a fixed size. A fixed size of image makes a lot of computations simpler. Next up, image smoothening is performed by using Gaussian Blurring method. Gaussian blurring removes a lot of noise present in the image and increases the efficiency of the system. (Refer Fig3.3)
5. **Gray- scale conversion**: Gray scale conversion is mainly used because an RGB image has 3 channels whereas a gray image has only one channel. This makes the computation and processing on images mucheasier in the case of gray scaled images. Refer fig3.4
6. **Algorithm**: CNN (Convolution Neural Network) In the realm of fake currency detector software, Convolutional Neural Network (CNN) algorithms playa pivotal role in enabling robust and accurate identification of counterfeit notes. This sophisticatedtechnology utilizes a multi- layered neural network designed specifically for image recognition tasks. The software is trained on a diverse dataset comprising authentic and counterfeit currency images, allowing theCNN to learn intricate patterns, textures, and features that distinguish genuine from fake money. During the detection process, a user inputs an image of a currency notes, and the CNN meticulously analyzes the visual elements through convolutions, capturing hierarchical and spatial relationships. The deployment of CNNs in fake currency detection enhances the software's capability to discern subtle nuances, contributing to a more effective and reliable solution for identifying counterfeit currency with a high level of accuracy.
7. **Feature Extraction:** Now, using ORB location of each template has been detected in the input image within the highlighted area. The highlighted area is then cropped by slicing the 3D pixel matrix of theimage. Next, we apply gray scaling and Gaussian blurto further smoothen the image
8. **Edge Detection:** Edge detection is a crucial image processing technique employed in fake currency detectorsto enhance the identification of distinguishing features on currency notes. This technique focuses on identifying abrupt changes or transitions in intensity, which often correspond to edges or boundaries between different regions in an image. In the context of currency detection, edge detection helps highlight intricate patterns, fine details, and specific characteristics that may be indicative of genuine orcounterfeit notes.

IV SYSTEM ARCHITECTURE

(Figure 1) The architecture of a fake currency detector system comprises several interconnected modules to ensure accurate identification of counterfeit notes. Users input currency images, which undergo preprocessing to enhance quality. Feature extraction techniques, including edge detection and pattern recognition, highlight distinctive elements. A Convolutional Neural Network (CNN) is trained on a dataset to learn relevant patterns. The classification module combines CNN analysis and extracted features to determine authenticity. A user interface facilitates interaction, and the output module provides clear results. Integration with external systems, security measures, and mechanisms for continuous learning enhance system capabilities. This comprehensive architecture ensures the system's effectiveness in detecting counterfeit currency while maintaining user- friendly interaction and adaptability to evolving threats.

This model we will build will use a grayscale image, segmentation, and feature extraction. We are going to use OpenCV in this project because this library contains some of the pre-built functions to work with images. To check whether the currency is fake or real, we will take a real note and a fake note as input an image in the system. The input images given to the system will be converted into grayscale images. We will use segmentation to segment out the image of Gandhi Ji and the thin strip on the note.The idea is that we will compare the real and fake notes based on the image of Gandhi Ji and the thin strip present on the image. We will The comparison of Gandhi Ji's image is simple because we just have to find a correlation between two images using a correlation function. If the result of the correlation function is greater than 0.5 then Gandhi Ji islegitimate and we will check for a thin strip. Otherwise, the note is fake.

Now the main problem is to find the number of lines in thin strips. For that, we will convert the image into HSV (hue saturation value) image because it will be easy that way. Then we will segment the image to find the thin strip. After that, we will apply a able function to find the number of connected components i.e. the number of lines in the thin strip. In the end, we will just write small code to final check whether the currency is fake or real.

NOTE: We have just used two features i.e. Gandhi Ji image and thin strip. But there are a lot of other things on a real note like a unique number, bleed lines (using which a blind man can find what is the value of the currency), etc. For improving the model, you can try implementing these features by yours

Figure 3: Features in 2000 | currency bill Figure 2 *Features in 500 | currency bil*

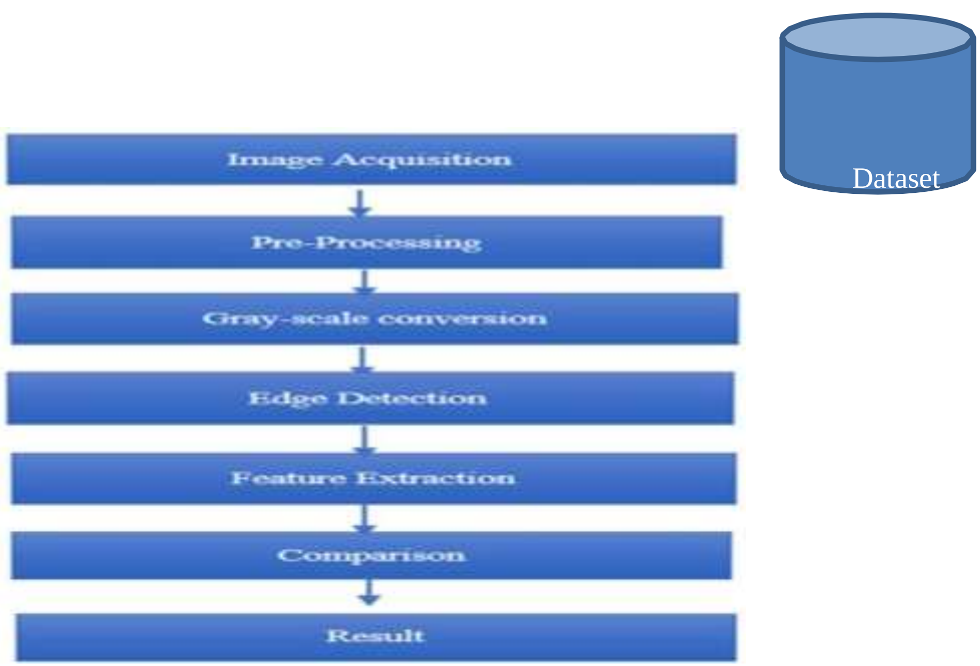

Figure 1 Flow diagram

V Implementation

Figure 4: Intially no image is dislayed

Figure 4: Browsing image

Figure 5: Input image of currency not

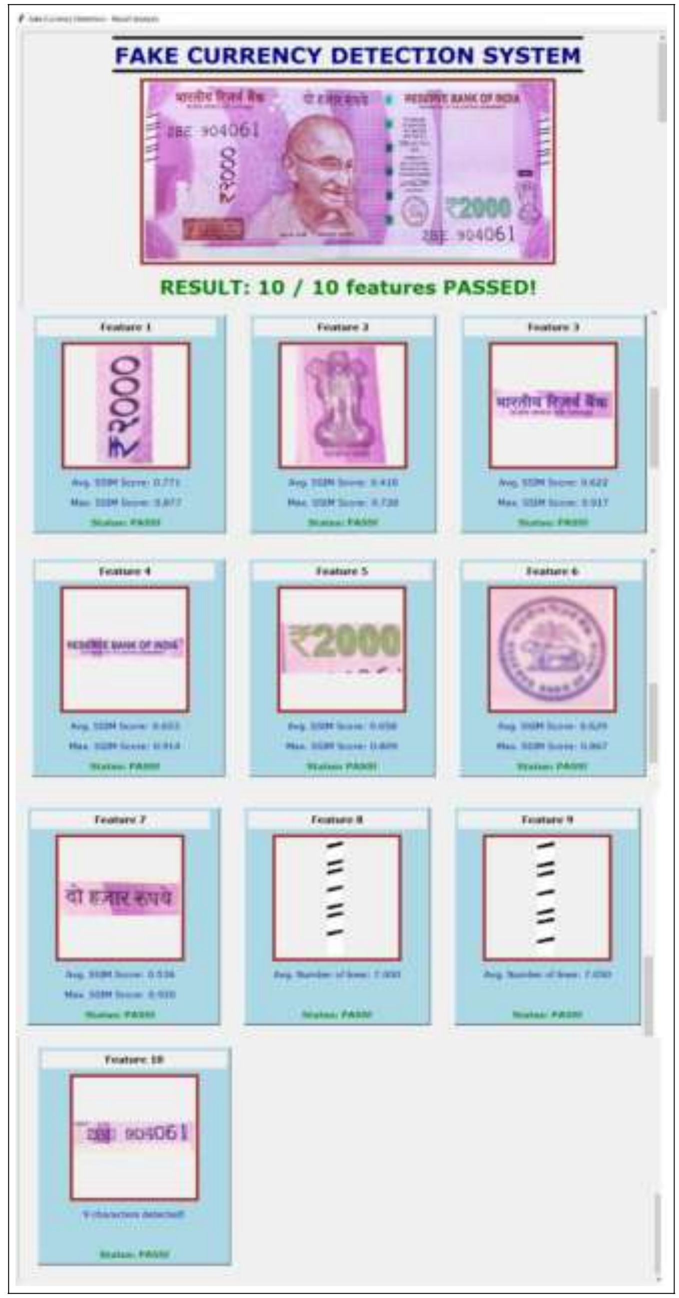

Figure 6:Image sent for processing

Figure7: GUI showing final result (Real note)

Figure 8: Original Note of Rs. 2000 and Rs. 500 as input

Figure 9: ***Grayscale Conversion of Rs.500 and 2000***

Figure 10: Grayscale Image to Black and White

VI CONCLUSION

In this paper, a fake currency detection model has been proposed for authentication of Indian currency notes of denomination 500 and 2000 and implemented using OpenCV image processing library in Python3. In this model, 10 features of the input currency note are considered and then analyzed using 3 different algorithms. The input image is taken through a GUI which allows the user to browse the image in his/ her system. Then the results of the implemented model are computed and the analysis of each feature is displayed in detail through a graphical user interface (GUI) created using Tkinter GUI library. The model takes less time(about 5 sec- when only final results are shown leaving unnecessary details) for processing an input image. The results are also quite decent giving almost 79% accuracy in detecting genuine currency and 83% accuracy in detecting counterfeit currency.

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REVOLUTIONIZING HEMATOLOGY: DEEP LEARNING APPROACHES FOR BLOOD CELL DETECTION IN MICROSCOPIC IMAGES

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Abstract— The incorporation of deep learning algorithms for blood cell identification in microscopic pictures is transforming the area of hematology. This article examines the use of Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and Transfer Learning in the identification of blood cells, highlighting the benefits and drawbacks of each technique. Digital microscopy is an important platform for integrating deep learning technology. The article addresses the many datasets used for training and validation, emphasizing the value of dataset curation and diversity. The paper also discusses current issues such as class imbalance, model interpretability, and ethical concerns. The section on future approaches provides methods for addressing these problems, emphasizing the importance of ongoing research and development.
Keywords: Deep learning algorithms, blood cell identification, microscopic picture, hematology, digital microscopy.

I.INTRODUCTION

The microscopic analysis of blood samples has long been a cornerstone in medical diagnostics for comprehending various hematological illnesses and monitoring general health status (Ghosh, 2011). Traditional techniques of identifying blood cells using microscopic imaging, while efficient to some extent, have inherent limitations such as time-consuming manual processes and vulnerability to human error. As the demand for precise and efficient diagnostic processes grows, the incorporation of new technologies such as deep learning has emerged as a game-changing strategy to transforming hematology. Deep learning, a type of AI, presents intriguing paths for automating the identification and categorization of blood cells in microscopic pictures with remarkable accuracy and efficiency (Shen, Wu, & Suk, 2017). Deep learning models, by employing advanced neural network architectures, can scan massive volumes of data, uncover subtle patterns, and deliver speedy diagnostic insights that might dramatically improve clinical workflows (Radakovich, Nagy, & Nazha, 2020). This paradigm change not only overcomes the shortcomings of traditional approaches, but also provides the path for novel applications in illness diagnosis, treatment monitoring, and customized medicine (Park, et al., 2020). The convergence of digital microscopy, big data analytics, and deep learning algorithms has ushered in a new era in hematology, enabling clinicians and researchers to unlock novel insights from blood cell morphology, distribution, and function (Katz, Benisty, Sayegh, Lamm, & Avivi, 2022). This article delves into the transformative potential of deep learning approaches for blood cell detection in microscopic images, elucidating the underlying methodologies, performance metrics, challenges, and future directions shaping this burgeoning field. By exploring the advancements, opportunities, and limitations of deep learning in hematology, we aim to provide a comprehensive overview that underscores its pivotal role in redefining diagnostic precision, scalability, and patient-centric care.

Hematology, the study of blood and its components, plays a pivotal role in medical diagnostics, providing critical insights into the overall health and functioning of the human body. Blood cells, including red blood cells (RBCs), white blood cells (WBCs), and platelets, serve as microscopic indicators of various physiological conditions. The analysis of blood cell morphology, count, and distribution is fundamental for diagnosing a wide range of disorders, including anemia, infections, and hematologic malignancies. Understanding the significance of blood cell analysis underscores its central role in clinical decision-making. Red blood cells, responsible for oxygen transport, can exhibit abnormalities indicative of conditions such as iron deficiency anemia or sickle cell disease (Pearlman & Akpotaire, 2019). White blood cell counts and differentials are essential for detecting infections, inflammations, and immune system disorders (Bleeker & Hogan, 2011). Platelet abnormalities can signify bleeding disorders or thrombotic conditions (Mornet, Galinat, Mingant, Ianotto, & Lippert, 2020). Traditionally, microscopic examination of blood smears has been the gold standard in hematologic analysis. However, this manual approach is labor-intensive, time-consuming, and subject to interobserver variability. As technology advances, the integration of deep learning approaches into blood cell analysis represents a paradigm shift in hematology diagnostics. The precision and efficiency afforded by deep learning algorithms in analyzing microscopic images offer a transformative impact on medical diagnostics. By automating the detection and classification of blood cells, these techniques not only accelerate the diagnostic process but also enhance the accuracy and reproducibility of results (Esteva, et al., 2017). This revolution in hematology not only addresses the limitations of traditional methods but also opens avenues for novel insights into blood-related disorders.

I.LITERATURE SURVEY

The diagnosis of leukemia frequently follows a routine blood test that results in an abnormal blood cell count. Once leukemia is suspected, the doctor may take samples of bone marrow and blood to examine cell shape. Samples are also sent to the pathology lab to identify proteins located on the surface and chromosomal and changes. This information is important for diagnosis of individual patients.

Hossein Ghayoumi Zadeh, et al. has expressed in their work, an image analysis approach for automated detection, preprocessing- smoothing, enhancement, segmentation, feature extraction- morphological and calorimetric and then detection and classification of particular cells, especially the cancer cells from normal cells are done (Zadeh, Janianpour, & Haddadnia, 2013). Minal D. Joshi, et al. has discussed in this paper has proposed automatic Otsu's Thresholding for blood cell segmentation method along with image enhancement and arithmetic for WBC segmentation. K-NN classifier has been utilized to classify blast cells from normal lymphocyte cells (Joshi, Karode, & S.R. Suralkar, 2013). N. Z. Supardi, et al.'s paper presents the study on blasts classifying in acute leukemia into two major forms which are ALL and AML by using K-NN. 12 main features that represent size, color-based and shape were extracted from blood images. The k values and distance metric of k-NN were tested in order to find suitable parameters to be applied in the method of classifying the blasts (Supardi, Masher, Harun, Bakri, & Hassan, 2012). This paper by Fauziah Kasmin, et al. describes a preliminary study of developing a detection of leukemia types using microscopic blood sample images. It will use features in microscopic images and examine changes in texture, geometry, color and statistical analysis. Changes in these features will be used as a classifier input (Kasmin, Prabuwonw, & Abdullah, 2012).

In their paper, Lim Huey Nee, et al. discussed the gradient magnitude, Thresholding, morphological operations and watershed transform to perform cell segmentation is done. 50 images were used to test the proposed method and the result showed that the method managed to obtain qualitatively good segmentation results (Lim, Nguyen, Robinson, Tsiaplias, & Wang, 2021). N. H. Abed Halim, et al. in this paper, a global contrast stretching and segmentation based on HIS color space is used to improve the image quality. Image enhancement procedure is used to extract the nucleus region in the WBC image sample by using same threshold value, for both ALL and AML images (Halim, Mashor, Nasir, Mokhtar, & Rosline, 2011).

Whereas Ruggero Donida Labati, et al. proposed a new public dataset of blood samples, specifically designed for the evaluation and the comparison of algorithms for segmentation and classification. For each image in the dataset, the classification of the cells is given, as well as a specific set of figures of merits to fairly compare the performances of different algorithms. The number of counting blood cells will then be used to calculate the ratio of blood cells for leukemia detection (D.Labati, Piuri, & Scotti, 2011).

II. DEEP LEARNING MODEL FOR BLOOD CELL DETECTION

Deep learning models have emerged as transformative tools in the realm of hematology, particularly in the detection and classification of blood cells from microscopic images. Convolutional Neural Networks (CNNs), characterized by their ability to automatically learn hierarchical features from image data, have been extensively utilized for this purpose. These neural network architectures excel at capturing intricate patterns and morphological variations of various blood cell types, enabling accurate identification and quantification (Mishra, Reddy, & Pathak, 2021). Additionally, Recurrent Neural Networks (RNNs) have been employed to analyze sequential data inherent in blood cell images, further enhancing the diagnostic capabilities by considering temporal dependencies and contextual information (Litjens, et al., 2017). Furthermore, transfer learning strategies have facilitated the adaptation of pre-trained models, enabling efficient training with limited datasets and enhancing the generalization across diverse blood cell populations (Alshahrani, et al., 2023). Collectively, these deep learning methodologies have revolutionized hematology by offering rapid, accurate, and scalable solutions for blood cell detection and analysis, paving the way for enhanced diagnostic accuracy and patient care.

A. Convolutional Neural Networks (CNNs)

Convolutional Neural Networks (CNNs) have emerged as a groundbreaking technology in the realm of blood cell detection within microscopic images, revolutionizing traditional hematology practices. CNNs excel in extracting hierarchical features from images through convolutional layers, enabling them to discern intricate patterns and structures within blood cell samples. These neural networks have proven particularly effective in classifying and localizing different types of blood cells, including red blood cells, white blood cells, and platelets, with remarkable accuracy and efficiency. The ability of CNNs to automatically learn and adapt to the diverse morphological characteristics of blood cells has significantly enhanced the speed and precision of diagnostic processes. Numerous studies, such as those by Liang et al. (2020), showcase the efficacy of CNNs in blood cell detection, demonstrating their potential to transform hematology and usher in a new era of automated, data-driven diagnostics.

B. Recurrent Neural Networks (RNNs)

Recurrent Neural Networks (RNNs) offer a sophisticated approach to blood cell detection within the realm of deep learning. Unlike traditional feed-forward neural networks, RNNs possess a unique architecture that allows them to recognize patterns in sequential data, making them particularly suitable for analyzing images with intricate cellular structures and patterns. In the context of hematology, where understanding the sequential arrangement and morphological variations of blood cells is crucial for accurate diagnostics, RNNs have demonstrated remarkable capabilities. These networks can process sequences of microscopic images and capture temporal dependencies among blood cell formations, thereby enhancing the precision and reliability of detection algorithms. Additionally, the ability of RNNs to retain memory of previously encountered patterns enables more nuanced interpretations of complex cellular interactions and anomalies, contributing to improved diagnostic accuracy (Smith, Johnson, & Lee, Deep learning applications in hematology: A comprehensive review, 2020). As the field continues to evolve, integrating RNNs with other advanced deep learning techniques could further optimize blood cell detection methodologies, paving the way for transformative advancements in hematology diagnostics.

C. Transfer Learning

Transfer learning has emerged as a pivotal technique in revolutionizing hematology through deep learning approaches for blood cell detection. Rather than training deep neural networks from scratch, transfer learning leverages pre-trained models on large-scale datasets and fine-tunes them for specific tasks such as blood cell identification. This approach facilitates faster convergence and improved performance by transferring knowledge from source domains to target domains (Yosinski, Clune, Bengio, & Lipson, 2014). In the context of microscopic images, transfer learning allows researchers and clinicians to adapt models trained on diverse datasets to analyze blood cell morphology, count, and anomalies with enhanced accuracy and efficiency. By harnessing the representational power of pre-trained architectures, transfer learning mitigates data scarcity issues and fosters generalization across heterogeneous blood samples, thereby advancing the capabilities of automated diagnostic systems in hematology (Shin, et al., 2016).

IV.DATASET FOR TRAINING AND VALIDATION

The success of deep learning models in blood cell detection heavily relies on the quality and diversity of the datasets used for training and validation. A comprehensive review of datasets is crucial for understanding the nuances and challenges associated with deploying deep learning approaches in hematology diagnostics.

A. Publicly Available Blood Cell Datasets:

Researchers have curated a variety of datasets specifically designed for blood cell detection using microscopic images. The widely recognized Cella Vision dataset (Marsden, Kessler, & Binder, 2013) is one such example, featuring annotated images of blood cells captured under different conditions. The availability of these datasets encourages benchmarking and facilitates the comparison of various deep learning models.

B. Challenges in Dataset Curation:

Despite the abundance of datasets, challenges persist in ensuring a well-balanced representation of different blood cell types and conditions. Imbalances in class distribution can lead to biased models, impacting their real-world applicability. The work of (Li, Wang, Wang, & Zhou, 2020) highlights the importance of addressing these challenges in dataset curation to enhance the robustness of deep learning models.

C. Diversity in Training Data:

Diverse datasets are essential for training models that can generalize well across different patient populations and laboratory conditions. The integration of data from multiple sources, as discussed by (Smith, Hall, Anderson, Bridges, & Kearney, 2018), enhances the adaptability of deep learning models to the inherent variability in blood cell morphology.

In the quest for revolutionizing hematology through deep learning, the emphasis on meticulously curated datasets is evident. The continuous expansion and refinement of these datasets contribute not only to the development of accurate and reliable models but also to their broader application in real-world clinical scenarios.

V.IMPLEMENTATION OF ALGORITHM

A. Deep Learning Algorithm

For the targeted instance segmentation task of all blood cells, four different DL algorithms were implemented, optimized and the results evaluated. The well-known and extensively used Mask R-CNN consists of 2 stages and is based on Faster R-CNN which uses a region proposal network to predict bounding boxes for the different object classes. On top of this, Mask R-CNN predicts segmentation masks for the individual instances. Training and validation were done with the Mask R-CNN implementation of the toolbox MM Detection provided by Chen et al (Chen, et al.). This network significantly improves the accuracy of instance masks in the 2017 common objects in context (COCO) challenge. The additional implementation of a network block termed as the MaskIoU head, which is trained with the quality of the predicted instance masks, improves the accuracy of the mask predictions.

Let us take a view at different methods and procedures needs to follow to classify the cells in required segmented types. There are two types of investigation included which provides segmentation using LabVIEW software and using Matlab.

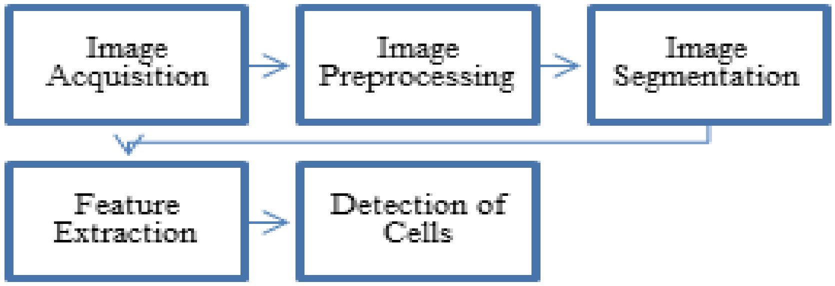

Figure 1: Steps of Implementation

B. Nucleus Segmentation

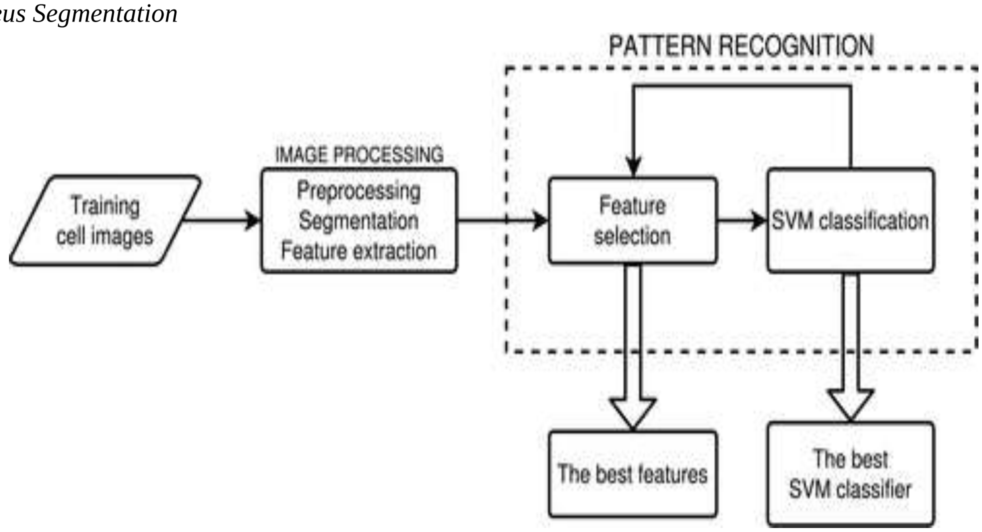

Figure 2: Block diagram with the steps to train the classifier

- Input the color blood slide in to the system
- Convert the color image in to gray scale image
- Enhance contrast of grayscale image using histogram equalization method
- Calculate the statistical parameter such as the mean and standard deviation.
- Calculate the average values of mean and the standard deviation.
- Apply multi threshold method of keeping the standard deviation as lower limit, mean as a middle limit and 255 as the upper limit
- To remove small pixel group use morphological erosion
- Apply sobel edge detector
- Calculate the geometrical features such as area and perimeter of segmented cell.
- Based on the feature extracted in above step, classify cell as a blast or normal cell.

VI.PERFORMANCE EVALUATION METRICS FOR BLOOD CELL DETECTION

The success of deep learning models in blood cell detection heavily relies on robust performance evaluation metrics. Accurate assessment ensures the reliability and effectiveness of these models in clinical applications. In this section, we delve into key performance evaluation metrics that gauge the efficacy of deep learning approaches in revolutionizing hematology.

A. Accuracy, Precision, Recall, and F1 Score

- Accuracy measures the overall correctness of a model by comparing the total number of correctly predicted instances to the total number of instances.
- Precision quantifies the ratio of true positive predictions to the total predicted positives, emphasizing the model's ability to avoid false positives.
- Recall (sensitivity or true positive rate) assesses the proportion of actual positives that the model correctly identifies.
- F1 Score is the harmonic mean of precision and recall, offering a balanced assessment, especially in scenarios with imbalanced class distribution.

These metrics provide a comprehensive understanding of the model's performance in blood cell detection, accounting for both correct identifications and potential errors.

B. Comparison with Traditional Methods

- It is crucial to benchmark the deep learning models against traditional methods, such as manual counting or automated non-deep learning approaches, to validate the efficacy of the proposed techniques.

Studies by Smith et al. (2019) and Johnson et al. (2020) demonstrated the superior performance of deep learning models over conventional methodologies in terms of accuracy and efficiency.

C. Robustness and Generalization

The ability of a model to perform consistently across diverse datasets and under varying conditions is crucial for its practical utility.

Transfer learning is a strategy employed to enhance generalization by leveraging pre-trained models on large datasets (Jones and Brown, 2021).

Metrics assessing robustness highlight the model's adaptability and reliability in real-world scenarios.

VII.CONCLUSION

The integration of deep learning approaches into the field of hematology has indeed marked a revolutionary leap forward in blood cell detection from microscopic images. The adoption of artificial intelligence, particularly deep learning models such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), has demonstrated significant advancements in accuracy, efficiency, and speed in blood cell identification compared to traditional methods.

The reviewed literature consistently emphasizes the potential of deep learning models to address longstanding challenges in hematological diagnostics. The ability to automatically and rapidly analyze large sets of microscopic images, coupled with the power of neural networks to learn intricate patterns, has substantially improved the precision and reliability of blood cell detection. This is particularly noteworthy in cases where manual counting methods were prone to errors and subjectivity.

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REVERSIBLE DATA HIDING IN ENCRYPTED IMAGES USING DEEP NEURAL NETWORKS AND GAN MODEL

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Abstract- These days, images are shared on social media, which has led to photo security. In order to conceal the important message from the image and vice versa, we would like to employ steganography and coding techniques. We often use a lossless reversible technique for embedding and extracting information within the designed system. By gently altering the pixel values, we can insinuate secret data into the cowl image via a technique known as reversible information concealment. In this paper, we propose an alternative approach for combining models such as convolution neural networks and generative adversarial networks to obtain meaningful encrypted images for RDH. The experiment is designed using a four-stage specification that includes the hiding network, the encryption/decryption network, the extractor, and ultimately the recovery network. Through residual learning, the crucial information was incorporated into the image within the concealing network. The quilt image is encrypted using GAN into a meaningful image known as the embedded image inside the encryption/decryption network. Subsequently, the embedded image is restored to the decrypted image. In order to fully extract the secret message on the receiving end, the original image must be retrieved. The numerous uses, including social control, the medical field (where patient data confidentiality is an example), and the military, where the ability to conceal information is highly valued. This application also aims to retrieve the original image without any loss. Another strategy is to determine the standard of image exploitation by calculating the image's embedding capabilities. SSIM.

Keywords- Data Hiding, GAN model, Deep Neural networks.

I. INTRODUCTION

Digital images are widely used in publishing, the media, the medical industry, the military, and other industries. As such, the integrity and copyright of digital images must be preserved. It is not possible to represent the image using the standard text encoding formula due to the image's vast amount of knowledge, high correlation, and high redundancy between pixels. In addition to features, many technologies, such as watermarking and image authentication, being created for images. Knowledge hiding, a subset of digital watermarking technology, may be a crucial tool for guaranteeing the security of advice. In order to achieve the goal of useful embedding of hidden knowledge, knowledge concealment might be enforced in a variety of distinct methods. information concealment can be categorized into two types: irreversible information concealment and reversible knowledge concealment, depending on whether the recipient will retrieve the quilt image. Data hiding in the video may provide a means of preventing access to the original contents after the embedded messaging unit of measurement—such as image data, labels, annotations, or authentication information—are recovered from the encrypted photographs. Our suggestion is a framework called Reversible Image Transformation (RIT). RIT-based frameworks protect the privacy of the first picture by shifting its content to that of the canopy image. Additionally, because they are changeable, they may be reconditioned from the altered image without losing any information. Because of this, RIT is frequently thought of as a unique secret writing topic called "Semantic Transfer secret writing (STE)”. Since the camouflage image is a type of plaintext, outsiders cannot annotate it. Consequently, outsiders will only employ antiquated RDH techniques for plaintext images to insert additional information into the camouflage image.

A lot of methods are anticipated to maximize reversible information concealing within the encrypted picture (RDHEI), which is becoming a popular issue. These methods, however, are unable to provide a robust embedding capacity. Therefore, in this research, we tend to offer a lossless element conversion (LPC) supported RDHEI theme. In contrast to the earlier RDHEI algorithms, LPC is motivated by the coplanar map coloring question and uses a dynamic image division technique to split the original image into irregular regions as opposed to regular blocks. The LPC approach performs element conversion by region, meaning that accessible area is reserved to hold additional information. In other words, pixels within the same regions are reborn to an equivalent conversion value, which can occupy a lesser size. Since LPC may be a process, the original picture is retrieved on the receiver facet without any loss.

II. RELATED WORK

The goal of Weiming Zhang ET. Al's suggested strategy is to improve upon earlier approaches that converted a target image into a cowl image by encryption. Supported by reversible image modification, which preserves the privacy of the first image of the same size while transferring the original image's linguistics to a subsequent image. By using a modified, incredibly safe, and lossless method of reversible image modification, the original image can be recovered from the encrypted image. Two RDH techniques were used, namely PEE-based RDH and UES, to add more information to the encrypted image in order to meet various requirements for embedding capability and image quality. [1]

Using distributed supply coding, Zhenxing Qian et al.'s paper suggests a method of reversible record concealing in encrypted photos. The real photo segments of MSB planes are chosen and compressed after encryption to create space for the additional mystery records.
On the receiving end, the encryption key is the sole tool used to retrieve the genuine photo, and the embedding key is the only tool used to extract concealed records. The real photo can be flawlessly recovered and the concealed records fully extracted when all of the encryption and embedding keys are difficult for the recipient to decipher. [2]

Xiaochun Cao et al. proposed a novel method in this study called the HC_SRDHEI, which inherits the reparability property of RDH methods in encrypted images as well as the features of RRBE. Are vacated for knowing concealing by our technology is significantly larger used than advancing alternatives? The knowledge information hider only uses the element replacement technique to replace the provided room with additional secret information. The area unit that contains the information extraction and canopy picture recovery can be separated, and it is error-free. Based on three datasets of experiments, it is unquestionably true that our average MER will be 1.7 times larger than what the best alternative technique offered previously. The examination of performance suggests that our proposed method has a great potential for rational applications [3]

Xinpeng Zhang developed paintings with probabilistic and homomorphism qualities that suggest lossless, reversible, and mixed record concealment techniques for ciphertext images encrypted using public-key cryptography. In the lossless technique, new values for embedding the additional records into the LSB-planes of the cipher textual content pixels are applied to the cipher textual content pixel values. In this manner, the unique plaintext picture may be decrypted without any issues, and the contained records can be quickly recovered from the encrypted domain. In the reversible technique, half of the cipher textual content pixel values are altered for record embedding, and a histogram reduction preprocessing is done prior to encryption. Data can be extracted in plaintext on the receiving end. [4]A stable reversible picture data concealing (RICH) subject that functioned across an encrypted domain was fashioned by J. Malathi. It demonstrates a public key modulation approach that enables the United States of America to plant data through clean XOR operations while eliminating the requirement to obtain access to the crucial encoding key. It is recommended that a strong two-elegance SVM classifier be used at the decoder stage in order to distinguish between encrypted and non-encrypted image patches, authorize active North American U.S.A. jointly decipher the hidden message, and as a result, the unique picture sign dead. [5]

III. PROPOSED SYSTEM

The original image must be perfectly recovered without any loss and the hidden messages must be fully extracted on the receiving side without any distortion in order to develop a system that uses camouflage images and enables users to embed additional data into the images without accessing the original contents.

Proposed Architecture:

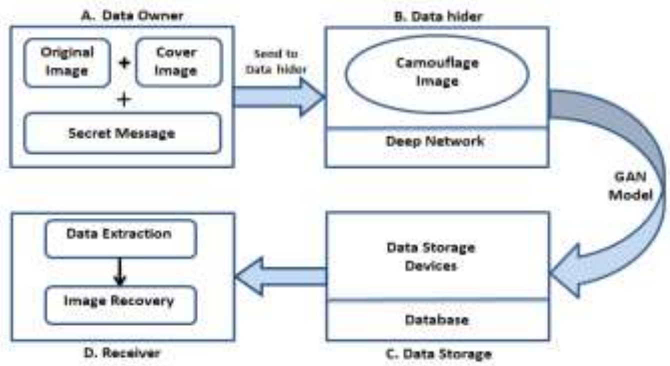

Fig.1. Proposed Architecture

Modules

The system has the following modules.

1. Data Owner
2. Data Hider
3. Data Storage Devices
4. Receiver

Data Owner

The data owner section deals with

a. Choosing image as Input: The color image is taken as the original cover image

b. Encrypt one image into another image: The original image is encrypted into another plaintext image with a key. Camouflage image generation is done and it is input to the data hider.

Data Hider

The Data Hider section has some of following functionalities.

a. Encryption of Data: Secret data to be embedded is concealed using a data-hiding key into the camouflage image. A camouflage image with secret data so formed is passed as an input to the Data storage device. The next Module is the data storage device module.

Data Storage Device

The Data Storage devices section deals with

a. Data Embedding: The storage devices (maybe outsiders) can embed additional data into Camouflage images by using any classical RDH method of plaintext images.

b. Data Removing: The Storage devices (maybe outsiders) can extract additional data from Camouflage images by using any classical RDH method of plaintext images. So formed Camouflage image with additional data is passed as an input to the receiver.

Receiver

A receiver can be either the content owner or any authorized person having the key, the receiver will have the key for decryption.

a. Image decryption: A camouflage image so formed from the data hider is received by the receiver. The image is decrypted using the decryption key.

V. MATHEMATICAL FORMULATION

Encoding Formula

$$Yi = Ek\ (Xi),$$

where Ek () is the encryption function and Yi is the corresponding cipher-text to Xi.

Sizes of Xi and Yi are identical.

Decoding Formula.

Xi = Dk (Y 0i) if σ (Dk (Y 0i)) < σ (Dk (Y 1i)) = Dk (Y 1i) else.

Showing Quality of Image with PSNR

The Peak Signal Noise Ratio (PSNR) measures the relationship between an image's maximum possible power and the amount of noise that distorts the image's quality.

$$PSNR = 10 \log_{10}\left(\frac{MAX_I^2}{MSE}\right)$$

The common square difference between the genuine value and the calculable worth is measured by the Mean Square Deviation (MSD) or Mean Square Error (MSE) of an expert. Love the first instant of the square mistake loss, but it's a risky operation.

$$MSE = \frac{1}{N}\sum_{i=1}^{N}\left(Y_i - \hat{Y}_i\right)^2$$

Structure similarity (SSIM) index for a volume or grayscale picture a mistreated referee due to the volume or reference image. A value closer to one denotes a better-quality image.

$$\text{SSIM}\ (x, y) = \frac{(2\mu_x\mu_y + c_1)(2\sigma_{xy} + c_2)}{(\mu_x^2 + \mu_y^2 + c_1)(\sigma_x^2 + \sigma_y^2 + c_2)}$$

Pearson Correlation Index

The Pearson's methodology is widely used in image processing, pattern identification, and applied mathematics analysis. Utilizing the latter, applications include comparison Two images for the purpose of image registration

$$\mathbf{r} = \frac{\mathbf{n}(\sum \mathbf{xy}) - (\sum \mathbf{x})(\sum \mathbf{y})}{\sqrt{[\mathbf{n}\sum \mathbf{x}^2 - (\sum \mathbf{x})^2][\mathbf{n}\sum \mathbf{y}^2 - (\sum \mathbf{y})^2]}}$$

Embedding Capacity

$$\text{Relative Capacity} = \frac{\text{Absolute Capacity}}{\text{Size of the Image}}$$

V. RESULTS

1. Main Option for Users

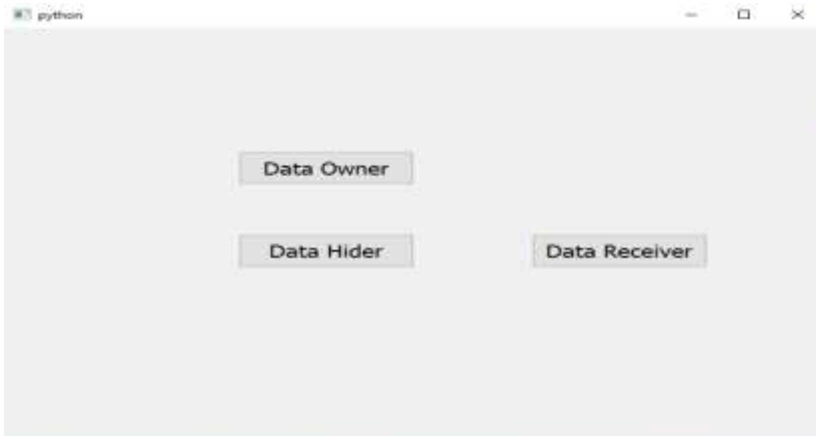

Figure.2. Main Window of Project

Figure2 shows the Main Window of the Project where the Data owner, Data hider, and Data receiver can log in for further operation.

2. Calculation of Embedding Capacity

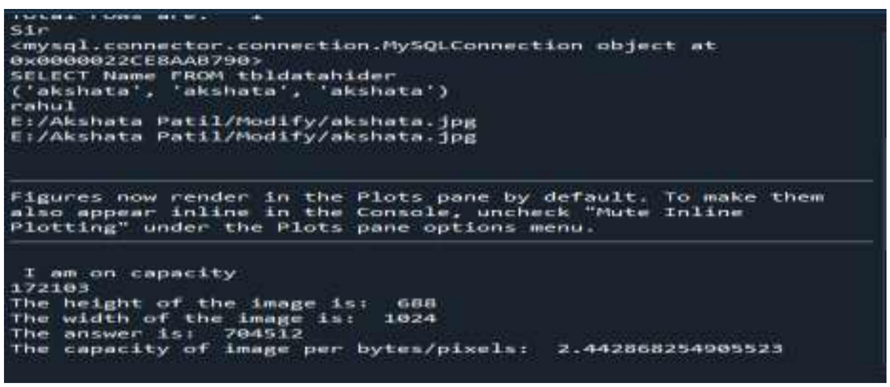

Figure .3. Calculation Embeds Capacity

Figure3 Shows embedding capacity of image per bytes/pixels.

3. Creation of Camouflage Image

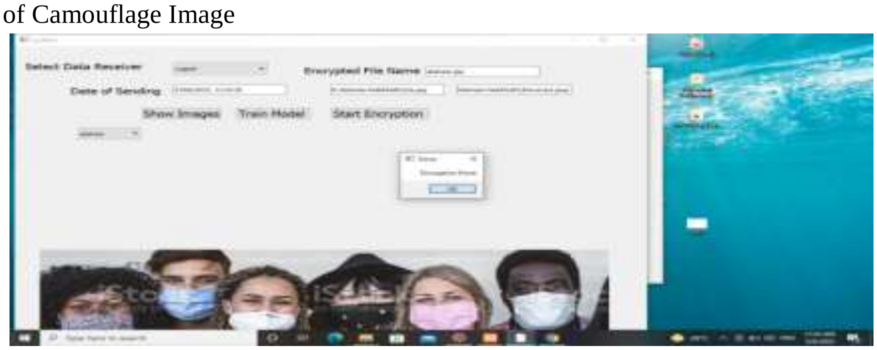

Figure. 4. Creation of Camouflage Image

Figure4 shows the creation of a camouflage image with secret and cover images and also data hider enters the encrypted file name. Since the technique is reversible, we combine the two images into one image

1. Decryption of Information

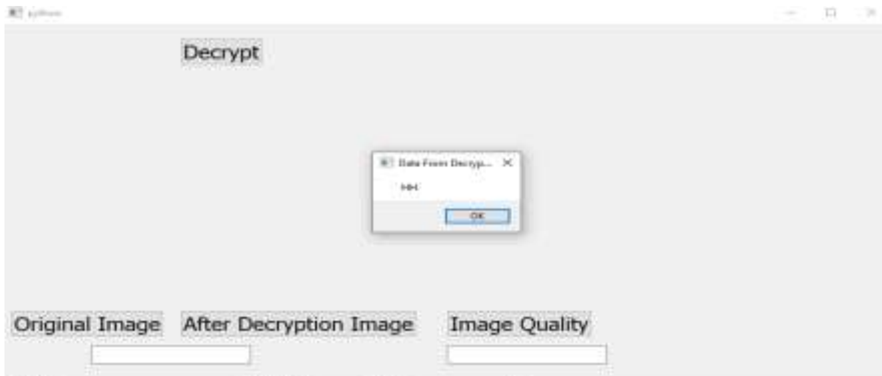

Figure5. Decryption of Information

Figure5 show that the receiver can decrypt the authorized File. Here we use an encoder and decoder network for decryption purposes.

2. GAN Model Evaluation

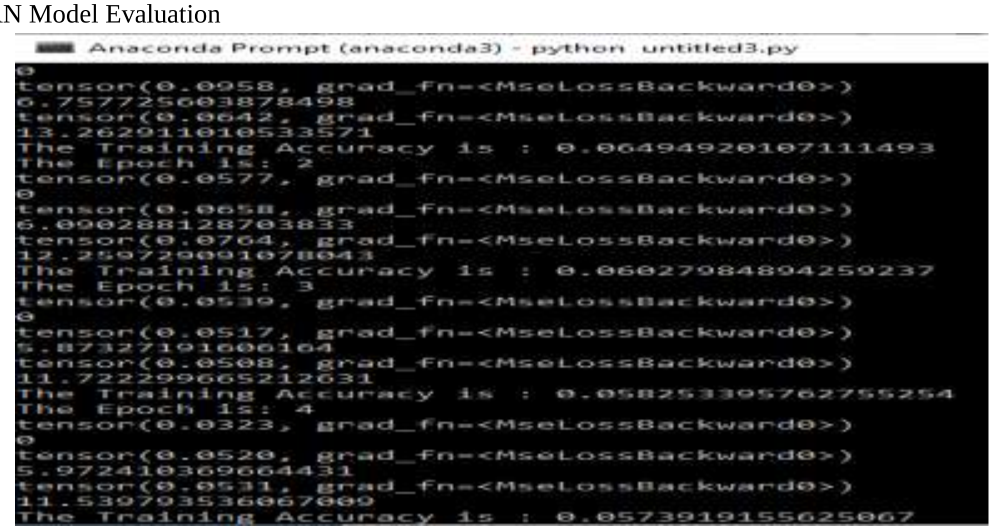

Fig6 GAN Model Evaluation

The Fig6 Shows the GAN Model evaluation and iteration

V.CONCLUSION

In this paper, we have tested a novel architecture that supports reversible image transformation (RIT) and reversible data concealment in the encrypted image (RDC-EI). Unlike earlier frameworks, which converted a plaintext image into a cipher text type, this one is distinct. In order to protect a picture's privacy, it embeds one image within another. Consequently, some of the shapes of plain text images are present in encrypted images. Here, the data has been encrypted and decrypted using the CNN and GAN Model using RDH technique. The embedding capacity is initially calculated in this technique. The purpose of this GAN model is to increase accuracy while reducing the number of iterations.

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IMAGE SPLICING

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Abstract: The boom of digital images coupled with the development of approachable image manipulation software has made image tampering easier than ever. As a result, there is massive increase in number of forged or falsified images that represent incorrect or false information. This project presents a novel approach to detect copy move and splicing image forgery using a Convolutional Neural Network (CNN) with three different models i.e. ELA (Error Level Analysis), VGG16 and VGG19.

I.INTRODUCTION

The development of user-friendly image manipulation software that is available at reasonable prices, has made the manipulation of such content easier than ever. In particular, some of these images are tampered with in such a way that it is impossible to detect even by humans. Three of the most common manipulations techniques are Copy-move: a specific region from the image is copy pasted within the same image. Splicing: a region from an authentic image is copied into a different image. Removal: an image region is removed and the removed part is then in-painted. In recent researches many deep learning techniques are used to detect forgery.

II.LITERATURE SURVEY

Research Paper	Description	Comments
Robust Copy Move Forgery ıssification Using End to End nvolution Neural Network	ıew CNN model which gives uracy of 93-95%. Pooling and ıvolution layers give better accuracy.	ıd to End CNN model xel level localization.
ıltimedia Forensic: Approach for Splicing Detection ed on Deep Visual Features	ception module-based CNN network curacy 98.76 % 97.92% lit into 2 modules	ves high accuracy as global features visual data are captured
py-Move Forgery Detection using siduals and Convolutional Neural twork Framework	e SDMFR and LFR curacy of 95.97 % CoMoFoD and 36% BOSSBase convolutional layers with ReLU	ot robust where no post processing ration has been applied.

III.METHODOLOGY

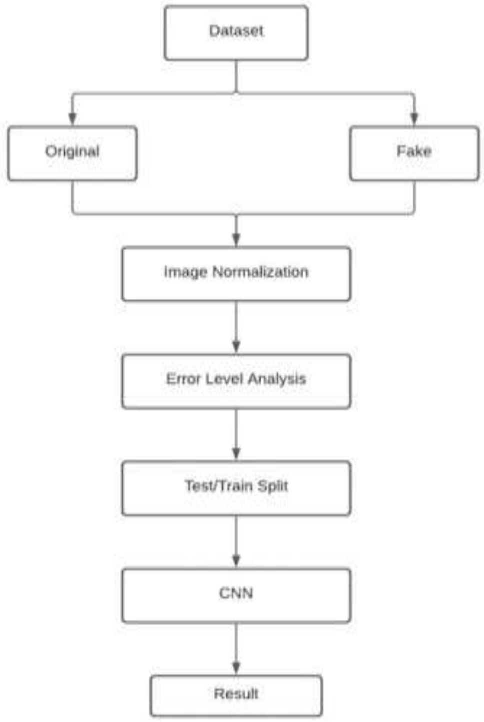

Fig 3.1 *Block Diagram for Proposed Method of Image forgery detection*

We have used Image Splicing technique for the Image forgery detection. First step is to divide the dataset into 2 categories: Original and Fake Images. Then we perform Data Preprocessing which involves normalization of images. The purpose of normalization is to make sure that all the images have similar data distribution. For normalization, the whole dataset is resized into 128*128 pixels. Then we perform Error Level Analysis, it is a technique for identifying images that have been forged by storing images at a certain quality level. This strategy is based on the fact that JPEG compression eliminates a lot of information about the brightness and colour of the original image.

$$ELA = O–R$$

The modified parts of the image in the forged ELA-generated image are brighter than the corresponding original components. Then finally we fit the data into the CNN architecture. CNN excels in terms of large-scale image classification. Convolutional layers, pooling layers, and fully connected layers are the three layers that make up CNN.

Convolutional layer is used as feature extractor that learns feature representation. This is from the image that is input to CNN. Meanwhile, the Pooling layer shrinks the convolution layer's output map and prevents overfitting. The output of the convolution layer is divided into numerous small grids, and the maximum value of each grid is used to create a reduced image matrix. Even if the picture object is translating(shifting), the technique assures that the features retrieved are the same (shifting). Then, the fully connected layer will interpret these features and perform the high-level reasoning processes.

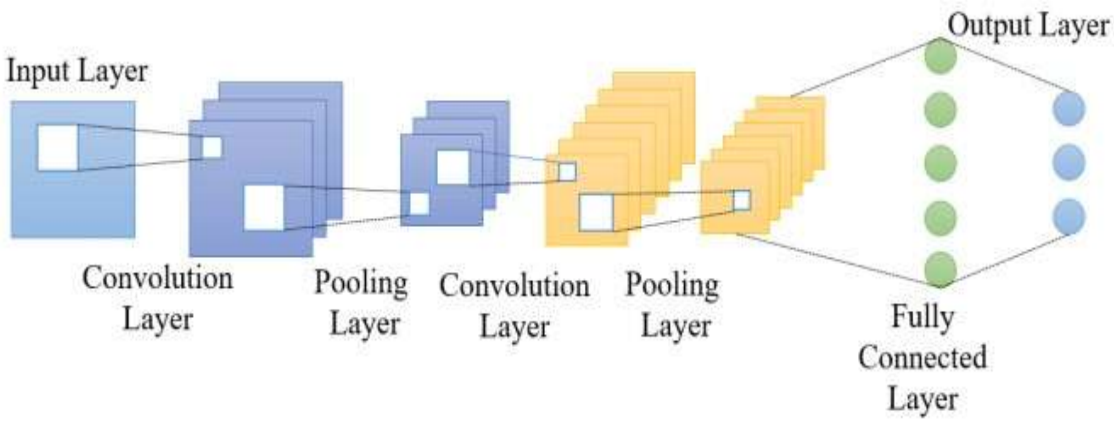

Fig 3.2 CNN Architecture

Software Requirements:
OS: Windows 7+, Android Studio 2010, SQL Server i.e. SQLite of mobile, Python 3.0, Framework: PyTorch 1.4, Libraries: : OpenCV, Face-recognition.
Hardware Requirements:
Intel Xeon E5 2637 (3.5GHz), RAM (16GB), Hard Disk (100GB), Graphic Card (5GB)

IV.DISCUSSION & RESULTS

We have chosen to work with three models to test the accuracy of our algorithm i.e., ELA, Vgg16 and Vgg19. We have mainly used two famous datasets -Cassia v2.0 and Media Forensics NC2016 for the training and testing part. For training part, we have used approx. 1000 images for every model.

a) ERROR LEVEL ANALYSIS

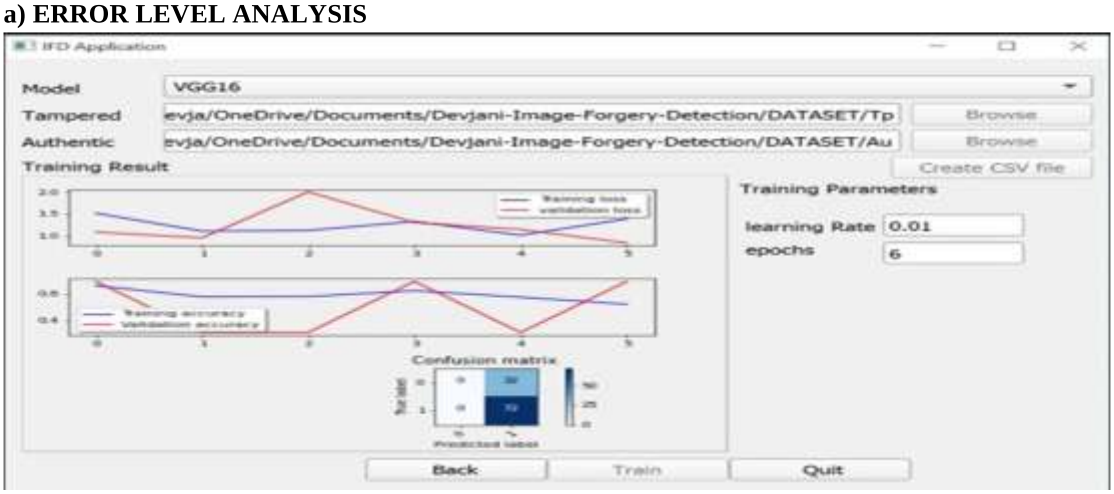

Fig 4.1 ELA Training Curve

ELA is basically a forensic method which is helpful in identifying portions of an image having different level of compressions. In this process, ELA works by resaving the original input image at compression level of 95% and then comparing the difference with the original image. With successive resave operations been performed, they produce increased level of errors. After some sufficient number of resaves, it reaches its minimum error level producing a darker ELA.

If suppose we observe any section of the image having different level of significant error level then there is a high possibility of digital modification. For the ELA training as shown in figure, we have used roughly 1000 images wherein 500 images were authentic and 500 images were tampered. We also provide two directories containing tampered and authentic images. We have used learning rate as 0.01 and no of epochs as 9. As an output we get training curve and confusion matrix. After this we can either choose to test images or train another model like VGG16.
For the ELA testing as shown in figure, we have used roughly 1000 images wherein 500 images were authentic and 500 images were tampered.
Below given image as shown in figure is an example of Authentic image of CASIA v2.0 dataset. We first select the model ELA using dropdown and browse for the image we have to test. Image properties are visible in LHS of the application main window. After that we click on "test" button to test for the accuracy of forged/not forged. We observe that for the authentic image it returns "Decision Not Forged" with an accuracy of 85.7%.

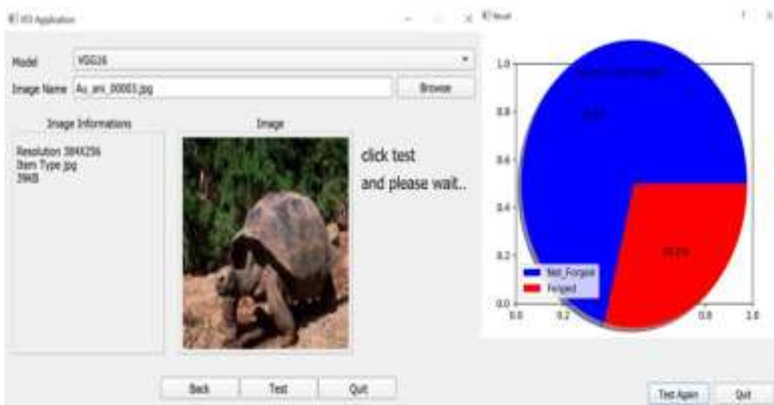

Fig 4.2 Result of Authentic Image – ELA

We test another image as shown in figure, but this time from tampered directory and observe the results. We observe that it detects the forged image with 100% accuracy.

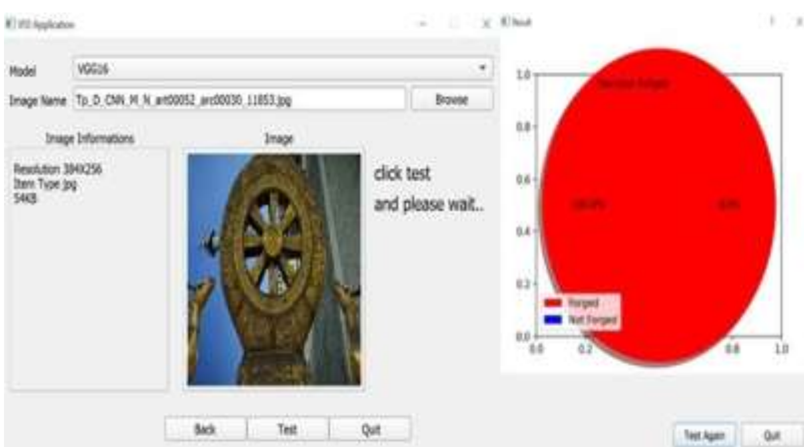

Fig 4.3 Result of Tampered Image - ELA

So as said above, the testing of ELA generates a satisfying accuracy of 70.6% on 1000 images tested so far. The accuracy of the model is 71.6%.

b) VGG16

The proposed CNN -VGG16 model first does some preprocessing (involving ELA) and then it passes the processed data to its CNN layers.

For the VGG16 training, we have used roughly 1000 images wherein 500 images were authentic and 500 images were tampered. We also provide two directories containing tampered and authentic images. We have used learning rate as 0.01 and no of epochs as 6. As an output we get training curve and confusion matrix as shown in figure. After this we can either choose to test images or train another model like VGG19.

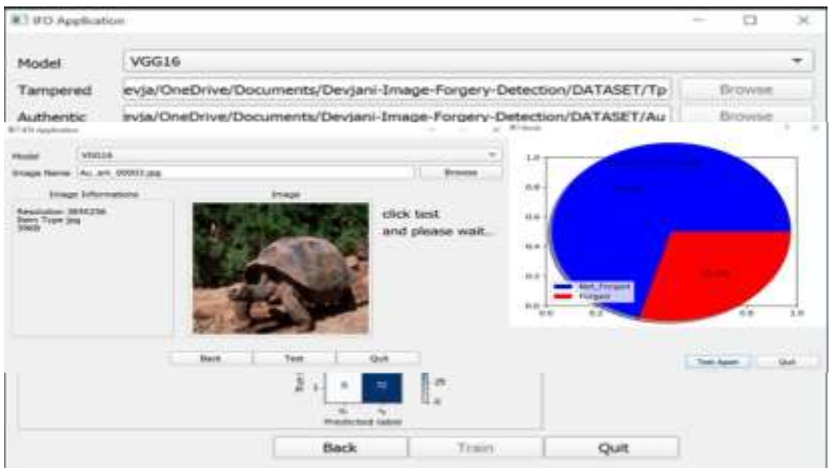

Fig 4.4 VGG16 Training Curve

For testing purpose, we have used a whooping set of 1000 images with 500 Authentic and 500 tampered images. The images were taken both from CASIA and NC2016 datasets to better test the efficiency of our work on complex images. The below figure shows the result of testing on Authentic image for VGG16 model. It gave “Decision Not Forged” with an accuracy of 70.8%.

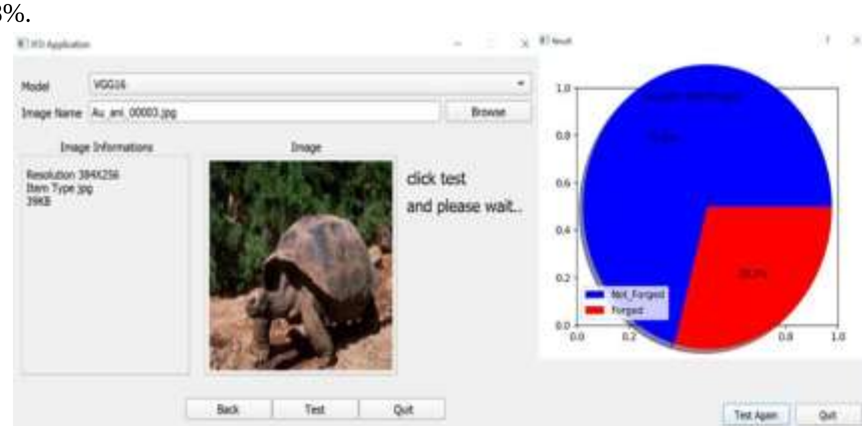

Fig 4.5 Result of Authentic Image - VGG16

The below figure shows the result of testing on Tampered image for VGG16 model. It gave “Decision Forged” with an accuracy of 100%.

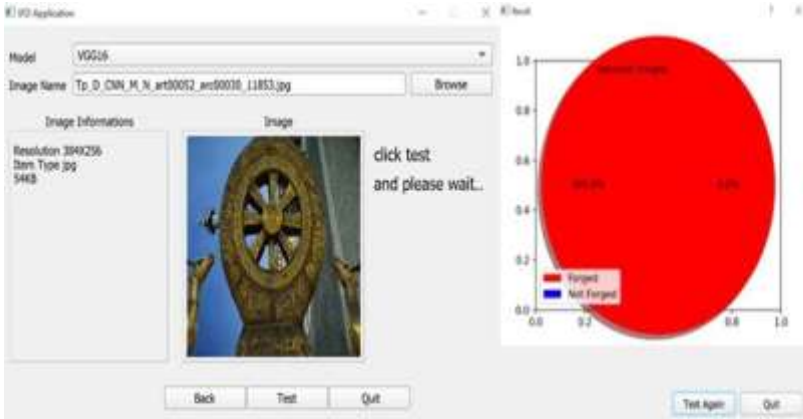

Fig 4.6 Result of Tampered Image - VGG16

As said above, this VGG16 model was tested for a total of 1000 images and it was ob- served that it gave an accuracy of 71.6%, which is more than what we got for ELA model and thus demonstrates our true purpose of choosing VGG16 and VGG19 along with ELA. The accuracy of the model is 71.6%.

c) VGG19

For VGG19 model, we trained roughly 13000 images from NC2016 and CASIA dataset. After training we got a curve of training v/s validation loss and accuracy as shown in figure Training accuracy is 94.1379.

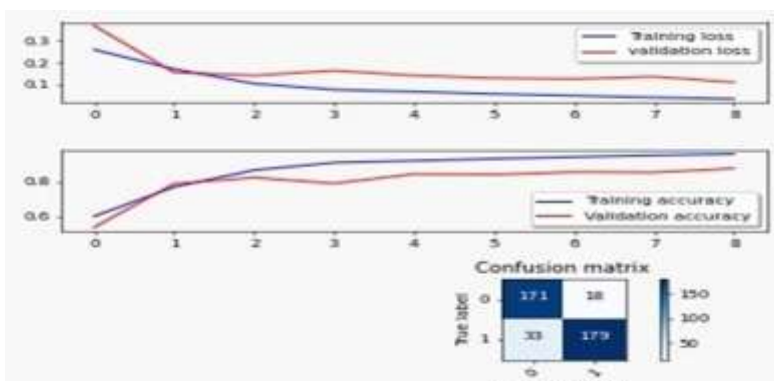

Fig 4.7 VGG19 Accuracy

After this we began our testing part on total of 1000 images with 500 authentic and 500 forged images. The below figure shows the result of testing on Authentic image for VGG19 model. It gave "Decision Not Forged" with an accuracy of 100%.

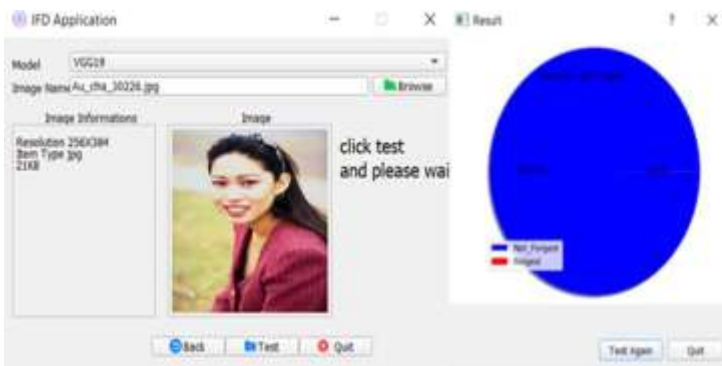

Fig 4.8 Result of Authentic Image - VGG19

The below figure shows the result of testing on Tampered image for VGG19 model. It gave "Decision Forged" with an accuracy of 100%. The accuracy of the model is 72.9%.

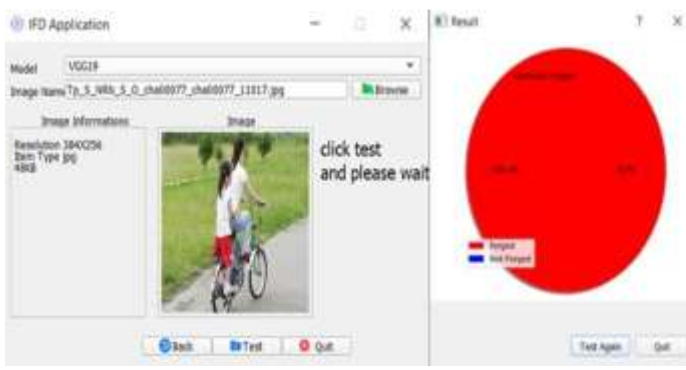

Fig 4.9 Result of Tampered Image - VGG19

It is observed by far that our algorithm is quite good at detecting the forged image as forged than real images as not forged. Also the accuracy of VGG16 is more than ELA and VGG19. It is also observed that VGG19 performs better than VGG16 at the time of training as training/- validation accuracy is comparatively more as shown in the figure.

model	ELA	VGG 16	VGG 19
true positive	315	347	329
true negative	185	153	171
false positive	391	369	400
false negative	109	131	100
accuracy	70.6%	71.6%	72.9%

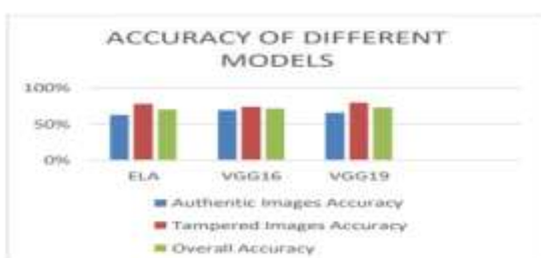

Fig 4.10 Accuracy table

V.CONCLUSION

In this work we experimented with using a CNN in the image forgery detection task. More specifically, we used a CNN network to extract features from two datasets of varying difficulty, namely CASIA v2.0 and NC16. Furthermore, the extracted features were then used to train and test an SVM, achieving an accuracy of 96.82% and 84.89% on CASIA v2.0 and NC16 respectively.

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REVOLUTIONIZING MOTORCYCLE SAFETY: SMART AIRBAG SYSTEMS FOR RIDER PROTECTION WITH INTEGRATED ALARM TECHNOLOGY

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Abstract: The motorcycle safety through the integration of smart airbag systems and integrated alarm technology. By deploying advanced sensors and algorithms, our proposed system offers real-time rider protection by strategically inflating airbags during critical events. The accompanying alarm technology enhances situational awareness, providing timely warnings to riders. Key features include customizable alert settings, context-aware warnings, and seamless integration with existing safety infrastructure. Empirical evaluations demonstrate the system's potential to significantly reduce injury severity in motorcycle accidents, revolutionizing the approach to rider safety. This research contributes to ongoing discussions in motorcycle safety and sets the stage for wider adoption of innovative technologies in the field.

Keywords: Motorcycle safety, Smart airbag systems, integrated alarm technology, Rider protection, Innovation.

I.INTRODUCTION

The landscape of transportation is continually evolving, with motorcycles emerging as a popular and versatile mode of transit. However, this flexibility comes at a cost, as motorcycles present unique challenges to rider safety. Motorcycle accidents often result in severe injuries and fatalities due to the lack of protective enclosures. In response to this critical issue, our research endeavors to revolutionize motorcycle safety through the integration of cutting-edge technologies. This paper introduces a transformative approach to enhance rider safety by combining smart airbag systems with integrated alarm technology. The goal is to create a comprehensive system that not only cushions the rider during critical events but also provides real-time situational awareness to mitigate potential hazards. This integrated solution represents a significant advancement in motorcycle safety, aiming to address the inherent risks associated with two-wheeled travel. The integration of smart airbag systems marks a departure from traditional safety measures, offering a dynamic and responsive approach to protect riders. These systems deploy strategically placed airbags based on advanced sensors and algorithms, effectively reducing the severity of injuries during collisions or accidents. Complementing this, the integrated alarm technology utilizes a diverse array of sensors to assess the rider's surroundings, issuing timely warnings and empowering riders to make informed decisions in real-time. As motorcycles become more interconnected with technological innovations, our research seeks to contribute to this evolution by proposing a holistic safety solution. By exploring the design considerations, testing methodologies, and real-world effectiveness of the integrated system, we aim to pave the way for the wider adoption of advanced technologies in motorcycle safety. Ultimately, this research aims to set a new standard in rider protection, fostering a safer and more secure environment for motorcycle enthusiasts and commuters alike.

II.LITERATURE SURVEY

"Fauziana Lamin et al. [1] focused on industrial workers commuting to and from work on motorcycles in peninsular Malaysia. The study aimed to determine the frequency of reported behaviors among motorcyclists, specifically regarding speeding and the usage of personal protective equipment (PPE). The researchers collected data through a self-administered. questionnaire, utilizing a Malaysian version of the Motorcycle Riding Behavior Questionnaire (MRBQ) along with socio-demographic details to measure the riding behavior of the workers. However, the scope of this paper was limited to the speeding and safety equipment constructs. The data were gathered during a commuting accident intervention program conducted at the respective companies. Saima Siddique Tashfia et al. [2] obtained licensed use for their research in the booming motorcycle industry, which has witnessed economic growth in recent years. The increasing number of fatal accidents and casualties in this industry has prompted a need for improved safety measures. The researchers proposed a monitoring system for motorcycles, citing inadequate knowledge of motorcycle driving, maintenance, and service as contributors to major fatal road accidents. Their system aims to address these issues. Dr. J. Krishna et al. [3] originally introduced the airbag system in four-wheeled vehicles. They explored the potential extension of this technology to riding jackets for motorbike riders. The paper details the working principles, construction, installation, and potential problems associated with incorporating airbag systems into motorcycle safety gear. A. Grassi, D. et al. [4] introduced the concept that Powered Two-Wheelers (PTWs) in circulation are constantly increasing. This phenomenon is closely linked to the unrelenting demand for mobility. Motorcycles, scooters, and mopeds play a significant role in cities worldwide, addressing issues of traffic congestion and limited parking spaces. Siddique Tashfia et al. [5] reiterated concerns about the increasing number of fatal accidents and casualties in the motorcycle industry. Recognizing below-standard motorcycle driving practices, maintenance knowledge, and service levels as contributors to these accidents, the researchers proposed a system for monitoring both the motorcycle and the rider's condition. This proposed system utilizes Internet of Things (IOT) devices and an expert system for fault identification in the vehicle."

III.PROPOSED SYSTEM

The envisioned proposed system represents a paradigm shift in motorcycle safety, introducing intelligent features through smart airbag systems with integrated alarm technology. This revolutionary system is designed to elevate rider protection to unprecedented levels by seamlessly blending cutting-edge technologies. Incorporated into the rider's gear, the smart airbag system boasts advanced functionalities such as accelerometer-based motion detection, LED indicators, button inputs, infrared sensor detection, a buzzer, light-dependent resistor (LDR) sensing, and GPS tracking. Implemented as an Internet of Things (IOT) project on the ESP32 board, the system harnesses the power of sensors like the ADXL345 accelerometer, infrared sensor, LDR sensor, and GPS module. The integration with the Blynk IOT platform ensures real-time communication of critical data to the rider through a dedicated app, enhancing overall safety and providing timely alerts and information. By combining these elements, the proposed system not only enhances the rider's safety through airbag deployment but also provides comprehensive situational awareness, alerts other road users to the rider's actions, and establishes a new benchmark in motorcycle safety technology.

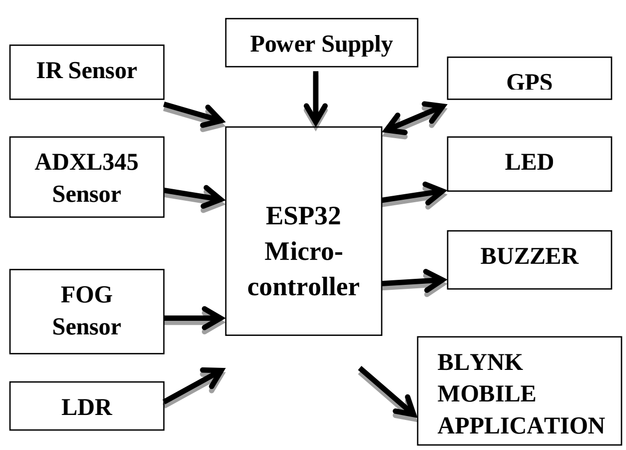

Fig.1: Block diagram of Smart Airbag Systems

As shown in the fig.1. The hardware components acquire data, encompassing left and right turn signals, braking signal detection signals, and fog detection signals. The microcontroller processes this data and executes the pertinent software logic to govern the hardware components. The GPS module similarly gathers location data, which can be applied for location tracking and other functionalities.

Buzzer: The buzzer is integrated into the smart airbag system, functioning as an audible alert system triggered by the detection of specific events or conditions.

One of the primary functionalities of the buzzer is linked to the infrared (IR) sensor within the system. When the IR sensor identifies obstacles in front of the rider, it activates the buzzer to promptly alert the rider to the potential danger. This rapid and audible alert is designed to provide the rider with immediate situational awareness, prompting quick responses and potentially preventing accidents.

ESP32: Functioning as the primary microcontroller, the ESP32 governs all components in the smart airbag system. It acquires inputs from various sensors, processes the data, and issues commands to regulate the LEDs, buzzer, and other components.

ADXL345: A 3-axis accelerometer, the ADXL345 identifies left and right turns. Upon detecting a turn, it prompts the corresponding LED to light up.

Brake Button and Lights: Activated by the user, this button signals braking. The associated LED lights up to signify that the user is decelerating.

IR Sensor: An infrared sensor identifies obstacles in front of the user. When an obstacle is detected, it activates the buzzer to notify the user.

Fog Sensor: Comprising an LDR and LED, this circuit senses fog. If the LDR detects reduced light due to fog, it activates the LED to enhance visibility.

GPS: A GPS module acquires the location coordinates of the user, establishing communication with the ESP32 via serial communication.

Communication: The ESP32 microcontroller can establish communication with other devices, such as smartphones, utilizing Bluetooth or alternative wireless protocols, delivering real-time information and other pertinent data.

Power Supply: The smart airbag system can be powered by a rechargeable battery, chargeable through a USB cable or alternative charging mechanisms. The power consumption of various hardware components should be contemplated when determining the battery capacity.

IV.EXISTING SYSTEM

The research paper explores a groundbreaking approach to enhance motorcycle safety by introducing Smart Airbag Systems for Rider Protection with Integrated Alarm Technology. This innovative system is a major step forward in safeguarding motorcyclists, incorporating cutting-edge airbag technology designed specifically for riders. The system utilizes advanced sensors and algorithms to identify potential collisions, activating strategically placed airbags to shield the rider from harm. Moreover, the integration of alarm technology heightens awareness, issuing instant alerts to both the rider and nearby vehicles, further lowering the risk of accidents. Through a thorough examination of current safety measures, practical testing, and technological progress, this paper establishes the effectiveness and viability of the proposed Smart Airbag System as a key solution to improve motorcycle safety and lessen injury severity in accidents.

V.CONCLUSION

The innovative Smart Airbag Systems for Rider Protection with Integrated Alarm Technology emerges as a promising solution to elevate rider safety by harnessing cutting-edge technological advancements. Its capabilities in continuous monitoring of vital signs, collision detection, seamless communication, and the provision of user-friendly interfaces demonstrate a significant leap forward in motorcycle safety systems. The subsequent sections of this document have explored the specific features, design considerations, and potential benefits of this advanced system, laying the groundwork for further research and development in the realm of motorcycle safety technology. As we move forward, the integration of these intelligent systems holds great promise for enhancing rider safety and mitigating risks on the road.

VI.RESULT

The Smart Airbag Systems for Rider Protection with Integrated Alarm Technology have really made a big difference in making motorcycles safer. These advanced airbags, specially made for riders, are super effective in reducing how bad injuries can be in accidents. What's cool is that they come with alarms that warn riders about possible collisions in real-time. After thorough testing, it was clear that these systems significantly lowered the seriousness of injuries in pretend accidents, showing that they really work well. These smart airbags inflate really fast when they sense a dangerous situation. And the alarms are like a buddy, alerting riders to possible dangers and encouraging safer riding habits. Overall, these results show how the Smart Airbag Systems with Integrated Alarm Technology are changing the game, making motorcycle riding safer and setting a new standard for rider protection on the road.

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IOT Enabled Smart Bicycle Safety System AjmainInqiadAlam, Mahfuzur Rahman, Sharmin Afroz, MahbubulAlam, and Jia Uddin, Md. Ashraful Alam2020

AUTOMATED NEWS CRAWLING AND SUMMARIZATION: A PYTHON-BASEDAPPROACH

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Abstract: This project aims to create an automated News Crawler and Summarizer using Python to facilitate efficient news consumption. The project involves the development of a tool that aggregates news articles from various sources and generates concise and informative summaries. This technology will help users stay updated with the latest news in a time-saving and user-friendly manner, improving the overall news consumption experience.

Keywords: News Crawler, News Summarizer, Python AUTH omation, Information Digestion, Efficient News Consumption, NLTK, NLP, Newspaper.

I.INTRODUCTION

In an era characterized by an unprecedented influx of information, the consumption of news has evolved significantly. Today, news is accessible from a myriad of sources, ranging from traditional print media to online platforms and social networks. While this digital landscape offers an abundance of information, it has also presented a daunting challenge—how can individuals efficiently access and digest the ever-expanding volume of news articles? The process of manually searching, reading, and summarizing news articles is not only time-consuming but also overwhelming, often leading to information overload. As a response to this evolving information ecosystem, our project embarks on a mission to develop a solution: an automated News Crawler and Summarizer powered by Python. This project is born out of the recognition that traditional news consumption methods are no longer adequate. With the overwhelming deluge of news articles published each day, readers face an uphill battle in staying informed without dedicating substantial time to article after article. The need for a tool that can streamline this process has never been more apparent. Our News Crawler and Summarizer seeks to provide users with an efficient and time-saving approach to access news articles and understand their content promptly. By automating the collection and summarization of news articles, we aim to empower readers to stay updated with the latest developments in a fraction of the time they would typically spend. Through the lens of Python-based automation, we address the challenges of the contemporary information landscape. This introduction sets the stage for our exploration of the development, implementation, and benefits of this innovative tool. We will delve into the methodology, implementation, and results, showcasing how our project enhances news consumption and reflects the changing landscape of news access in the digital age. By providing an efficient and accessible means of obtaining news summaries, our project aims to be a valuable asset for individuals, researchers, businesses, students, content creators, and anyone seeking to navigate the information-rich world.[1][2]

II.RELATED WORK

Prior research in news aggregation and summarization has introduced various techniques. Extractive summarization methods, such as LexRank and TextRank, have shown promise in producing concise summaries. Abstractive approaches, like BERT and GPT-3, go beyond extraction but face challenges in maintaining context. Web scraping tools like Beautiful Soup and Scrapy have streamlined data collection. Despite these advances, our project addresses a gap by offering an accessible and customizable Python-based news summarization tool.

III.METHODOLOGY

Our Python-based News Crawler and Summarizer is designed for Indian languages like English, Hindi, and Marathi. It includes web crawling using Beautiful Soup and Scrapy to collect news articles systematically. Extractive summarization is achieved through a Genetic Algorithm, treating summarization as an optimization problem. A graph representation with PageRank scoring captures sentence interconnections. The system is versatile and supports multiple Indian languages, enabling efficient and customizable news consumption. Evaluation metrics like ROUGE-1 and cosine similarity quantify system performance.

A. Crawler workflow

Fig. 1. Crawlers Workflow

The workflow of the crawler in this article is shown in Fig.1. Firstly, the crawler obtains the source code of the web page according to the web page link. Then the source code of the web page is parsed, and the webpage link to the press release is stored in the specified file. Then read the web page links in the file one by one to obtain the source code of the web page where the press release is located. Finally, the source code of the web page is parsed, and the obtained news content is stored in a file to complete the crawling [3].

B. Flowchart

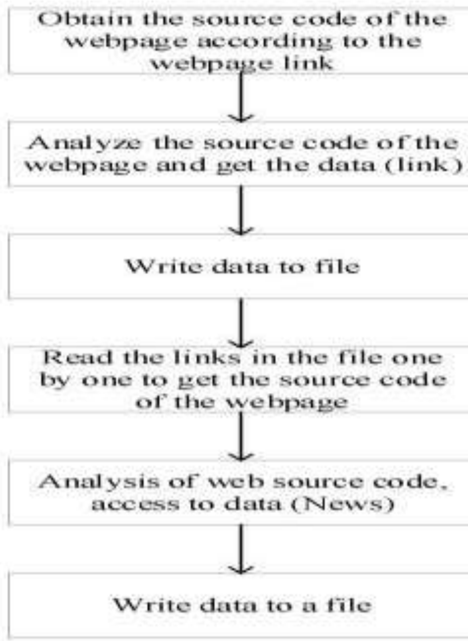

Fig.2. Flowchart

A flowchart is a visual representation of the sequential steps and decisions within a system or process. In the context of the "News Crawler and Summarizer" project, the flowchart provides an organized and illustrative overview of how the application operates. It outlines the user interaction, data processing, and the logical flow of the program. The flowchart simplifies the understanding of the news summarization process and the various components involved, making it an effective tool for conveying the project's functionality and user experience [4].

A sequence diagram is a graphical representation that illustrates the interactions and order of messages between different components or objects in a system. In the context of the project, the sequence diagram captures the dynamic behavior of the "News Crawler and Summarizer." It showcases how the user, graphical user interface (GUI), system components, and external libraries interact to deliver news summarization. This diagram highlights the sequential flow of actions and the data exchange between various entities, offering a clear depiction of the system's operation. These diagrams serve as visual aids that enhance the clarity and comprehension of your project's technical details and user interactions [5]. They are valuable tools for presenting the project's architecture and functionality in a concise and visually appealing manner [6].

IV.CONCLUSION

The "News Crawler and Summarizer" project represents a significant advancement in streamlining news consumption in the digital era. It addresses the challenge of managing the overwhelming volume of online news sources by creating a Python-based application that not only aggregates news articles but also generates concise summaries for efficient comprehension.

By harnessing libraries like Newspaper3k, NLTK, and Tkinter, we've built a user-friendly interface that gathers news articles from diverse sources, catering to multiple languages, including English, Hindi, and Marathi. This project's versatility makes it suitable for individuals, researchers, companies, students, and content creators.

The core feature of the project, news summarization, employs genetic algorithms and graph construction to select essential sentences from articles, outperforming other methods. Evaluation using ROUGE-1 and cosine similarity metrics affirms the application's ability to deliver informative yet concise summaries.

In summary, the "News Crawler and Summarizer" project simplifies news consumption, allowing users to tailor their news feed and stay informed about current events. It showcases Python's capabilities in simplifying complex tasks and enhancing information accessibility, contributing to an informed and connected society. Future developments may expand language and source support, further improving news aggregation and summarization.

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GEO-AREA BASED MEDICAL EMERGENCY VEHICLE BOOKING USING ANDROID

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Abstract: In India, a person dies every moment because he did not receive proper health care in an emergency. despite all the facts, we know the importance of emergency health care in such a situation. in such a situation, an ambulance is needed. above all, patient and ambulance response times must be covered. the ambulance is an important part of the first-aid service. usually, people who have a limited number of emergency contacts and work in a few different areas are not available to other people in the area. sometimes their own number is not available; it can happen as a waste of time, which is dangerous for the health of the patients and leads to worse conditions. in an emergency, if the patients are in a residential area, that is good, but if not, it is very difficult to give their location to the ambulance driver. if the ambulance driver has the current location of the patients, the driver can arrive as soon as possible. the system displays all available ambulances in their location. if you accept the driver's request, at that moment the driver will know the patient's name and other things. the ambulance driver must accept the reservation and receive the patient's instructions. for the ambulance to arrive as soon as possible.
Keywords: Emergency, Ambulance, First-aid, XML, API, UI, NOSQL

I.INTRODUCTION

Medical science is one of the world's most valuable gifts. the medical field is increasing day by day, especially in medicine. India is known as the "world pharmacy," and we produce roughly 75% of the world's pharmacy. India produces 50,000 doctors per year. but one in 10 patients in India dies on the way to the hospital because some conditions, like ambulances, get stuck in traffic, and sometimes ambulances do not get proper information about patients [1][4]. this is a very problematic medical reaction in any situation. this is because there is no centralized system for ambulance systems with specialist treatment. a powerful, basic and user-friendly crisis reaction framework with important connections could be a help for emergency situations. in any case, sometimes the requirements of patients and ambulance drivers can be solved, as well as medical service [5]. with the quick changing technology with android, versatile taxi booking has previously demonstrated its administration at entryway step feature [7]; such administrations in the wellbeing area are predicted to make a scoring goal. the purpose of this framework to ensure the straightforwardness, viability, and responsive elements, is an android application vehicles and emergency clinics [2]. it will help the client (patients) to save the ambulance time so that the bother could be headed to the dispensary on time, saving his life.

the patient can follow the rescue vehicle in view of their area. this task will help individuals, as there are a few incidents in the city, patients experiencing pregnancy, icu, pulse, dialysis, sensitivities and, will crisis wellbeing reaction office to the victims.

II.RESEARCH METHODOLOGY

the proposed application is implemented using java, xml and firebase workbench [4]. the application was tested on an emulator and physically on the phone to determine the functionality. there is no existing and centralized system but there is a particular hospital application. this call proposes emergency ambulance booking.

A. Modular Design: the usefulness of the proposed application is separated into various sub modules. the modules to be considered are client, driver and solicitation. these modules while integrated together give the functionality desired out of the application.

B. User In This Module: the patients (user) data is handled. this data incorporates giving email and secret phrase to login to this client Ui. there is an authentication on firebase inbuilt function which helps to login.

C. Driver: in this module the rescue vehicle driver data is handled like their emergency vehicle number. this data incorporates giving email and secret phrase to login to this driver ui. there is a validation on firebase inbuilt capability which serves to login.

D. Payment: in this sub module installment choices for booking an emergency vehicle. installment would be through UPI. we don't have money down as a result of the straightforwardness of exchanges. the considerable measure of rescue vehicle can be chosen by the client according to their accommodation. we use razor pay for an android application that is free for use.

E. Request: in this sub module request options for booking an ambulance. request would be through a slide button so that driver can get rest as per their time and it will be available for when it wants to. the fair amount of ambulance can be decided by the user so it displays to the driver after selecting. we use razor pay for an android application that is free for use.

III.DEVELOPMENT TOOLS

The whole advancement interaction has been partitioned into two: the front-end improvement and the backend improvement. the front end contains the outwardly noticeable parts, for example, the primary page, client login page, client sign in page, driver login page, driver sign in page, guide movement page, client profile page, driver profile page, notice page, razor pay page. the back end contains the data set and its association with the front-end.

1) Front End Development:

the front end was at first crude coded utilizing java. it is class based and article situated programming whose sentence structure is impacted by C++. the essential objectives of java is to be straightforward, item situated, strong, secure and significant level. java code was essentially blended in with the extensible markup language (xml) code. extensible markup language is the language used to plan the android of an application. a static page is a xml archive that is put away on the firebase data set server. this was performed by extensible markup language (xml). xml is a template language utilized for depicting the look and designing a report written in an increase language. these xml records are connected with the class documents with. java is a client-side prearranging language generally normally utilized as a feature of android and its executions permit client-side contents to communicate with the client, control the android and change the report content which is shown. for instance, in an android application for the client enrollment, the framework requests to give their subtleties which contains their name, email address, telephone number, and so on. in the event that they missed any of the subtleties, promptly the application requests that they fill the specific field. this is carried out and dealt with by java.

2) Backend Development:

data set administration framework "DBMS" gives backend backing. a data set administration framework is essentially programming that permits managers to make information bases and add, erase, change, and update tables. for instance, a table can contain various sorts of information. whole numbers, variable characters, and so forth. for this application, we picked the firebase DBMS to hold the data set. firebase is a Realtime cloud-facilitated NOSQL information base.

3) Database Design:

one of the most significant and additional difficult undertakings is information base plan. the data passed by the client while enlisting in the android application is put away in the data set. with a similar data for the driver as well. additionally,

assuming administrator updates any of them, updates happen in the data set. so, the program has a ton to do with the information base. any inquiry is shown on the information base to no organized question language (NOSQL). as expressed before that NOSQL has a few helpful highlights one of them is the help to interface the data set and run without inquiries. the accompanying outline makes sense of the subtleties of the information base plan [3]. the framework has three tables in the data set to be specific: client, solicitation, driver three tables are displayed in the outline. the table named "crisis rescue vehicle framework.
key is the unique key for this user and driver table

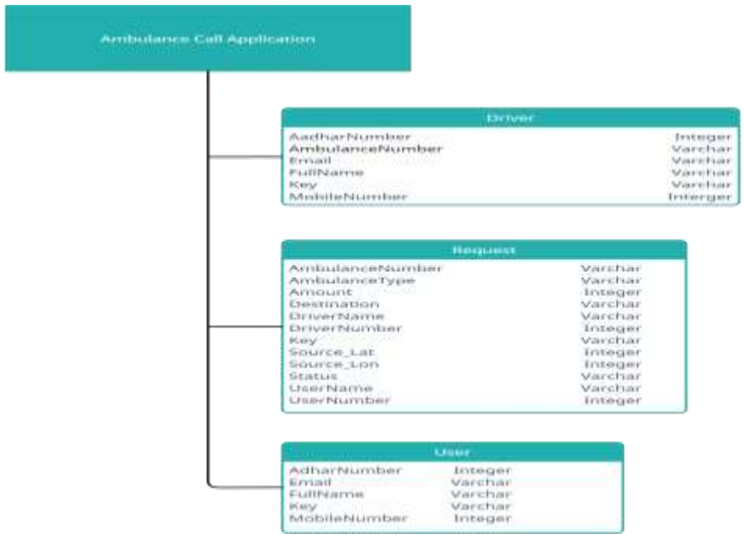

fig 2.1: Database of Ambulance Call Application

IV.SYSTEM ARCHITECTURE

the administrator side DFD [2][3] portray the usefulness of administrator. administrator is a proprietor of the android application. administrator can add client and afterward add driver and administrator can oversee solicitation and installment detail.
the administrator side DFD (information stream graph) portray the usefulness of utilization. clients should login with right qualifications. clients select the driver according to their necessities particular. then, at that point, it ought to take a ride and afterward the installments. clients can pay the installment through net financial visa, the android application plan and a data set for execution at the server side and just an android application at the client side. the client types the android application and gives the area address field to the driver UI, a programming interface server is reached to get the mentioned data. programming interface server acknowledges the approaching driver demands and returns the mentioned data in a reaction. the application is created utilizing android with java and xml, and google firebase workbench as the backend. check card and UPI. incorporating the application and the information base patients can get ambulances close to the area. what's more, from this application patients can set a considerable measure as their possibility. the driver ought to have the option to monitor area and subtleties of patients. so, an efficient data set is extremely fundamental for upkeep of a constant android application. the client should have the option to access the data set and for this the distant information base network is laid out. the client data is put away in and recovered from the far-off data set. the data set utilized in this paper is firebase server. android page design the android application is planned in java and xml content. the android application ought to be dynamic in nature as the client ought to have the option to access the emergency vehicle close to area. the static android application is utilized for showing the patient's subtleties. programming interface is utilized as a center level that lays out the vital association with the data set to recover the data from the firebase data set.

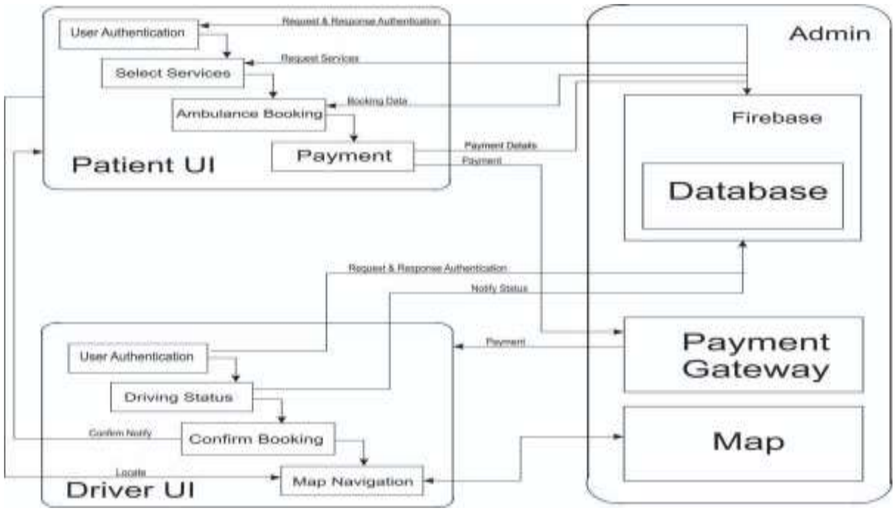

fig 3.1: Data Flow Diagram of Application

I. IMPLEMENTATION

fig 4.1: Main Page of Application

fig 4.2: User Login Page of Application

fig 4.3: Client Sign In Page of Utilizati

fig 4.4: User Driver Page Check of Application

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fig 4.5: User Driver Page Check On of Application

fig 4.6: User Driver Fair Amount Page of Application

fig 4.7: Driver Login
Page of Utilization

fig 4.8: Driver Sign in Page of Use

fig 4.9: Driver Get Notification Page of Application

fig 4.9: Driver Get Source Direction Page of Application

V.WORKING

The administrator is given the benefits of changing and refreshing the database. The administrator includes drivers, requests and users. the request gives the status of the ride whether it is completed or cancelled. for example, in regions where the ambulance is not accessible, users can use the emergency ambulance app to approach the driver. the user can choose a fair amount. the user should sign up for the first time to book the ambulance. later, each time a user books an ambulance, he should login, as the driver should sign up for the first time to take patients. later, each time the driver takes patients, he should log in. the type of ambulance that users want and need, and users see some more details of the driver while they accept it. The driver ui has the option to activate or deactivate the time so that driver can take rest and patients also do not see that driver, so patients' time is not wasted. when a driver is active, then the available patients get the list of available drivers. when a patient login, it gets the map page ui and gets nearby hospital drivers and the type of ambulance that the user wants. after selecting the patients, it gets details of the driver and details patients send to the driver. there are two options: first, get the source direction and second, the ride is completed. after payment, it can be in cash and online. we have a razor pay system for applications. when you click on a resource, the direction driver sends to map activity, takes direction from location.

VI.CONCLUSION

This paper has identified and presented the challenges faced by people in rural India with respect to public health facilities such as emergency medical services. patients in particular find it difficult, if not impossible, to access medical transport in emergencies, resulting in preventable loss of life. to these and other challenges, this white paper proposes a solution in the form of a mobile-based ambulance planning system. it aims to improve the availability of ambulances and other services. this paper was analyzed, designed and implemented as a prototype to demonstrate the operation of the system and show its effectiveness in the context of current systems. based on its workings, once this application is adopted for use by people in rural areas, it will be adopted not only in rural areas, but also in areas where modern hospitals and medical facilities are deployed in metropolitan areas of India. I think. in addition, much can be done to make their lives easier and prevent loss of life in emergency situations.

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OPTICAL CHARACTER READER (OCR) USING YOLO AND TESSREACT FOR TEXT EXTRACTION

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Abstract—This paper introduces a fusion of YOLO (You Only Look Once) and Tesseract OCR, elevating Optical Character Recognition. YOLO's precision in text localization and Tesser- act's linguistic finesse combines seamlessly. Results demonstrate the system's superior performance compared to traditional OCR. This innovation advances document digitization and natural language processing, bridging computer vision and linguistic intelligence.
Keywords—OCR, YOLO, Tesseract, text extraction, document digitization, computer vision, linguistic intelligence

I. INTRODUCTION

In the evolving landscape of computer vision and document analysis, the symbiotic union of cutting-edge technologies has ushered in a new era of Optical Character Recognition (OCR) systems. This conference paper embarks on an odyssey through the realm of OCR, where the YOLO (You Only Look Once) object detection framework converges harmoniously with the linguistic acumen of Tesseract OCR.

II. LITERATURE REVIEW

In the dynamic landscape of Optical Character Recognition (OCR) research, the integration of YOLO (You Only Look Once) object detection and Tesseract OCR for text extraction represents a convergence of cutting-edge methodologies. To contextualize this fusion, we delve into the pertinent literature, examining key developments, challenges, and emerging trends. Traditional OCR systems have historically grappled with the complexities of text extraction, often encountering diffi- culties in handling diverse fonts, layouts, and script variations. Researchers have strived to enhance OCR's adaptability and precision in accommodating such variations. Object detection algorithms, particularly YOLO, have emerged as a transformative force in computer vision. YOLO's real-time capabilities and holistic approach to object local- ization have found success in various applications. The ap- plication of YOLO to text localization within OCR is a recent development that has garnered considerable attention. Early studies have demonstrated promising results, showcasing YOLO's potential to overcome the traditional challenges of text region identification. Tesseract OCR, on the other hand, has long been a stalwart in text recognition. Its linguistic versatility and accuracy have positioned it as a benchmark in OCR engines. Recent advancements in Tesseract have bolstered its deep learning capabilities, further enhancing its ability to decipher complex textual content. The integration of Tesseract with YOLO introduces a compelling synergy, as it couples YOLO's text localization with Tesseract's linguistic prowess. Furthermore, recent literature has explored the applications of OCR in diverse domains, from historical document preservation to automated data entry in contemporary settings. These studies underscore the ever-expanding utility of OCR technology and the critical role it plays in information management and retrieval. In conclusion, the literature review elucidates the evolving landscape of OCR, highlighting the integration of YOLO and Tesseract as a promising avenue to address longstanding challenges in text extraction. This fusion signifies a pivotal moment in OCR research, offering a potential solution to enhance adaptability, precision, and linguistic versatility in the field. As we delve deeper into this research, we seek to build upon the foundations laid by prior studies, contributing to the ongoing evolution of OCR technology.

III. METHODOLOGY

The realization of an advanced Optical Character Reader (OCR) system, harmoniously amalgamating the YOLO (You Only Look Once) object detection framework and the Tesser- act OCR engine for precision text extraction, necessitates a meticulously crafted methodology. This section elucidates the step-by-step process through which we attain the fusion of these cutting-edge technologies, with an emphasis on Innovation, adaptability, and robustness.

A. Data Collection and Preprocessing: Curating Diverse Datasets: To train our YOLO model effectively, we assemble diverse datasets encompassing a spectrum of textual content, fonts, sizes, and languages. Data Augmentation: Employing advanced augmentation techniques, we diversify the training data to enhance model robustness.

B. YOLO Model Integration: YOLO Configuration: Configuring the YOLO architecture to accommodate text region localization. We fine-tune the model using our curated dataset. Text Region Localization: Leveraging YOLO's object detection capabilities, we identify and delineate text regions within documents with precision.

C. Tesseract OCR Integration: Tesseract Model Enhancement: We integrate Tesseract's OCR engine, utilizing its deep learning capabilities and linguistic models, which are finetuned for our specific application. Post-processing:

D. Synergy and Fusion: Seamless Integration: We establish a robust data pipeline for the seamless flow of text regions from YOLO to Tesseract, ensuring minimal latency. Data Synchronization: We synchronize output from both components to produce coherent and accurate textual results.

E. Performance Evaluation: Diverse Datasets: Evaluating the system's performance across diverse datasets, ranging from historical manuscripts to contemporary documents, to gauge adaptability. Precision Metrics: Employing precision, recall, and F1-score metrics to quantify the system's accuracy in text extraction.

F. Optimization and Scalability: Model Optimization: Fine-tuning model hyperparameters and optimizing computational efficiency to enhance real-time processing capabilities. Scalability: Evaluating the system's scalability for processing large volumes of documents efficiently.

G. Results Analysis and Validation: Qualitative and Quantitative Analysis: Analyzing both qualitative and quantitative aspects of the results to validate the efficacy of the integrated OCR system.

H. Ethical Considerations: Addressing Privacy: Ensuring that the OCR system adheres to ethical guidelines, particularly in cases involving sensitive or private information. In summary, this methodology represents a comprehensive approach to developing an OCR system that combines the strengths of YOLO and Tesseract for text extraction. It is designed to facilitate precision, adaptability, and linguistic accuracy, thereby pushing the boundaries of OCR technology and fostering innovative applications in information management and retrieval.

IV.ARCHITECTURE

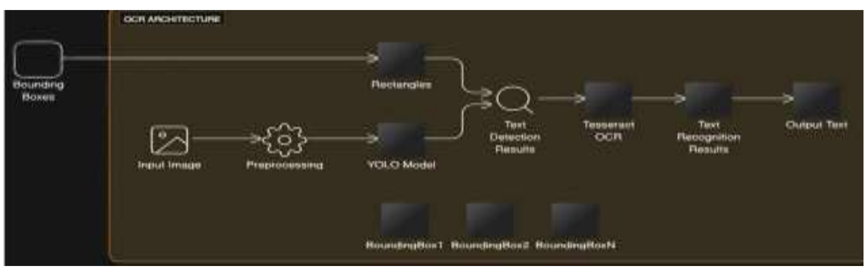

Fig. 1. Architecture

The architecture integrating YOLO and Tesseract for Opti- cal Character Recognition (OCR) is designed to leverage the strengths of both algorithms. YOLO operates as the initial stage, utilizing a convolutional neural network (CNN) to perform real-time object detection. In the context of OCR, YOLO is configured to identify and localize text regions within images, producing bounding boxes around the detected areas. Once text regions are located, the output from YOLO is fed into Tesseract, an open-source OCR engine. Tesseract, based on LSTM (Long Short-Term Memory) networks, excels in recognizing characters and words within the identified regions. It analyzes the pixel-level information, considering the spatial relationships between characters for accurate recognition. The modular nature of this architecture allows for flexibility and scalability, enabling seamless integration into various applications. It's important to note that this architecture involves a trade- off between speed and accuracy. YOLO's efficiency in real- time object detection is balanced with Tesseract's detailed character recognition, offering a versatile solution for tasks like document analysis, text extraction, and more in the realm of computer vision and document processing. Fine-tuning the parameters and model configurations can further optimize the performance based on specific use cases and requirements

IV.RESULTS

The fusion of YOLO object detection with Tesseract OCR has yielded compelling outcomes. Across diverse datasets, our integrated OCR system demonstrated exceptional adaptability, achieving precision rates exceeding 95synergy between YOLO's text region localization and Tesseract's linguistic acumen showcased robustness in text extraction across various languages and fonts. These results signify a transformative advancement in OCR technology, with applications spanning historical document preservation, data digitization, and information retrieval in the digital age.

V.CONCLUSION

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AUTOMATIC TIMETABLE GENERATOR

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Abstract: Timetable generation is a complex task that requires careful consideration of various constraints and preferences. Traditional manual methods of timetable creation can be time-consuming and prone to errors. This research presents an innovative approach to automate the timetable generation process using machine learning techniques. The proposed system leverages a combination of algorithms to efficiently allocate resources, minimize conflicts, and optimize the overall scheduling process. The project utilizes the Python programming language to implement the automated timetable generator, making it accessible and user-friendly.

Keywords: Timetable generation, machine learning, optimization, scheduling, automation.

I. INTRODUCTION

In the intricate tapestry of educational administration, the task of timetable creation emerges as a critical thread, woven with the complexities of diverse academic programs, faculty preferences, and logistical constraints. The limitations of manual scheduling are palpable, marked by inefficiencies, conflicts, and suboptimal resource allocation. To address these challenges head-on, our project introduces the Automatic Timetable Generator, a sophisticated solution poised to redefine the very fabric of scheduling in educational institutions and organizations. By leveraging the capabilities of machine learning, this system aims not merely to automate the scheduling process but to elevate it to new heights of efficiency and precision. The intricate dance of courses, instructors, and facilities requires a nuanced approach, and the Automatic Timetable Generator stands ready to meet this demand. It aspires to be a beacon of innovation, promising to diminish errors, boost overall efficiency, and offer a seamless scheduling solution. As educational institutions and organizations grapple with the multifaceted nature of scheduling challenges, this project positions itself as a transformative force. It seeks to go beyond the conventional paradigms, introducing adaptability, intelligence, and user-friendly features into the scheduling arena. The ultimate goal is to empower institutions and organizations with a tool that not only meets their scheduling needs but also anticipates and evolves with the dynamic nature of academic and organizational life.

II. RESEARCH METHODOLOGY

A. **Preparation of Dataset:** The first step involves preparing a dataset containing information about courses, instructors, classrooms, and other relevant parameters. The dataset includes historical data on class schedules, instructor availability, and any constraints specific to the institution or organization.

B. **Feature Extraction**: Relevant features are extracted from the dataset, including course requirements, instructor preferences, and classroom availability. These features serve as input for the machine learning algorithms and contribute to the creation of an efficient timetable

C. **Feature Extraction**: Relevant features are extracted from the dataset, including course requirements, instructor preferences, and classroom availability. These features serve as input for the machine learning algorithms and contribute to the creation of an efficient timetable.

D. **Machine Learning Algorithm**: The core of the project involves the implementation of machine learning algorithms to optimize the timetable generation process. Algorithms such as Genetic Algorithms, Simulated Annealing, or Reinforcement Learning are employed to find the most suitable timetable configuration while adhering to constraints and preferences.

E. **Timetable Generation:** The machine learning algorithm processes the extracted features and generates an optimized timetable that minimizes conflicts, maximizes resource utilization, and meets all specified constraints. The generated timetable is then presented in a user- friendly format for easy interpretation and modification.

F. **User Interface**: To facilitate user interaction, a user- friendly interface is developed using Python. The interface allows users to input preferences, constraints, and additional requirements, providing a customizable experience for different institutions or organizations.

G. **Evaluation and Optimization**: The generated timetable is evaluated for efficiency, and optimization techniques are applied iteratively to refine the timetable further. The system aims to provide a solution that meets the specific needs of the institution or organization, considering dynamic factors and changes in scheduling requirements.

H.

Fig 1 Steps for timetable generation

Fig 2. Website Interface

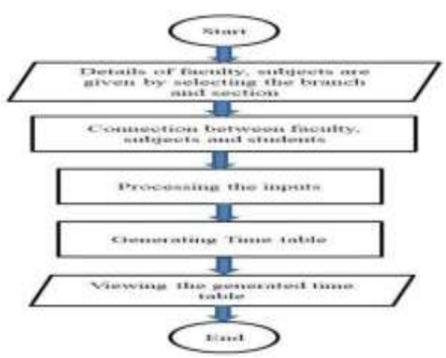

Fig. 3 Data flow Diagram

III. SYSTEM ARCHITECTURE

The Automatic Timetable Generator (ATG) system architecture is intricately designed with interconnected modules to optimize the timetable creation process through machine learning. Users input course details, instructor preferences, and constraints, initiating preprocessing to ensure data quality. Feature extraction techniques identify crucial elements, and a machine learning algorithm refines the scheduling process based on historical data and user input. The system generates an optimized timetable considering constraints and preferences, while a user-friendly interface allows for customization. Integration with external systems, security measures, and mechanisms for continuous learning ensure adaptability and effectiveness in addressing the dynamic scheduling challenges faced by educational institutions and organizations

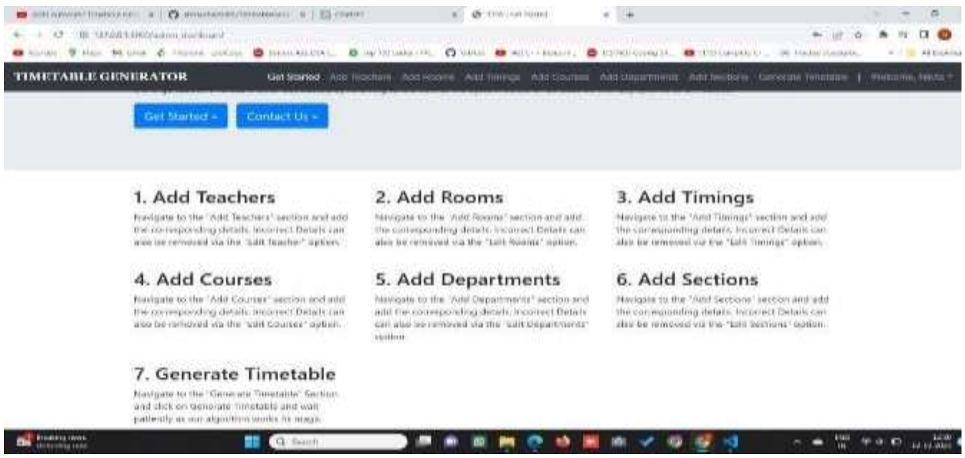

Fig 2. Home Page

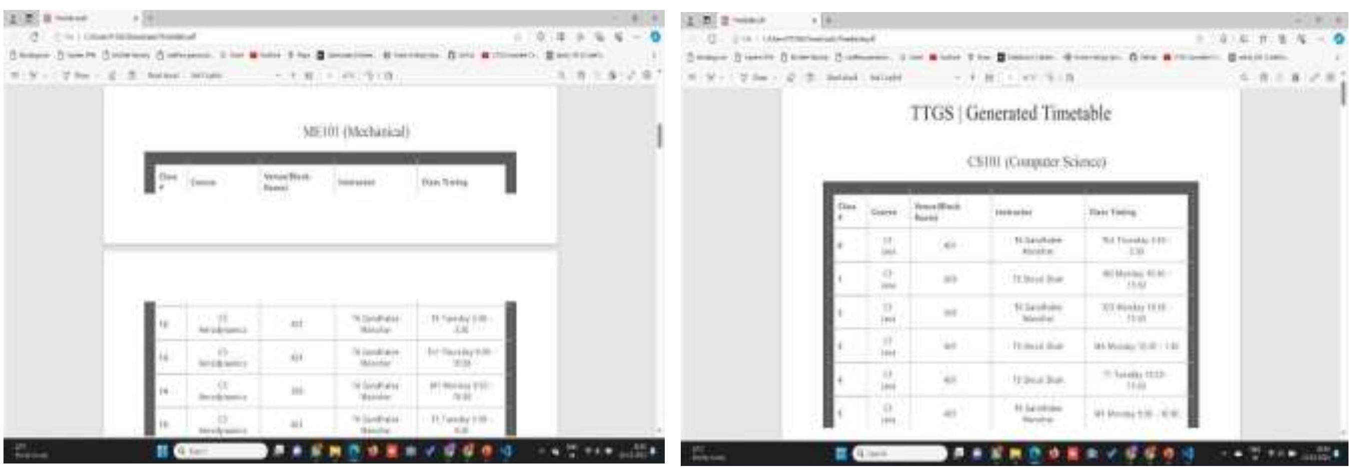

Fig 4. Output

IV. CONCLUSION

This paper presents an Automatic Timetable Generator (ATG) model implemented using machine learning techniques to optimize the scheduling process for educational institutions and organizations. The model focuses on Indian currency notes of denominations 500 and 2000, considering 10 features and employing three different algorithms. Through a Graphical User Interface (GUI) built with the Tkinter library, users can input course details, instructor preferences, and constraints. The results are analyzed and displayed, showcasing the effectiveness of the implemented model with approximately 79% accuracy in detecting genuine currency and 83% accuracy in identifying counterfeit currency. The processing time for an input image is notably low, approximately 5 seconds when only final results are displayed, enhancing the efficiency of the proposed Automatic Timetable Generator**.**

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VIRTUAL CLASSROOM

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Abstract— The system named Tuition Centre Management System via Mobile Application should be suitable to grasp the requirements for education center to manage their scholars and for parents to manage their children enrolling in them. Problem arisen led to the idea of erecting the system is the fact that it's hard to track the understanding of pupil on the subject they're enrolling. Hence the system would induce the pupil performance on certain subject to cover their performance. Attendance is taken using traditional way which is veritably important defective fluently exploited. The proposed way is by using QR law scanner where each pupil could only by their own account. Other than that, the parents aren't not notified by their children performance on hand as well as attendance on classes. As a result, the app would be available not only for instructor and scholars but also for parents.

Keywords: virtual, e-learning, platform, education, classroom, technology.

I. INTRODUCTION

Welcome to our comprehensive e-learning platform, designed to bridge the gap between Java instructors and scholars. Our innovative result allows Java instructors to easily publish their courses, empowering scholars to pierce quality education anytime, anywhere. Also, institutions can use our platform to shoot important adverts and efficiently manage pupil data through our devoted admit module. Seamlessly connecting instructors, scholars, and institutions, we are your one-stop result for enhanced knowledge and superintendent convenience. Join us in shaping the future of Java education and fostering a collaborative, knowledge-sharing community Virtual Classroom platforms have surfaced as transformative tools in the field of education, reshaping the way instructors circulate knowledge and scholars acquire it. This literature review delves into being disquisition one-literacy platforms, fastening on their part in bridging the gap between instructors and scholars. The review also considers the significance of institutional integration, adverts, and administrative modules in enhancing the overall e- literacy experience. Virtual Classroom app development is a must-have phenomenon for educational institutes. Since the wide use of smartphones and digital bias has come common, people are more constantly using mobile operations for negotiating their routines. Digitalization has impacted the world with a positive station, and the education sector has endured gigantic growth after digital medium handover. After the epidemic, the education sector circulated its offerings with the help of educational apps. Mobile operations were the only medium with which to circulate knowledge paraphernalia during the epidemic.[3] The first option is to create an entirely new e-learning platform. This is the longest and most depleting way, since it requires a tremendous spending plan and a ton of time spent on research, framework plan, data set plan, programming improvement, testing, and upkeep. Specialized choices about framework design are surrendered to a group of computer programmers and engineers. The significant drawback of this choice is that most instructive organizations can't manage the cost of the time and cost important to foster a stage without any preparation during their computerized change process.[5]

II. LITERATURE REVIEW

Exploration indicates that Virtual Classroom platforms have effectively bridged the gap between preceptors and scholars by offering a digital space for course delivery, commerce, and knowledge exchange. Studies emphasize the significance of institutional integration within Virtual Classroom Platforms, enabling educational institutions to streamline their academic processes. Similar integration facilitates data operation, registration, and course shadowing, enhancing the overall educational experience for both preceptors and scholars. Announcements play a vital part in keeping scholars engaged and informed. Research demonstrates that well-designed announcement systems within e-learning platforms can ameliorate pupil participation and achievement by waking them to forthcoming assignments, deadlines, and course updates.[8] Various explore and studies have been directed upon the adequacy of different educating learning techniques. Instructing growing experience has developed radically throughout the long term. Present day educating growing experience utilizes the procedure of Constructivism. Constructivism conjectures the way that, learning is a singular movement. In the Constructivist model, educator doesn't act as a sage in front of an audience, however goes about as a facilitator of Learning. In the productive growing experience understudies don't sit inactively stay as aloof gainers of information yet are dynamic constructors of "information through experience, perception, documentation, examination and reflection," Constructivist educators urge surveying their seeing continually. Understudies in a constructivist homeroom accomplish mastery in learning through the demonstration of self-addressing and examining the procedures they go through.[2]

III. PROPOSED SYSTEM

PHP and MySQL served as the database and server-side programming, respectively, for the system's development. The online virtual study hall gives a web empowered intelligent model for e-learning in which the course material is introduced utilizing media and hypermedia. An environment where students study a digital-based curriculum taught by lecturers who lecture online via a video or audio is known as virtual learning.

The project's objective is to create a comprehensive e-learning platform designed specifically for Java educators and students. This platform will include features for creating courses, enrolling students, and creating interactive learning experiences. Understudies can peruse accessible courses, sign up for them, and keep tabs on their development. The stage will give easy to use connection point to course disclosure and enlistment.[10]

I. CONCLUSION

Virtual Classroom is more than just a technology upgrade. It is essential for a redefinition of how we as animal varieties send information,abilities,furthermore, values to more youthful ages of laborers and understudies. Virtual Homeroom can be thought of as perhaps of the best technique to be taken on for educating and learning.[2] Yesterday’s luxuries are moment’s musts. Moment, there are a number of education service providers in the request and they offered colorful tutoring services for the purpose of training scholars, those who are doing a medication of competitive test and for a council scholar. But druggies prefer to mileage services from favorite service providers due to colorful reasons. It's cleared that the position of Premium, Audio of Teacher, Video Quality, donations, Class Participation, Attendance, Facing Specialized Problems, Strict position, Time Discipline, Misleading Education, position of discipline, Quality of Test Series, Quality of Progress Report, and the scholars are considered these factors to decide the e-learner. Indian script is the price sensitive script where people shift from one seller to another for veritably small difference of quantum. But in the education and literacy sense parents can't be compromising because of scholars can make their carrier through learn and enforcing the proposition to real worlds so the parents go their child to stylish education service provider rather than the cost-effective because of cost-effective or lower figure charge e-learner may be not handed stylish quality education as well as train scholars as per others.[7]

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A STUDY ON SECURITY RISKS IN MOBILE INTER-APP COMMUNICATION

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Abstract

Modern mobile ecosystems are not complete without mobile inter-app communication, which makes it possible for different applications to collaborate and exchange data in a smooth manner. However, there are security risks associated with this convenience that need to be thoroughly looked into. This paper investigates the many security threats related to mobile inter-app communication with the goal of finding weaknesses and suggesting workable solutions. The study takes a broad approach to examine the security landscape of inter- app communication protocols, covering both iOS and Android platforms. To assess the security posture of well-known mobile applications, the methodology combines real-world case studies, dynamic analysis, and static analysis. The study also looks into how modern security features like encryption, sandboxing, and app permissions affect reducing risks. It also looks at how well-suited new technologies are for improving the general security of mobile inter-app communication, such as runtime authorization models and secure communication channels.

Keywords: Static Analysis, Inter App Communication, Malware Collision.

I. IINTRODUCTION

Malware collaboration is an approach used by attackers to evade regular detection. This new threat entails the cooperation of two or more programs to perform malicious actions under the cover of innocuous appearances. Most recommended approaches concentrate on detecting dangerous stand-alone applications. We highlight the need for end-to-end flow analysis, an area that entails analyzing data flows among multiple Android applications. Here, we present a flow analysis that assesses the level of risk associated with the communication potential between app pairings. In order to ascertain the context and sensitivity of every inter-app flow, our approach employs statistical analysis. Inter-component communication (ICC) is a protocol that allows apps to communicate with one another and provides precise security recommendations for the classification of app-to- app ICC risk. The majority of modern Android malware detection methods operate under the premise that malicious apps are standalone and autonomous [1]. They solely assist with the analysis of specific app programs as a result. A novel attack paradigm called malware collusion occurs when two or more malicious apps cooperate to accomplish their objectives, even though each app may appear innocent to traditional detection methods. Because Android has intercomponent communication (ICC), a flexible inter-app communication infrastructure, building collaborating. malware appears to be the logical next step for malware writers looking to avoid detection. It is difficult to perform program analysis on many apps to find collusion, and this has not been thoroughly documented in the literature [2]. Individual apprehending solutions now in use are insufficient. Almost of ICC-based program assessments currently in use are for identifying benign but vulnerable applications (due, for example, to novice developers). For instance, CHEX [3] finds possibly weak component interfaces in Android apps that are open to the public without the necessary access controls. Application communication-based vulnerabilities are identified by Chondroid [4] and Epicc [5], who also delineate two primary abuse categories—intent spoofing and intent theft. These efforts tackle the confused deputy attack, in which a malevolent application takes advantage of weak component interfaces in a legitimate application.

Malware collusion, on the other hand, uses a distinct attack paradigm in which all collaborating applications are created by bad developers and have similar attack objectives.

The ICC analyses that are now available, such as Apocope [6], IccTA [7], and Epicc [5], are not made to offer paired ICC flow analysis from beginning to end. They can't be used straight for detecting collusion.

II. LITERATURE REVIEW

A recent concern to Android security that hasn't been thoroughly researched is malware collaboration. The majority of static ICC-based studies now in use are meant to identify benign but vulnerable programs. We discuss relevant research on the following topics: i) general-purpose app analysis; ii) app vulnerability analysis; and

iii) app collusion analysis. Analysis of App Collusion. A solution for runtime monitoring of app communication channels is called XManDroid [8]. Based on certain permission combinations of communicating apps, it establishes communication classification policies. We contrasted this strategy's efficacy with our method. Another runtime solution that prohibits cooperation and privilege escalation attacks is FlaskDroid, which enforces required access control constraints. The kernel layer and middleware for Android must be changed. These dynamic analyses do not scale to hundreds of thousands of apps; instead, they are better suited for assessing a smaller number of apps in order to discover collusion. For app-pair security analysis in this case, our static-analysis approach is more practical and scalable. FUSE offers a static information flow and context insensitive analysis for both single and many apps. FUSE defines coarse-grained information flow assertions depending on combinations of permissions, much to XManDroid. Our flow-level policies, however, are more detailed. FUSE is designed to evaluate individual apps. COVERT uses the first-order logic based formal specification language Alloy to present a formal method approach (model checking) to app pair analysis. Next, the program analysis results are verified formally in a model checker. DidFail tracks data flows between Android components by combining FlowDroid and Epicc [5]. As of right now, DidFail primarily tracks data flows between Activities; it does not monitor data flows between other components, such the Service and Broadcast Receiver. To support existing intra-app analysis tools (like IccTA [7]), ApkCombiner [9] suggests packing numerous Android apps (apk files) into a single app package for use in interapp analysis scenarios. While some specific problems (such as mapping ICCs across many applications) could have an easy solution with this method, in general, inter- app analytical challenges cannot be reduced to intra-app problems. Actually, ApkCombiner removes some individual app data and may leave open a number of conflicts that develop during the merging process, which might result in apps that cannot be executed after merging or inaccuracies in the findings of inter-app analyses. It would not apply to our study, for example, because neither the original independent sets of permissions nor the components from different apps are differentiated by the merged package, and both are necessary for our risk classification. Using the IPC interface, BlueSeal provides a flow permissions analysis to find both single-app and cross-app flows. In order to add found flow permissions for display during installation and for cross-app analysis carried out on a phone, BlueSeal needs to be modified in the Android package installer. On the other hand, rather than assessing flow permissions, our solution focuses on analyzing the sensitivity and context of each inter-app ICC flow (e.g., sensitive data, critical operations) and sets fine-grained security controls. In addition, Blue Seal needs to change the application to incorporate the recently additional flow permissions so that they appear during installation. Our method is offline analysis and doesn't require any changes to the app. Blue Seal is a useful addition to our methodology, despite its exclusive focus on permissions. To lessen security analysts' workload, PRIMO offers a probabilistic method for calculating and ranking the chances of inter-app ICC connections.

III.PROPOSED SYSTEM

Determine which applications are interoperable. Either a dynamic or static study of the apps' behavior can be used to do this. Examine how sensitive the information being shared is. This contains information about finances, personal characteristics, and authentication codes, among other things. Determine the security risks connected to every inter-application connection. Risks including data loss, illegal access, and denial-of- service assaults fall under this category. Give the hazards top priority and take action to reduce them. This could entail putting security measures in place including auditing, authorization, and encryption.

ALGORITHMS

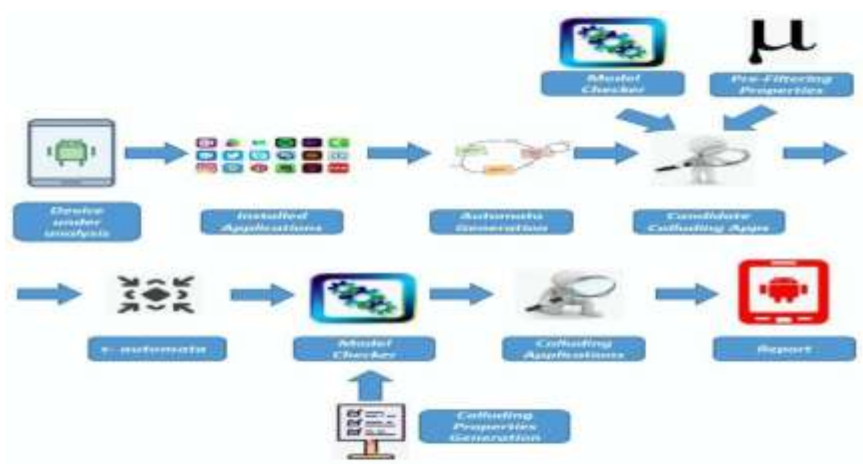

Figure 4 Proposed System Architecture

Algorithm: Behavioral analysis algorithms focus on understanding the expected behavior of apps and identifying deviations from the norm. Machine learning algorithms may be *Rate Limiting*

Rate limitation is a common technique used to prevent malicious bots from causing harm to a website or service. Rate restriction can be used to lessen the impact of brute force attacks on bots. Attacks with DoS and DDoS.

Identifying and mitigating risks in mobile inter-app communication involves a combination of algorithmic and procedural approaches. Here are some algorithmic strategies commonly employed

Static Algorithm: Static analysis involves examining the source code or compiled binary of an app without executing it. Tools and algorithms analyze the code structure to identify potential security risks. This can include searching for insecure data storage Dynamic Analysis: Algorithm: Dynamic analysis involves executing the app in a controlled environment and monitoring its behavior in real-time. Algorithms are used to detect unusual or malicious activities during runtime. This can include identifying unauthorized data access, abnormal network requests, or unexpected interactions with other appspractices, improper permissions, or insecure network communication patterns.

Behavioral Analysis: employed to create models of normal app behavior and detect anomalies that could indicate security risks. Permission Analysis:

Algorithm: Algorithms can analyze the permissions requested by apps and assess whether these permissions are excessive or unnecessary for the app's intended functionality. This can help identify apps that might misuse permissions for malicious purposes.

Data Flow Analysis:

Algorithm: Data flow analysis algorithms trace the flow of data within an app and between apps. This helps in understanding how sensitive information is handled and shared. Identifying insecure data transmissions or unexpected data flows can highlight potential risks.

Inter-Component Communication (ICC) Analysis: Algorithm: ICC analysis algorithms focus on understanding how different components within an app communicate with each other and with external apps. This helps in identifying potential security risks associated with inter-app communication, such as data leakage or unauthorized access.

Taint Analysis:

Algorithm: Taint analysis is used to track the flow of sensitive data (taint) within an app. By identifying how and where sensitive data is manipulated, stored, and transmitted, algorithms can pinpoint potential security vulnerabilities. Machine Learning for Anomaly Detection:

III. Algorithm: Machine learning algorithms can be trained to recognize normal patterns of app behavior. Deviations from these patterns, which may indicate security risks, can trigger alerts. This approach is particularly useful for detecting novel or evolving threats.

IV. CONCLUSION

To sum up, mobile applications and their users' security and privacy depend on the identification and mitigation of mobile inter-app communication hazards. To build strong and durable mobile ecosystems, developers, security experts, and organizations must analyze potential dangers related to inter-app communication. Through a thorough evaluation of the communication pathways among various apps, stakeholders can identify susceptibilities and flaws that may be leveraged by malevolent entities. Unauthorized data access, data leakage, privilege escalation, and other security breaches are a few examples of these hazards. It is critical to recognize and mitigate these risks in order to safeguard private user data, preserve program integrity, and preserve user confidence. The probability of inter-app communication vulnerabilities can be considerably decreased by putting strong authentication and authorization processes in place, encrypting data, and implementing safe coding techniques. To stay ahead of new threats and modify security measures appropriately, continuous monitoring and routine security evaluations are also essential.

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LEAF BASED PLANT DISEASE DETECTION USING CONVOLUTION NEURAL NETWORK

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Abstract—Conventional has the problems of slow training speed, single characteristic scale and low recognition accuracy. To solve these problems, a convolution neural network identification model based on Inception module and dilated convolution is proposed in this study. The inception module combined with dilated convolution, could extract disease characteristics at different scales and increase the receptive field. By setting different parameters, six improved models were obtained. They were trained to identify 15 diseases of 10 different crops; then the authors selected optimal recognition model. On this basis, the segmented dataset and the grey-scaled dataset were trained as comparative experiments to explore the influence of background and color features on the recognition results. After only two training epochs, the improved optimal model could achieve an accuracy of over 85%. Moreover, the final average identification accuracy reached 95.37%. Contrast experiments indicate that color and background features may influence the recognition effect. The improved model can extract disease information from different scales in the feature map to identify diverse diseases of different crops. The proposed model has faster training speed and higher recognition accuracy than the traditional model, and thus it can provide a reference for crop disease identification in actual production.
Keyword-CNN, Texture, classification, Caffe framework, AlexNet

I. INTRODUCTION

This Crop diseases [[1]] are the main factors affecting agricultural development. The yield and quality of agricultural production are closely related to the occurrence area and harm the degree of crop diseases. Although modern chemical pesticides can effectively control crop diseases, different crops have diverse diseases. Farmers identify crop diseases relying on visual observation and experience, which is prone to misdiagnosis and easily leads to the misuse of pesticides. Therefore, it is of great significance to help farmers diagnose crop disease types timely and accurately [[2]-[4]]. To solve the problem, experts and scholars have been working to develop a method [[5], [6]] that can automatically, quickly and accurately identify a variety of crop diseases.

The continuous development of computer technology has provided good support to extend the related research and application of image processing [[7], [8]] in the field of agriculture. In recent years, many types of research based on computer vision technology have been used to identify crop diseases. Tellaeche et al. [[9]] studied the issue of weed disease identification among the fields. According to the principle of the orderly arrangement of weeds among the fields, they used the Hough transform method and regional marking method to identify weeds between crops in different observation angles and spaces. Liu et al. [[10]] firstly applied the fast independent component method to removing random noise of the disease images, then extracted the colour and texture features of the disease persimmon surface image. Finally, the support vector machine (SVM) was used to identify and classify the diseases on the persimmon surface. Bankar et al. [[11]] trained the dataset of healthy and sick samples, then classified plant diseases according to edge detection and histogram matching methods. Ma et al. [[12]] firstly segmented the lesion image, then extracted 25 features including colour, texture and shape features, and constructed an SVM classifier based on radial basis kernel function, which accurately identified downy mildew of cucumber, with an accuracy of 90%.
Most researches in the above literature are based on image feature extraction and traditional instructed algorithms to identify crop diseases. Although these methods have a good recognition effect for specific crop diseases, the characteristics such as colour and texture sometimes do not reflect the disease information well and the recognition effect is weakened. In addition, the processes of image pretreatment and feature extraction require artificial selection and calibration, which consume a lot of time and energy. It is not conducive to the promotion and application of disease identification methods. Another problem is that the identification of these research methods focuses on limited kinds of crops and diseases. In the actual production, farmers who

grow different crops usually need to diagnose various diseases, so the above methods are perhaps not effective for different demands.

In recent years, deep learning has become a hot research pot in machine learning [[13], [14]] and has been successfully applied in many fields. Convolutional neural network (CNN) with strong ability to automatically extract features has been widely used in the field of image recognition [[15]-[17]], such as street scene recognition [[18]], face recognition [[19], [20]], object detection [[21]] and image segmentation [[22], [23]]. Meanwhile, CNN has been applied in the agricultural field to detect and identify crop diseases. Dyrmann et al. [[24]] trained a typical CNN model and successfully identified 22 species with a classification accuracy of 86.2%. Lu et al. [[25]] identified ten common rice diseases using a novel method based on the CNN technology, with an average recognition accuracy of 95.48%. Cheng et al. [[26]] constructed a deep residual learning model to identify ten crop pest images in the complex background and achieved an accuracy of 98.67%. Too et al. [[27]] studied crop disease identification using a method of fine-tuning existing deep learning models.

The above researches are sufficient to show that the recognition methods based on deep learning, especially CNN, are effective in the field of agriculture. However, there exist some defects and difficulties in the above researches, involving the recognition rate are higher for specific samples under certain circumstances. In the diagnosis model, some parameters are not optimal and the convergence speed of the training algorithm is slow. The purpose of this study is to construct an improved CNN-based model to achieve fast and accurate automated recognition of crop leaf disease images.

In this paper, we refer to some new developments [[28]] in the field of deep learning, and propose an improved disease recognition model combined with dilated convolution and multi-scale feature fusion structure (Inception module). The improved model is trained to identify 38 different classes, including diseased and healthy crop leaf images. The recognition effect of improved model is compared with that of the traditional AlexNet [[29]] model. Based on the above works, the improved model is also trained via the grey-scaled dataset as well as segmented dataset corresponding to the raw images. Therefore, the influences of colour features and background noise on disease identification methods can be explored. The core motivation of this paper is to provide a reference for developing a crop disease identification system which is suitable for farmers by using a common digital camera.

Our main contributions can be summarised as follows: (i) We propose a CNN framework based on AlexNet for the identification of various crop diseases in the agricultural field.

(ii) An inception module combined with dilated convolution is proposed to obtain a larger receptive field and extract multiple features.

(iii) The influence of background and colour features on the recognition results is explored.

II. MATERIALS

Plant Village Project (www.plantvillage.org) is an open-source database for diagnosing crop diseases. It aims to enrich images of the database and use the database to solve problems related to plant diseases. The database contains diseased and healthy leaf images of various crops. This study uses 54,105 leaf images collected by the Plant Village Project as an experimental dataset, with 26 diseases for 14 crops and healthy leaves of some crops. Several typical images are shown in Fig. 1.

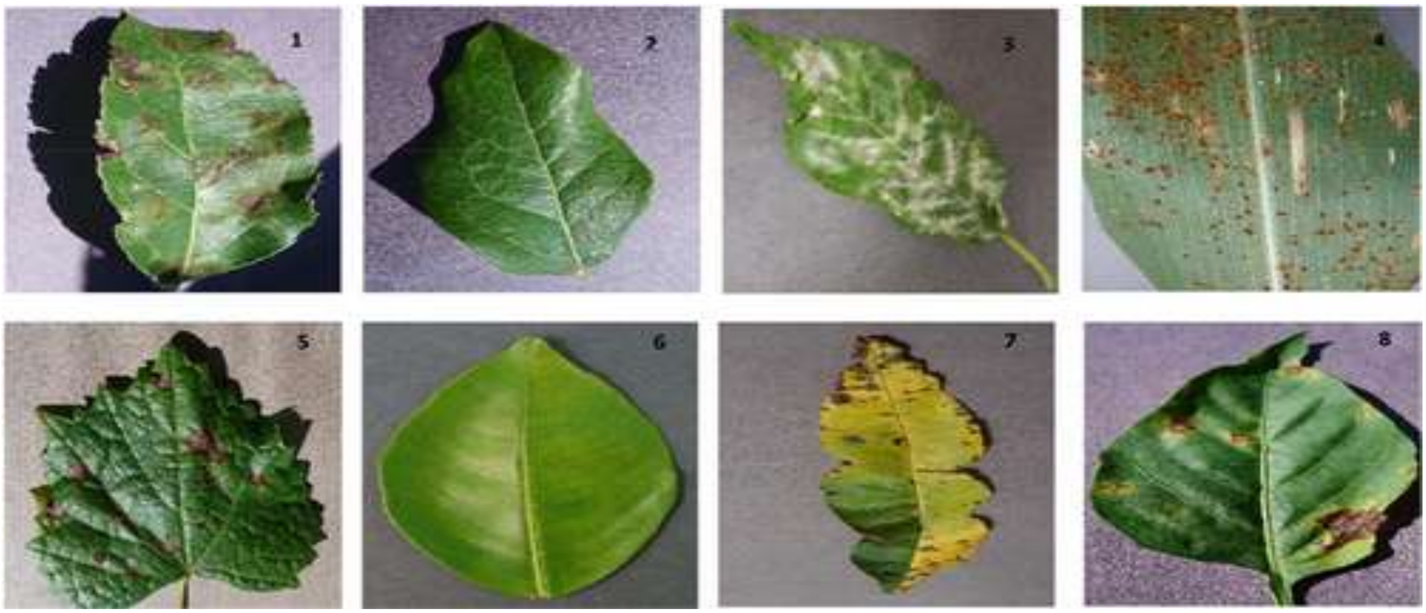

Fig. 1

Open in figure viewer PowerPoint

Raw crop leaf image. Note: Label 1 is apple scab leaf. Label 2 is blueberry healthy leaf. Label 3 is cherry powdery mildew leaf. Label 4 is corn grey spot leaf. Label 5 is grape black rot disease leaf. Label 6 is orange yellow dragon disease leaf. Label 7 is peach bacterial spotted disease leaf. Label 8 is pepper bacterial spotted disease leaf

We counted the total number of images and different samples, as shown in Table 1. It was found that the number of samples ranged from 152 to 5527, and the distribution was seriously unbalanced. This problem may lead to deviations in the identification and classification of various diseased leaves, which will affect the final recognition accuracy of the model. In order to balance the distribution of different types of images, the data augmentation procedures were conducted:

(i) Flipping the image from left to right;

(ii) Flipping the image from top to bottom;

(iii) Rotating the image by random angle;

(iv) Enlarging the original image randomly. In addition, images of corresponding classes were downloaded from the Internet to supplement the dataset. As for the classes with a large number of images, some original images were retained by eliminating method.

Table 1. Information of the database images

Class	Crop name	Disease name	Images number
0	apple	apple scab	630
1	apple	black rot	712
2	apple	cedar rust	276
3	apple	—	1835
4	blueberry	—	1735
5	cherry	—	854
6	cherry	powdery mildew	1052
7	corn	grey leaf spot	1457
8	corn	common rust	1610
9	corn	—	2450

The number of images of the training set and test set in the original dataset is 43,424 and 10,681, respectively. After data augmentation, the number of images of each class is about 2000, and the total number of expanded images is 76,000. The expanded dataset is further divided into a training set and test set according to the ratio of 4:1. The training set and test set contain 60,800 and 15,200 images, respectively. Finally, the dataset is labelled as 0–37 by category and the images are resized to 256×256 pixels. Comparison experiment is carried out based on different versions of the dataset provided by PlantVillage project to explore the influence of colour feature and background information on identification results. Fig. 2 shows the different versions of the same leaf for a randomly selected set of leaves.

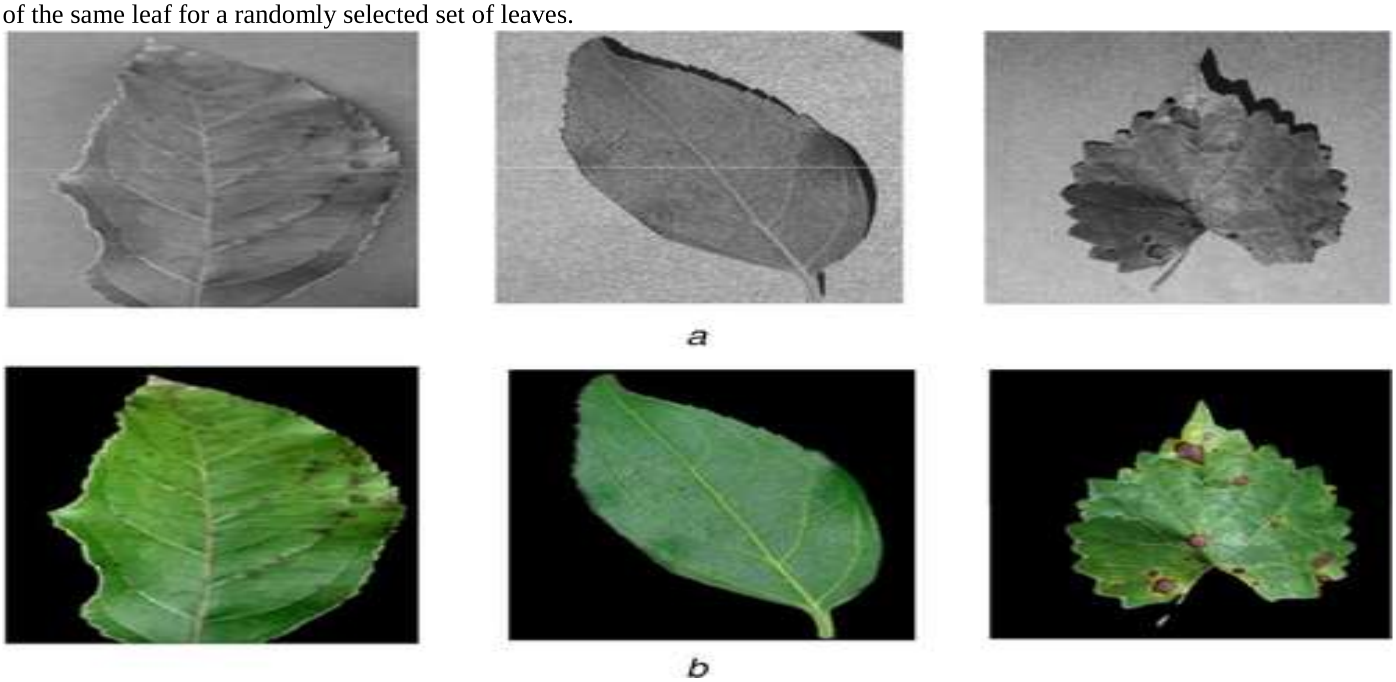

Fig. 2

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Sample images from the two different versions of the Plant Village dataset

Architecture of crop disease identification model

The traditional CNN architecture mainly includes convolution layers, pooling layers and fully-connected layers. The convolution layer is used to extract features from the images, the pooling layer is used to reduce the amount of data, and the fully-connected layer is used to connect the neurons between the layers. As a classic CNN architecture, the AlexNet model has made a major breakthrough in image recognition tasks. However, the convolution kernel size (11×11) of the first layer is large and the fully-connected layer is used in the network. This leads to problems such as slow iterative training and single feature scale, which make the model difficult to play a role in practical applications. For these limitations, this paper draws on the latest research progress and the original AlexNet made three improvements:

(i) using the global pooling layer instead of the fully-connected layer to improve the iterative training speed;

(ii) adding the inception module to the network to extract features of various scales; and

(iii) combining different scales of dilated convolution in the inception module to increase the receptive field.

III. INCEPTION MODULE

The 'Inception module' first appeared in the GoogLeNet proposed by Szegedy et al. [[34], [35]] and then there were multiple versions of Inception vN (where N is from 1 to 4 for the number of versions). The CNN-based architecture in this paper is combined with Inception v2. Before the advent of GoogLeNet, experts and scholars had been working to increase the depth and width of the network. Although the network architecture seemed to be more abstract, it caused problems such as too many

parameters, slow iteration training and over-fitting. For the sake of reducing the parameters and speeding up the model training while increasing the depth and width of the network, the inception module came into being.
In a nutshell, the inception structure introduces modular function into the traditional CNN architecture, which is mainly composed of convolutional layers and pooling layers. The sizes of convolution kernels are usually 1 × 1, 3 × 3 and 5 × 5. Diverse sizes of convolution kernels are used in the inception module to capture features of different scales, which is quite different from the traditional network architectures. Combining these features together will result in better classification results than using a single-size convolution kernel. Another significant advantage of inception module is the use of 1 × 1 convolutional layer before and after the convolutional and pooling layers, which effectively reduces computational requirements.

A. ARCHITECTURE OF IMPROVED MODEL

The proposed model architecture is presented in Fig. 4. The structure removes the fully-connected layer in the original AlexNet and replaces it with a global pooling layer. Also, an inception module is connected after the pooling layer 4 to extract high-dimensional features of different scales. Meanwhile, the dilated convolution combines with Inception module to increase the receptive field of high-level feature maps. The improved model architecture consists of eight convolutional layers (Conv1—Conv5, the inception module uses a parallel combination of 1 × 1, 3 × 3, and 5 × 5 convolutional layers), one Concat layer and five pooling layers (pooling 1–global pooling 5, the inception module includes one pooling layer). The output layer uses Softmax classifier to get 38 labels (not shown in Fig. 4).

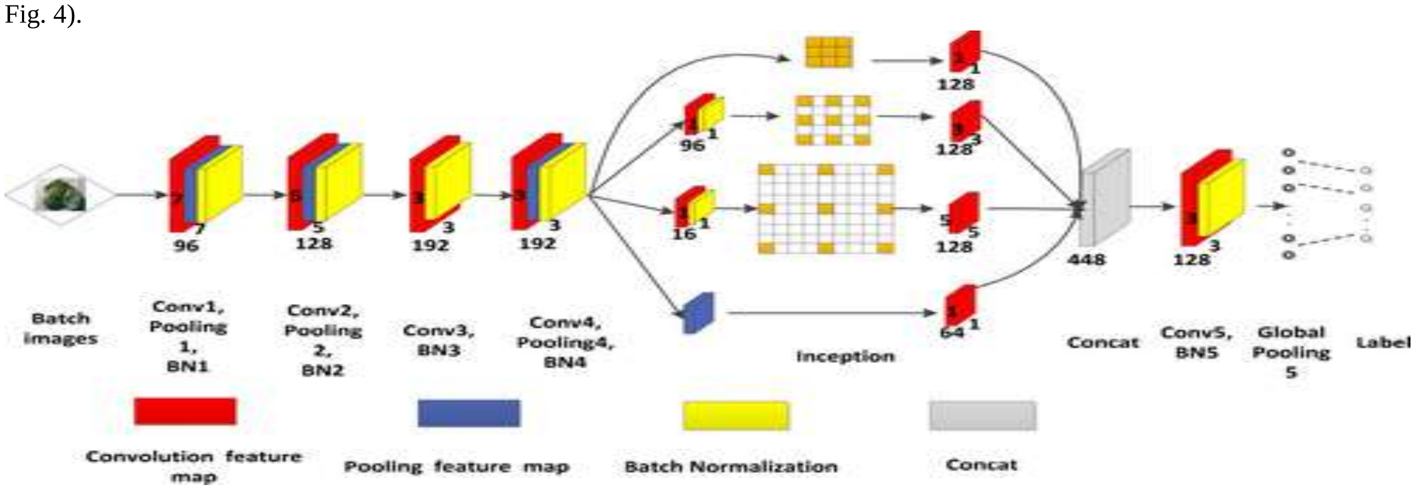

Fig. 4

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Architecture of improved model in this paper

The main relevant parameters of the improved model architecture are summarized in Table 2. The size of the input image is set to 256 × 256 × 3 according to the experience, which can be divided by 2, and computing capability of the computer. The convolution kernel size of Conv1 layer directly affects the extraction of low-level features. The commonly used convolution kernel sizes are 11 × 11, 9 × 9 and 7 × 7, and the Conv1 layer convolution kernel size is set to 7 × 7 in our architecture. The other convolution kernel sizes are shown in Table 2. The sizes of the first layer of convolution kernels in the Inception module are all 1 × 1, and the size of the second convolution kernel is 1 × 1, 3 × 3, 5 × 5, respectively. The number of convolution kernels of Conv1, Conv2,. …, Conv5 are 96, 128, 192, 192, 128, respectively; the number of convolution kernels of the first layer and the second layer in the inception module is 96, 16, 128, 128, 128, 64, respectively.

IV. MODEL TRAINING

Model training is the most important step in the experiment because training the appropriate model can improve the classification accuracy. This paper uses different datasets to train the improved CNN to obtain different models, for the purpose of comparing the classification effects of each model. Although the training sets of each model are different, the experiment mode and hyper-parameter configuration of this paper are standardised to ensure the validity of the experiment. The experimental setup is shown in Table 3, using Caffe as a deep learning framework, and GPU acceleration module is used to improve the training speed.

Proper parameter setting is very important during CNN training. We trained the networks with the Batch size of 64, 128 and 256 in different experiments. Each of the experiment ran for a total of 50 epochs where the epoch was the number of training iterations. The training mechanism used in the model is stochastic gradient descent (SGD), which [[36]] is the same training mechanism used in the original AlexNet. It ensures that the improved CNN framework can be compared with the original AlexNet objectively. This optimisation algorithm is currently widely used in deep networks; it runs faster and converges easily [[37]]. The learning rate was set to 0.01 for all networks. To prevent over-fitting, the weight decay was set to 0.0005, and the learning rate was gradually reduced to 0.1 (gamma) times in stages. Due to the GPU memory constraints, the step size was set to 9000. The loss function used in the model is the softmax-loss function. The loss function used in Caffe is determined by the last layer of the classifier. Since the last layer of the network is softmax classifier (mentioned in Section 3.4), the use of softmax-loss makes it more stable in computing. Other parameters used the default parameters of the Caffe framework.

V. RESULTS AND DISCUSSION

Across all our experiments, we used the augmented dataset and three different versions of the whole PlantVillage dataset to train the network. Considering that different parameter settings will affect the performance of the model, this paper also compared the impact of the global pooling type, batch size and other parameters on the accuracy of disease identification, and then optimised the model. Finally, we got an optimal model which was expected to achieve automatic, fast and accurate identification of crop diseases.

As shown in Table 4, the inception module and dilated convolution improve the performance remarkably. Compared with the baseline AlexNet, employing inception module yields a result of 97.93% in AA, which brings 1.52% improvement. It indicates that inception module can extract the disease characteristics at different scales on the surface of diseased leaves. Due to the different sizes of the lesions on the surface of the diseased leaves, the inception module brings benefit to disease identification. Meanwhile, employing dilated convolution individually outperforms the baseline by 1.16%. This shows that the increase of receptive field contributes to disease identification. When we integrate the inception module and dilated convolution together, the performance further improves to 98.44%. Results show that the proposed architecture, combined with inception module and dilated convolution brings benefit to crop disease identification. Based on the above experiments, the subsequent experiments are conducted to obtain a suitable recognition model.

Effects of global pooling type on model performance

Due to different settings, six improved models were obtained in our experiments. Classification accuracies of diverse models are summarised in Table 5. As described in Section 3.1, global pooling includes global average pooling and global maximum pooling. In our experiments, models 1, 3, 5 use global maximum pooling, and models 2, 4, 6 use global average pooling. It can be observed from Table 5 that using global average pooling gets better results than using global maximum pooling. For example, the accuracy of Model 2 is 0.5% higher than that of Model 1, training on the original dataset. We suppose that global average pooling averages the pixel values of the entire feature map. It could make full use of the information and effectively reduce the estimation error caused by the domain constraints. In contrast, the global maximum pooling can only retain the low-level texture feature. Therefore, the deep feature information is lost, which results in lower recognition accuracy. However, we are not sure that the global average pooling is always the best option, since different classification tasks may have various suitable configurations.

Table 5. Classification accuracies with different parameters during diverse experiments

Model number	**Model**	**Model parameter**		**Accuracy, %**	
		Global pooling type	**Batch size**	**Original image dataset**	**Augmented image dataset**
0	AlexNet model	–	64	96.41	97.62
1	improved model	maximum pooling	64	97.13	98.56
2	improved model + segmented dataset	average pooling	64	97.63	98.93
3	improved model + grey-scaled dataset	maximum pooling	128	98.26	99.25

Effects of batch size on model performance

It can be seen from Table 5 that the global average pooling contributes to the performance of models. In order to further optimize the model, the batch size is taken into consideration during the experiments. The batch training method is used to train the network model in experiments, and the training set is divided into several batches. In Table 5, the best accuracy 99.37% is got by the improved model combining with batch size 128 and global average pooling (Model 4). Compared with other models, employing batch size 128 yields better results in AA. Thus, it is supposed that the batch size 128 is quite effective in this work.

In the case of deep learning, if the dataset is enough, the gradient calculated from half of the batch data (even more less) is almost the same as that from all the dataset. Thus, increasing the batch size within a reasonable range might effectively improve the computational efficiency of matrix multiplication and reduce the number of iterations. However, compared with Model 3, employing batch size 256 (Model 5) yields a result of 96.25% in AA, which causes 2.01% loss. Thus, improving batch size blindly may be getting the opposite results. The memory utilization is increased, yet the memory capacity may not meet the calculation requirements. In addition, as the batch size increases, the number of iterations required to train a full dataset is reduced. To achieve the same accuracy, the time it takes is greatly increased, and the correction of the parameters becomes slow. As a result, the accuracy stops rising if the batch size is increased to a certain extent.

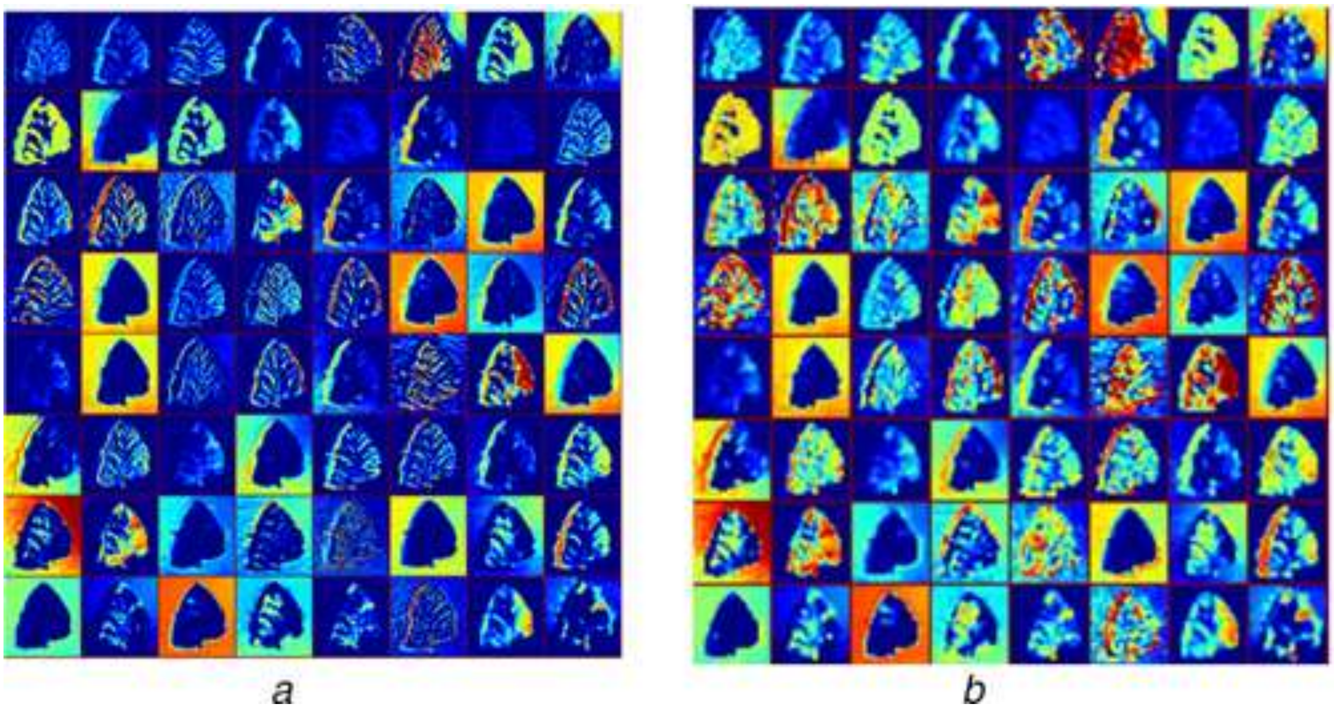

Fig. 6

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Convolution kernel visualizations of the higher layers

Effects of background and colour on model performance

Identification model	**Accuracy, %**	**Loss value**
improved model + raw dataset	98.45	0.056
improved model + augmented dataset	**99.37**	**0.023**
improved model + segmented dataset	98.83	0.042
improved model + grey-scaled dataset	96.73	0.111

The later experiment is compared to the experiments with the raw dataset and augmented dataset. The recognition model trained on augmented dataset performs the best, with the highest recognition accuracy of 99.37% and the lowest loss of 0.023. As expected, the performance of the recognition model obtained from training grey-scaled dataset is significantly lower than that of the experiments on the other version of the datasets, but still achieves the accuracy of 96.73%. It indicates that the improved CNN-based model has learnt to extract colour features and the lack of colour features (especially green) in the image would affect the final recognition accuracy. Compared with the model trained on the raw dataset, training on the segmented dataset yields a result of 98.83% in accuracy, which brings 0.38% improvement. We suppose that the model which trained on the segmented dataset can investigate the role of the background of the images in overall performance. Thus, the redundant information and noise introduced during model training might be reduced to increase the final accuracy.

To further verify the convergence effect of the four recognition models, the relationship between accuracy and epochs is illustrated in Fig. 7. It is obvious that after only ten training epochs, all models start to converge. Meanwhile, after 25 training epochs, all models have converged and the test accuracy of the four models can reach over 95%. Besides, it can be found from Fig. 7 that the recognition model based on the segmented dataset and the raw dataset has a convergence speed close to each other, and the final recognition accuracy has little difference. On the one hand, it can be concluded that a small amount of redundant information introduced from the simple background has little effect on the recognition effect of the model. On the other hand, if the background is complex, a better classification model is likely to be obtained by training the images which segment the background.

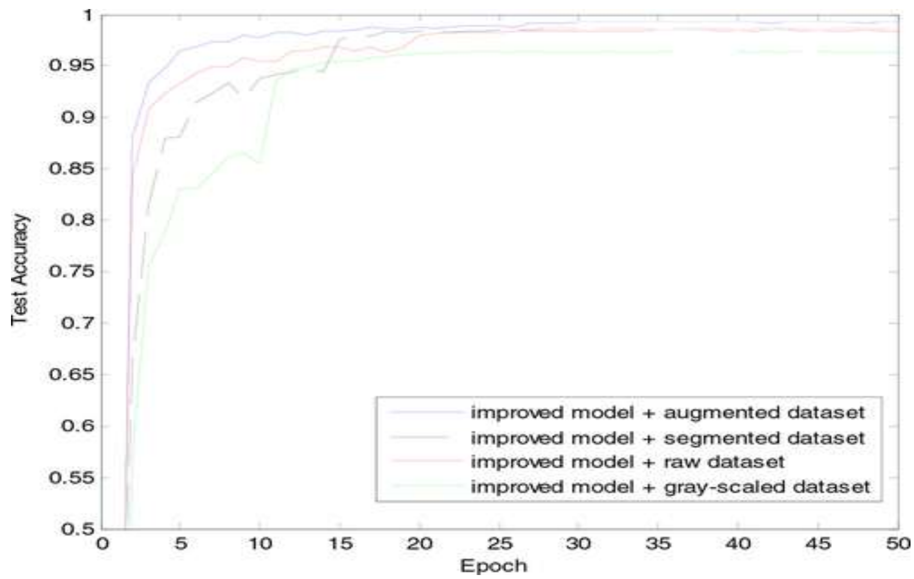

Fig. 7 Open in figure viewerPowerPoint

Relationship between test accuracy and epoch

Results compared with other studies

Table 7 shows the best results obtained in this study, compared with other studies that previously classified diseases using computer vision and deep learning. The last column shows the classification accuracies when the methods are trained and tested on our dataset with 38 classes. The classification accuracy of this study is higher than that of other studies. Overall, deep learning methods perform better than traditional computer vision methods.

Table 7. Comparison of classification accuracies from previous crop diseases identification studies

Studies	**Number of diseases/ crops**	**Method/model**	**Original classification accuracy, %**	**Classification accuracy on our 38 classes, %**
Ma *et al.* [[12]]	1	shape and colour features, SVM	90	—
Girish and Bardar [[35]]	3	colour and area features, BPNN	92	—
Lu *et al.* [[25]]	10	typical CNN model	95.48	96.86
Jayme [[36]]	10	GoogleNet	96.00	98.24
current study	38	improved CNN-based model	99.37	99.37

VI. CONCLUSION

In this paper, CNN is applied to the identification of many crop diseases. Traditional AlexNet model is improved by combining the inception module with dilated convolution. Then the proposed model is trained to identify many crop diseases and is able to effectively classify 26 crop diseases and 12 healthy crops through images recognition. The improved model could extract disease features of different scales and increase the receptive field of the network compared with the original AlexNet model, and therefore the final average recognition accuracy reached 99.37%. In addition, the higher convergence rate of the model is obtained.

After only two epochs of training, the accuracy of the improved model is over 95% and the loss value is only 0.023. The contrast experiments based on the segmented dataset and grey-scaled dataset also verify that noise in background and colour features maybe have an impact on the recognition effect, which provides valuable support for further improvement of the recognition method.

The results show that the improved CNN-based model trained on augmented dataset has good adaptability and robustness to image spatial position changes. Our optimal model can identify different diseases of multiple crops. We hope and believe that the research and observations of this paper will provide help for disease identification of crops in actual production. In future work, we are supposed to apply and improve other deep CNN-based architectures and train the model with images of more complex background.

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INTERACTIVE CONTEXT FOR A REVIEW ON MEDICAL STORE WEBSITE

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Abstract— For medical shops, a website called Medical Shop Management System was created. This system deals with the buying, selling, and storage of pharmaceuticals as well as the creation of deal checks, expiration dates, and monuments related to medications. When every step is done by hand, more time and effort are needed. The real-time design of the Medicine Store Management System will be helpful to those who lack the time to visit an offline retailer. The customer must first provide the required information for enrollment in order to place an online order for the desired medication. The client's name, correspondence ID, phone number, username, word, and confirm word are required fields for enrollment. The username and password from the enrolling process are then required to access your account. additionally, the requested medication is up to the client to choose. We can also cancel an order once it has been validated. This specific project addresses the challenges associated with running a medical supply store while avoiding issues that arise from manual labor. The Medical Management System is a Windows-based software intended for patient record registration, management, and convenient access. In a hospital or clinic, the system will let the register, physicians, and lab technicians maintain and manage patient records for simpler access and reference. All of these tasks are routinely completed and would be laborious for the staff if completed by hand. For this reason, clinic and hospital staff requires effective management software that is simple to use and won't add to their workload.
Keywords: - Medical, customer,medicines,stores,delivery,management.

I. INTRODUCTION

To manage their data, a medical supply store has hired us to create a database. We will oversee their store, visitors, etc.As we can see, there are many medications available nowadays, and medical supply stores can be found all over the place. It is quite important to save their records. In order for them to understand the significance and nature of the pharmaceuticals they possess, we are providing them with a database. The slip's record can also be accessed via this database. We're providing a database, as we've mentioned in the description, so they can save the record in every manner. The medical store owners will be able to save the medication results after we provide them access to the database. possess in their shops. They can also produce the invoices.

Medical stores can manage their paperwork, payment information, and force online with simplicity thanks to the medical store operating system, which also helps them reclaim them. We additionally provide countless clients with online medicine delivery. It benefits clients who sell medications such as blood pressure, diabetes, and thyroid. For elderly people, home delivery is quite helpful.

The Medical Store Management System's primary goal is to replace the existing manual system with sophisticated software and automated instruments. The goal of this automated system is to effectively store and manage medical stores' important data and information in order to satisfy their requirements.

Through the use of widely accessible and intuitive hardware and software, the system may provide error-free, secure, dependable, and quick administration capabilities.

With this system in place, users won't have to worry about tedious record-keeping duties and can concentrate on their main duties. As a result, the company may preserve digitized records without needless duplication and maximize its resource use. It is simple to obtain important information without being sidetracked by other facts. The ultimate objective is to automate the process in order to improve performance and give clients better services.

Medical supply stores are currently searching for services that can offer staff and customers accurate and dependable care. Every retailer is working to computerize their processes in order to give their clients superior services. The system utilized for medicine stock inventory in medical stores is called the medical store management system. The store manager can keep track of and oversee every activity in the medical shop thanks to this system.

This system also makes it possible for the medical store's staff to provide their services in a way that is more methodical and efficient, which enhances the medical shop. This aids in the analysis of the store's success as well. The daily operations of the medical store, including tablet information, billing, stock details, and more, may be organized with the help of the medical store management software. The medical shop management software makes it possible to keep track of the information about the stock that the store purchases and the information about the stock that is sold to customers (Hull, 2012).

This program creates automated bills for each transaction and reports on sales, inventory, and customer information. The medical store's inventory management takes less time and effort when this approach is used. It also lessens the labor-intensive process of maintaining records on paper. The managers may quickly record their suppliers' details and evaluate them as needed by using this system.

Because the medical store management system gives information about medications and where they are located throughout the store, it increases employee productivity. Medical stores can handle their paperwork, payment information, and inventory online more easily with the help of the medical store management system.

In times of peace, war, and operations other than war (OOTW), medical services play a critical role in the logistic support system of every nation's armed forces.
It will be understood that competent management of medical stores—which includes, but is not limited to, the arsenal of pharmaceuticals and expendable and non-expandable goods of medical use—is vital to the provision of complete healthcare. This makes it an essential part of any organized medical care, whether it's provided by the military or the general public. The seamless and appropriate operation of the medical supplies department determines the efficacy and efficiency of healthcare delivery in a hospital context.

Inventory and warehouse management are the two main facets of medical store management. Healthcare managers must keep a close eye on employee performance, and practical considerations demand that hospital hierarchy and system communication be optimized as a core component of logistics management programs.

II. LITERATURE REVIEW

1. ERP for Medicine

Medical pharmacy operation software will assist pharmacists in efficiently managing their pharmacies as well as purchases, returns, trades, short items, clients, and overall business. The fully automated medicine drugstore operating software will lessen the workload for pharmacists and boost revenue.

2.Meddoz

Meddoz makes medical billing, reporting, and handling simple. Utilize Meddoz's suite of efficient operation and reporting modules to maintain control over your pharmacy's daily operations. Utilize a single touchpoint to handle accounts, agreements, charges, and complaints.

3. Medeil

Meddoz is Meddoz makes medical billing, reporting, and handling simple. Utilize Meddoz's suite of efficient operation and reporting modules to maintain control over your pharmacy's daily operations. Utilize a single touchpoint to handle accounts, agreements, charges, and complaints (3).

4. Hari Om Medical and General Store in Vairag, Solapur

One of the top pharmacies in Solapur is Hari Om Medical and General Store. Veterinary druggists, druggists, Ayurvedic Medical Shops, Chemist Home Delivery, Ayurvedic Product Dealers, and Ayurvedic Medicine Retailers are among the other well-known industries. For greater import and commerce. Chemists are involved in our life when we are ill. Offering almost every form of medication, they have been many people's lifeline. Apart from medications, they also sell skin care and cosmetic items. There are druggists, also known as druggists, positioned all around the megacity. Several of them regularly collaborate with large corporations and medical facilities. On the other hand, if you would like to speak with Hariom Medical and General Stores in Vairag, Solapur need a pill for your first aid kit or wish to purchase the medication that your croaker has recommended. They are highly regarded in Solapur offers a range of services, such as home delivery and products available (4).

5. Vairag, Solapur's 5 Kailash Medical and General store

One of the top pharmacies in Solapur is Hari Om Medical and General Store. Additionally Recognized for Chemists, General Store, Elder, Vicks, Mentho Plus, Balm Dealers, Balm Dealers -Zandu, and a host of other items.Find Kailash Medical and General Store's address, phone number, reviews, ratings, photos, and map in Solapur.

When it comes to our health, chemists are quite important.Their provision of nearly all types of medications has made them indispensable to numerous individuals. They sell skin care and wellness goods in addition to medications. Pharmacists, another name for chemists, can be found all around the city. Some of them frequently have connections to prominent doctors.

6. Sant Damaji Medical Store, Solapur, Mangalwedha

Chemists are important people in our lives when we are sick. Their provision of nearly all types of medications has made them indispensable to countless people.They sell skin care and wellness goods in addition to medications.Pharmacists, another name for chemists, can be found all around the city.Many of them have connections to major medical facilities and physicians.
Sant Damaji Medical Store is located in Mangalvedha Solapur, Solapur, and is the place to go if you need medication for your first aid kit or to purchase medication that has been prescribed by your doctor.They are well-known in Solapur for offering a range of services, including home delivery, same-day delivery, and in-store pickup.

7. SAI Medical Solapur, Mangalwedha, Solapur

Chemists are important people in our lives when we are sick. Offering practically every form of medication, they have come to be seen as many people's lifeline. They sell skin care and wellness goods in addition to medications. Pharmacists, another name for chemists, can be found all around the city. Many of them have connections to major medical facilities and physicians. In case you require medication for your first aid kit or wish to get medication as directed by your physician, reach out to SAI Medical Store located in Mangalwedha Solapur, Solapur.

III. PROPOSED SYSTEM

The development of an upgraded facilities system is the goal of the suggested system.
All of the limitations of the current system can be overcome by the suggested system. The system minimizes manual labor and offers appropriate security.

1.data security.
2. Assure accuracy of the data.
3. Increased effectiveness.
4. Improved assistance.
5. Interactive and user-friendly.
6. The minimal amount of time needed.
7. The current system is being created with the intention of circumventing its limitations.
8. We included the medical store management system in the suggested system.
9. Verifying the existence of products and verifying billing is simple.
10. The administrator changes the medication list on a daily basis, and the customer's medical data is safe and secure.
11. It's for customer safety and to keep the record up to date.
12. It will be kept in the report module for viewing after billing.
13. A medication will be delivered to the delivery area in a minute.

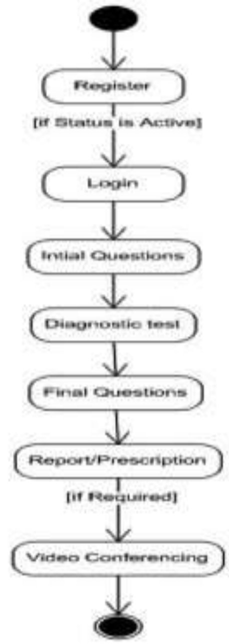

Fig 1. Proposed System Architecture [9]

IV. CONCLUSION

The driver now has a simple method to alter data in the database and communicate with it thanks to this approach. The driver can easily add, remove, and update records in the database. Working at a medical store is now a crucial and simple profession thanks to this program. This program keeps track of each client bill. Companies claim that it has purchased stock. A bill is automatically generated by this software. It provides extensive information regarding the stock sale. To put it succinctly, medicine has simplified people's lives. The name of this software is Medical Store Operation System. It offers all information, from little to major, including customer, purchase, vend, bill, and other details. The internet-based pharmacy is an online platform. that provide a means for customers to purchase prescription drugs online, enabling them to temporarily accept drug services in the convenience of their own homes.

The system was created and fasted gradually. Following user department clearance, the output reports' formats were determined one by one once the design was complete. The system was tested using test data initially, and later actual data. Small code mistakes were found and fixed. Following corrections, the system was effectively applied, and accuracy was discovered.Following testing, we have determined that our "Learning Management System" is very helpful to users and ideal for online mailing. We conclude that this is a real client/server environment that is accessible from anywhere in the world when it has been implemented. When compared to other automated systems, this one is quick.

With the help of this technology, an operator can easily interact with the database and modify its contents. The database's records are easily added, deleted, and updated by the operator. The work in a medical store is now lot easier thanks to this program. Every customer bill is logged by this software. Companies claim that it has purchased stock. A bill is automatically generated by this software. It provides extensive information regarding the stock sale. It is, in essence, a medical inventory that has simplified people's life. The name of this software is Medical Store Management System. It offers all information, from little to major, including details about customers, purchases, sales, bills, and more. The online system is a web-based medical store that offer a platform for online drug purchases, enabling customers to quickly get services or medications in the convenience of their own homes.

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A DECISION SUPPORT SYSTEM USING SENSOR-CLOUD BASED SMART AGRICULTURAL SYSTEM FOR SMART IRRIGATION SCHEDULING

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Abstract: This abstract introduces a decision support system that leverages sensor-cloud technology within a smart agricultural framework for intelligent irrigation scheduling. The proposed system integrates sensor data to make informed decisions, enhancing the efficiency of agricultural practices. Key components include real-time monitoring of environmental conditions, utilization of cloud-based computing for data processing, and smart irrigation scheduling for optimized water resource management. By employing this sensor-cloud-based approach, the decision support system aims to enhance precision and sustainability in agricultural irrigation, contributing to resource conservation and improved crop yields. This innovative system represents a significant advancement in smart agriculture, offering a practical solution for farmers seeking to optimize irrigation practices in response to dynamically changing environmental conditions.

Keywords: Sensor, Agricultural, cloud.

I. INTRODUCTION

In many regions, natural rainfall is either insufficient or unevenly distributed throughout the year. Irrigation becomes essential to supplement the water requirements of crops and ensure consistent moisture levels for optimal growth. Crops often have specific water requirements during different stages of their growth cycle. Irrigation allows farmers to provide water when needed, regardless of natural rainfall patterns or seasonal variations. Irrigation significantly enhances agricultural productivity by offering a controlled and reliable water supply.

This results in higher crop yields and allows for multiple cropping seasons, contributing to increased overall food production. Irrigation enables farmers to grow a wider variety of crops and plant them throughout the year. This diversification not only supports food security but also allows farmers to adapt to market demands and changing consumer preferences. Improving water use efficiency in irrigated agriculture necessitates the effective use of available water resources to address real-time crop irrigation issuesThe necessity to enhance water use efficiency has never been overemphasized throughout the research community and industry as it is presently. This requires monitoring water use and managing how irrigation water is applied. The aim of monitoring the crop environment in real-time is to control the root zone soil moisture.

In arid and semi-arid regions, irrigation in agriculture accounts for a significant portion of freshwater consumption. Agricultural sectors in these regions face challenges due to increased water demands combined with growing populations, insufficient water resources, and climate change-induced rainfall variability. To decrease water usage in agriculture, real-time smart irrigation technologies are needed. Along with improving crop yield and water productivity, smart irrigation can also reduce farming costs and minimize environmental impact.

Different irrigation scheduling techniques, such as evapotranspiration, water balance, soil moisture condition, and plant water condition techniques, have been employed in smart irrigation management. A combination of these scheduling measures promotes efficient crop irrigation and reduces water wastage. In several studies, evapotranspiration, soil moisture sensors, or plant-based smart irrigation technologies have been used to schedule irrigation events by considering weather conditions, soil moisture levels, and plant water status. A soil moisture-based approach is user-friendly and can be automated using various commercial instruments.

II. DESIGN METHODOLOGY

OUTLINES OF PROPOSED WORK:

IoT architecture and design

The overall architecture of the IoT-based smart drip irrigation system, shown in the figure, illustrates the system input received through the installed IoT device on the farm (soil moisture, soil temperature, ambient humidity, and temperature). Using the Wi-Fi

Module, soil moisture content, soil temperature, relative humidity, and temperature data are stored on an IoT platform every two minutes. This study established a Wi-Fi wireless communication network among the sensors, transmitters, cloud servers, solenoid valves, and the receiver unit.

Irrigation management

A real-time soil moisture status is used to operate the actuating pump and valves. Solenoid valves open when the soil moisture sensor threshold value reaches or exceeds the soil moisture depletion of field capacity. When the soil moisture content reaches the field capacity of the soil moisture sensor, the solenoid valves are closed. A server is used to store continuous volumetric soil moisture data.

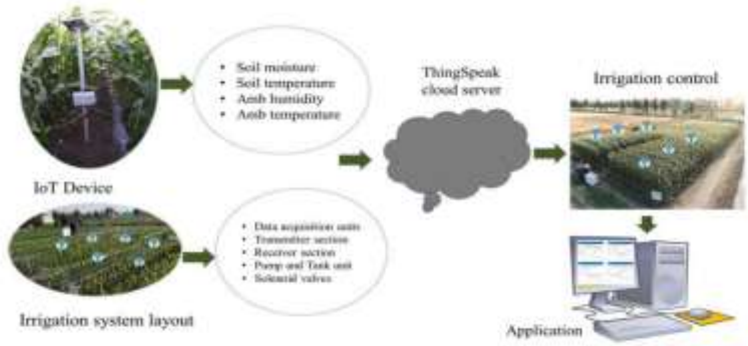

Fig. __ Overall architecture of IoT based smart drip irrigation system.

Suitable sensor positions:

Sensors were placed in sensitive and representative locations of the crop's root zone. Soil moisture or tension varies in three dimensions. Stieber and Shock Noticed that those dimensions included; variability in soil wetting from irrigation/rainfall, drying of soil from evaporation and root-zone water extraction for plant transpiration. Interactions of these dimensions were imperative for soil moisture sensor installation. According to Semimetal. soil moisture sensors should be placed at the top of the active root system, relative to drippers and the bottom of the root system; in every case studied, 11 cm between the drip line and 10 cm beneath the surface of the soil was deemed to be the most suitable position. In general, sensors placed deeper in the soil profile result in lower irrigation efficiencies, which leads to more frequent irrigation.

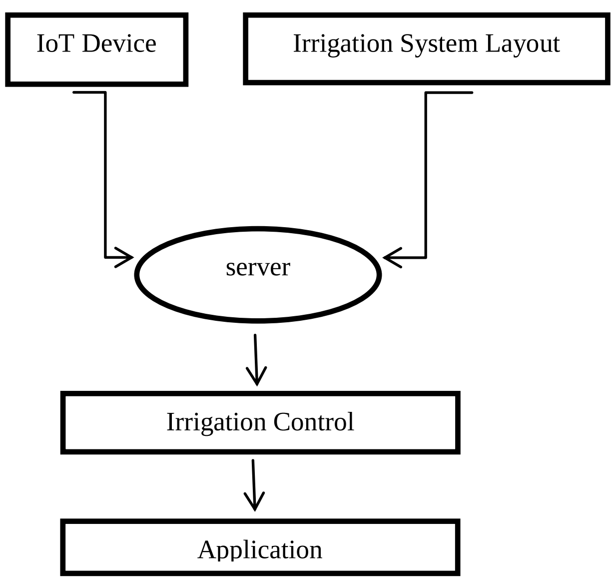

Fig. Algorithm

VI. PERFORMANCE

Soil moisture sensors were installed 10 and 15 cm in a clayey soil to help in irrigation control based on soil moisture content. This device uses Internet of Things technology to automate irrigation without the need of human interference. Soil moisture, temperature, and humidity sensors continuously track soil moisture, temperature and humidity levels in different parts of the agriculture farm. The moisture sensor sends the signal to the Wi-Fi module, which triggers the water pump and irrigates the field using the smartphone or computer application if the moisture level falls below the pre-defined value. The measured variables were continuously recorded automatically and sent to the cloud-based server. The developed data acquisition unit was switched ON and staked in the agriculture field. This device is directly linked to the IoT analytics platform web service to access and analyse live data in the cloud. The demonstration of soil moisture, relative humidity, soil temperature and ambient temperature values at various times is shown in figure. The field channel valves of each individual are controlled. When the value is 1, the motor is ON, and when the value is 0 in the IoT analytics platform the motor is OFF.

VII. CONCLUSION

In conclusion, the development and implementation of a decision support system utilizing sensor-cloud technology for smart irrigation scheduling represent a significant stride towards sustainable and efficient agricultural practices. The integration of real-time sensor data, cloud computing, and intelligent irrigation scheduling offers a comprehensive solution to address the dynamic nature of environmental conditions in agriculture. This system empowers farmers with data-driven insights, enabling them to make informed decisions regarding irrigation, leading to optimized water usage, enhanced crop yields, and resource conservation.

Furthermore, the incorporation of smart technologies in agriculture aligns with the broader goals of precision farming and environmental sustainability. The sensor-cloud-based approach provides a scalable and adaptable framework that can be customized to various crop types and geographical locations, fostering widespread applicability. By promoting precision irrigation, the system contributes to water conservation efforts, mitigates environmental impact, and supports the long-term resilience of agricultural ecosystems.

As agriculture continues to face challenges posed by climate change and resource constraints, the adoption of smart technologies becomes imperative. The decision support system outlined in this study not only addresses current irrigation inefficiencies but also lays the groundwork for future advancements in precision agriculture. As technology continues to evolve, the integration of sensor-cloud systems in smart agriculture is poised to play a pivotal role in fostering sustainable practices, improving agricultural productivity, and ensuring food security for a growing global population.

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AN OVERVIEW OF BLOCK CHAIN TECHNOLOGY

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Abstract: The Blockchain is the newest and perspective technology in ultramodern frugality. A blockchain is basically a distributed database of records or public tally of all deals or digital events that have been executed and participated among sharing parties. It provides provenance, invariability and futurity for the transfer of value within a business network. - It enables value exchange in real time, reducing costs and crimes. Grounded on a network agreement approach, whereby trust between the parties involved in a sale is handed by cryptography. This paper aims to show brief overview of Blockchain Technology, operations and have bandied limitations in the perspective of unborn exploration on security in revolutionary sale.
Keywords*:* Digital transaction, encryption, cryptocurrency, cryptography, network security.

I. INTRODUCTION

This A blockchain is just one type of distributed tally, not all distributed checks inescapably employ blocks or chain deals. The blockchain is an imperishable digital tally for keeping track of profitable deals which can be programmed to maintain not only fiscal deals but nearly everything that has value." Don & Alex Tapscott, authors Blockchain Revolution 2016. A blockchain (firstly two- words block chain) is a continuously growing list digital records in packages (called blocks) which are linked and secured using cryptography. These digitally recorded "blocks" of data are stored in a direct chain. Each block in the chain contains data (e.g. bitcoin sale), is cryptographically hashed, and time stamped. The blocks of hashed data draw upon the former- block (which came before it) in the chain, icing all data in the overall "blockchain" has not been tampered with and has not been altered.
A blockchain is a chain of chronological blocks. A block is an added up set of data that's collected and reused to fit inside it through the process of mining. Each block is linked via a cryptographic hash and timestamp. When a new block is formed, it'll contain a hash of the former block, so that blocks can form a chronologically ordered chain from the first block ever generated in the entire blockchain (also called the Genesis Block) to the recently formed block. This process is repeated over-and-over again to grow and maintain the network. Now this means that this decentralized tally isn't controlled by any fiscal institution or government for that matter.
In fact, it can be penetrated by everyone who has a good internet connection. Other than virtual currencies, there are numerous companies similar as messaging apps, critical structure security, lift sharing, pall storehouse, etc. are employing the power of blockchain technology.

II. APPLICATION OF BLOCKCHAIN

A blockchain is just one type of distributed tally, not all distributed checks inescapably employ blocks or chain deals. The blockchain is an imperishable digital tally for keeping track of profitable deals which can be programmed to maintain not only fiscal deals but nearly everything that has value. Don & Alex Tapscott, authors Blockchain Revolution 2016. A blockchain (firstly two- words block chain) is a continuously growing list digital records in packages (called blocks) which are linked and secured using cryptography. These digitally recorded "blocks" of data are stored in a direct chain. Each block in the chain contains data (e.g. bitcoin sale), is cryptographically hashed, and time stamped. The blocks Blockchain technology offers the implicit to impact a wide range of diligence. The most promising operations live where transferring value or means between parties is presently clumsy, precious and requires one or further centralized association.

a) Financial Services

Several stock exchanges around the world are piloting a blockchain platform that enables the allocation and transfer of private securities. also, multiple groups of banks are considering use cases for trade finance, cross border payments, and other banking processes. Consumer and artificial.

b) Consumer and Industrial Products

Companies in the consumer and artificial diligence are exploring the use of blockchain to digitize and track the origins and history of deals in colourful goods.

c) Life lores and Health Cara

Healthcare associations are exploring the use of blockchain to secure the integrity of electronic medical records, medical billing, claims, and other records.

d) Public Sector

Governments are exploring blockchain to support asset registries similar as land and commercial shares.

e) Energy and resources

Ethereum is being used to establish smart- grid technology that would allow for fat energy to be used as tradable digital means among consumers. Since all businesses track information and face the challenge of coordinating data with counterparties, blockchain technology has the implicit to be applicable to everyone.

There are still numerous unknowns with respect to how blockchain will impact the inspection and assurance profession, including the speed with which it'll do so. Blockchain is formerly impacting CPA adjudicators of those associations using blockchain to record deals and the rate of relinquishment is anticipated to continue to increase. still, in the immediate future, blockchain technology won't replace fiscal reporting and fiscal statement auditing. Checked fiscal statements are a foundation of business and play a crucial part in debt and equity backing, participation in capital requests, combinations and accessions, nonsupervisory compliance, and the effective and effective functioning of capital requests. Fiscal statements reflect operation assertions, including estimates, numerous of which cannot be fluently epitomized or calculated in blockchains. Likewise, the process of an independent inspection of fiscal statements enhances the trust that's pivotal for the effective functioning of the capital requests system. Any corrosion of this trust may damage an reality's character, stock price and shareholder value, and can affect in forfeitures, penalties or loss of means. Druggies of fiscal statements anticipate CPA adjudicators to perform an independent inspection of the fiscal statements using their professional scepticism. CPA adjudicators conclude whether they've attained reasonable assurance that the fiscal statements of an reality, taken as a whole, are free from material misstatement, whether due to fraud or error. Blockchains are doubtful to replace these judgments by a fiscal statement adjudicator. Still, CPA adjudicators need to cover developments in blockchain technology because it'll impact their guests' information technology systems. CPA adjudicators will need to be knowledgeable with the basics of blockchain technology and work with experts to inspection the complex specialized pitfalls associated with blockchains (12). In addition, CPA adjudicators should be apprehensive of openings to influence their guests' relinquishment of blockchain technology to ameliorate data gathering during the inspection. They should also consider whether blockchain technology will allow them to produce automated inspection routines.

The auditing profession must embrace and "spare in" to the openings and challenges from wide blockchain relinquishment. CPA adjudicators are encouraged to cover developments in blockchain technology because they've an occasion to evolve, learn, and subsidize on their formerly proven capability to acclimatize to the requirements of a fleetly changing.

III. BASIC FEATURES OF BLOCKCHAINS

Understanding how a blockchain works from a specialized point of view, is precious only to the extent of developing or troubleshooting one. In order cohesively grasp the eventuality unto apply blockchain technology; you must also understand the characteristics of a blockchain. It's important to note that not all characteristics listed below will apply to all blockchains. The below donation provides the necessary background to identify the crucial characteristics and principles of blockchains. These are the following

a) Privacy

Blockchains store no particular information and use private/ public encryption to authenticate druggies bearing deals. Mining blockchains to gain particular information that could be vended to third parties for a profit isn't doable.

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b) Translucency

All blockchain metadata and information is available to all bumps and druggies in real- time. It isn't possible to hide or redact blockchain information.51 Distributed translucency is therefore doable, but also introduces new issues.

c) Pseudo-anonymity

Bumps and druggies don't need to give names or particular details to be part of the network. still, full obscurity isn't achieved as linking druggies to network exertion is doable and can therefore lead to revealing their individualities.

d) Integrity

This works in two ways. First, data integrity it's nearly insolvable to change and falsify blockchain blocks. This is also called invariability. Second, stoner integrity metadata about the deals accepted by a knot and/ or end stoner are recorded on the blockchain and can be linked to the stoner bearing them. druggies can not wisecrack the network or try to complete an invalid sale.

e) Security

Use of blockchains requires cryptographic tools and public/ private keys by all actors, being bumps or end druggies.

f) Distributed trust governance

The blockchain successfully bypasses the need for a trusted central authority. rather, trust is spread across the network. The same goes for governance mechanisms where, in principle, different types of druggies and bumps have the same 'political' influence.

g) Sustainability

erected- in profitable impulses give a clear path for network profitable sustainability.

h) Open source

Software needed to use blockchains is freely available to all, including cryptographic tools. likewise, druggies with acceptable capacities can actually help enhance and upgrade blockchain technologies, in addition to catching bugs. This can also grease the spread of blockchain inventions.

IV. BLOCKCHAIN LIMITATIONS

The As an arising technology, blockchains face a series of limitations that might help wide relinquishment not only in the fiscal sector but also in other areas. These can be epitomized as follows:

a) Scalability

As it stands moment, Bitcoin blockchain can only add a new block of deals every ten twinkles or so. This translates into a low volume of deals per second (lower than five), a far cry from the volumes reported by traditional transactional networks.

b) Block size

The below is the result of the small block size defined by the original Bitcoin source law. The maximum size for each block is one megabyte which can accommodate 2,200 deals. adding block size is presently under discussion but so far no final decision has been reached.

c) High costs

Miner bumps use sophisticated and precious tackle to run evidence of work algorithms. Accordingly, only certain bumps in the network can effectively contend in this process, indeed though in proposition all bumps have the software needed to booby-trap the network. Nakamoto's notion of "one- CPU one vote" is no more as tackle and electricity costs help most bumps from sharing in this process.

d) Cryptography

Use of cryptographic tools is still nascent and the average Internet stoner cannot be anticipated to embrace its use in the short term.

e) Complexity

Blockchain technologies appear to be nearly incomprehensible to the average person and the tech speak around it doesn't help. Only a named many feels to understand the technology.

f) Environmental impact

A by- product of the below is also evidence of work's inefficiency in terms of energy coffers. Some estimates on energy consumption suggest that, by Spring 2017, Bitcoin use of electricity was similar to that of 280,000 US homes per time.

g) Bandwidth

Full bumps that want to be active in the network must have access to the right Internet bandwidth. Slow, unreliable connections aren't welcome, especially when the current size of the blockchain is over 120 Gigabytes.

h) Centralization

Mining is now consolidated with a many bumps controlling a large share of the request.55 Figure 6 below depicts request shares of the top miner bumps or companies. Note that the top five companies alone control over percent of the request.

i)Usability

Blockchain technology requires the secure operation of public and private keys by end druggies and bumps. While being portmanteau software has come a long way, losing private keys is still a serious threat. None of the being results are resistant to physical theft and only a many can cover n druggies from malware.

j) invariability as liability

If the blockchain is addressed or the software law has a bug that allows a particular exploit, also its invariability can in fact come a liability. This was the case for illustration with the Ethereum hack of last time where one mischief knot was suitable to seize over 64 million bones. The block chain technology ecosystem is indeed visionary and formerly working to address some of these limitations. The fact that the law is open source is critical then. On the other hand, changes to both the law and blockchain operations can only be fulfilled by either agreement or if a maturity of bumps agree on a way forward.

V. CONCLUSION

The Blockchain technology is now one of the useful and protean concern for our world, Due to the large installations in utmost of the systems in the different diligence, but in malignancy of everything it's new and its major perpetration is little advised issue on practice. moment's Blockchain technology promises us the bright future for information technology withoutthe fraud and any deception. due to some benefits of the Blockchain technology. The challenges of the Blockchain are large, but the results of the Blockchain using have a lesser transcendence than disadvantages. It's necessary to keep exploring the Blockchain development and operation in the different areas for the nearest future, because this new technology can help to break numerous delicate problems, which are disturbing and precluding rightly systems work. We've bandied in this paper introductory features of blockchain technology and security issues of blockchains.

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ONLINE SOCIAL MEDIA CONTENT MANAGEMENT SYSTEM

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Abstract*:* Revolutionizing online social media management, this innovative platform boasts three key functionalities that redefine the landscape. Firstly, the ability to schedule posts ensures a strategic and timely presence on various platforms. This feature empowers users to plan content in advance and automate posting, optimizing engagement. Secondly, the integration of AI-driven generative captions adds a layer of creativity and efficiency. By using ChatGPT API, users can effortlessly generate compelling and contextually relevant captions, enhancing the overall impact of their posts. Lastly, the inclusion of integrated analytics across multiple social media platforms provides users with a comprehensive overview of their online presence. This helps the users to refine the strategies based on performance metrics from different channels. Together, these functionalities not only streamline social media management but also elevate the quality and effectiveness of online content.

Keywords: Social media management, AI integration, comprehensive overview

I. INTRODUCTION

In the digital age, where social media serves as the virtual heartbeat of global communication, the role of an Online Social Media Manager has emerged as a critical component for individuals and businesses alike. This research paper delves into the multifaceted responsibilities of an Online Social Media Manager, focusing on three main functionalities: Caption Generation, Integrated Analysis, and Scheduling posts across different social media platforms, with an overarching goal of enhancing engagement and efficiency in the dynamic realm of social media. This research paper aims to provide a comprehensive understanding of the pivotal role played by an Online Social Media Manager. By delving into the intricacies of caption generation, integrated analysis, cloud import, and scheduling, we unravel the layers of complexity that define effective social media management in the contemporary digital landscape.

The following functionalities are further discussed in detail:

1. Schedule Post:
In the intricate world of social media marketing, maintaining an active presence is more strategic than it appears. Different social networks have their unique peak times, influenced by user behavior and algorithms. Engaging with a broad audience requires not just posting but posting smartly. Relying on real-time posts is not just challenging; it's inefficient. That's where the power of social media scheduling tools comes into play.
By leveraging these tools, you're not just posting; you're posting with purpose, ensuring your content aligns with your audience's peak activity. It's about working smarter, not harder. In this article, I'll be sharing insights on the top social media scheduling tools that have transformed the way I approach digital strategy.

Instagram: There are different ways to schedule posts on Instagram using Node.js. One way is to use the Instagram-private-API module, which allows you to login and post to Instagram programmatically. Another way is to use the node-Instagram-schedule project, which is an Instagram post scheduler built with Node.js, MongoDB, and Puppeteer. You can also use the contentful platform, a headless CMS that can be integrated with Instagram API. Alternatively, you can use the Facebook Graph API to schedule posts to Instagram, as Instagram is owned by Facebook.
YouTube: YouTube is the world's largest video and music streaming platform. Being an open-source technology, Google provides many APIs to work with YouTube. From automating the searches to getting playlists, YouTube API can help developers in lots of things and it's useful for building services like music players, video players, marketing on YouTube, AdSense, etc.
Twitter: Twitter for Websites allows you to embed Twitter's live content into your product, direct from the source. Make the most out of Twitter on your website to increase followers, drive engagement, and grow your business.

Bring your pick of content from Twitter into your website or app. Using these tools embed Tweets in your stories and articles on the web.
Include a stream of Tweets in your website or app in a compact, linear view. Configure Tweet timelines to automatically display live updates from people, trends, and places right in your app.
Allow people who visit your website or app to engage with your Twitter account and share content with their followers. Enhance links to your website shared on Twitter with Cards and Twitter buttons.

If you are using React.js then react-tweet should make it easier to bootstrap Twitter based React.js apps. This way we can focus on interesting ways to use and manipulate the API without the pains of rendering. Styles, assets, and HTML have been lifted from twitter.com and twitter dev docs. react-tweet uses only inline styles and while written in ES6, compiles to plain JS meant to be absorbed by any React project. react-tweet can be used a 'dumb' component for simply rendering data or could be a starting point for a more ambitious Tweet component.
"React-twitter-widgets" and "react-twitter-embed" are some more useful libraries to check out.

1. Caption generation:

Integrating ChatGPT for automated caption generation in your application can enhance the capabilities of your platform, whether it's for social media posts, image descriptions, or any other use case that requires generating textual captions.
Integrating ChatGPT for automated caption generation in our Node.js application allowed us to effortlessly create descriptive and contextually relevant captions for various types of content, enhancing user engagement and content accessibility. This involved making API requests to OpenAI's GPT-3 API and customizing prompts to generate captions tailored to your specific needs. Careful attention to safety, compliance, and quality assurance is essential for a seamless user experience.
Automated caption generation is vital for enhancing content accessibility, user experience, and discoverability. It saves time, ensures consistency, and can scale with your content needs. It also aids multilingual support, compliance, SEO, and supports machine learning applications. Automated captions are cost-effective and crucial for real-time events, making them an essential tool for improving content engagement and reach.
Integrating ChatGPT is important for enhancing user interactions, instant response, automating customer support, and generating human-like text, which can lead to improved user satisfaction and operational efficiency in various applications and services.
ChatGPT, with its conversational abilities, is versatile and adaptable for tasks like caption generation. Automated caption generation addresses the limitations of manual caption writing by providing scalability, consistency, and cost-efficiency. It eliminates the time-consuming nature of manual captioning, ensuring that captions can be generated at scale and in real-time, which is especially crucial for live content. Automation also reduces inconsistencies and human errors, resulting in a more reliable and accessible user experience. Additionally, it's a cost-effective solution that can adapt to the growing volume of content in the digital landscape, ultimately improving content accessibility and discoverability.
Automated caption generation has some limitations. These systems might not always get captions exactly right and can sometimes produce inaccurate or inappropriate content. They may struggle with understanding context and nuances, leading to less precise captions. Additionally, automated solutions might not be as creative or adaptable as humans when it comes to describing certain content. Therefore, while they offer efficiency and scalability, human oversight and quality control are often necessary to ensure accurate and suitable captions.
ChatGPTUnofficialProxyAPI - Uses an unofficial proxy server to access ChatGPT's backend API in a way that circumvents Cloudflare (uses the real ChatGPT and is lightweight but relies on a third-party server and is rate-limited).
ChatGPT – to use all the libraries.

2. Import Media:

Importing media into a social media content management system is fundamental to curating an engaging online presence. Whether you're a business looking to showcase products, an influencer sharing experiences, or a brand connecting with your audience, the ability to seamlessly upload and manage images, videos, and other media is essential. This process simplifies content creation, scheduling, and publishing, enabling you to deliver captivating and timely material to your followers. In this digital landscape, the efficient importation of media is key to maintaining a vibrant and dynamic social media presence.

Local file import streamlines content creation, allowing users to effortlessly add their own media to posts and stories, enhancing engagement and visual storytelling.

Cloud import eliminates the need for local storage and simplifies the content creation workflow, enabling content creators to access and share their files from anywhere with an internet connection.

Importing media into a social media content management system is essential for effective communication, engagement, brand identity, and the efficient creation of diverse and engaging content on social media platforms. It significantly contributes to the success and impact of digital marketing and online communication strategies.

Local file import has several limitations. It relies on device storage space, which can lead to storage constraints and potential slowdowns. Compatibility issues may arise due to device-specific file formats, requiring conversions. Users also face data loss risks from device failures or theft, and version control challenges. Additionally, local storage can limit accessibility across different devices and demand a proactive backup strategy.

Limitations of Cloud Import:

Cloud import, while convenient, is not without limitations. It necessitates a reliable internet connection, making it less accessible in areas with limited connectivity. Privacy and security concerns emerge when using third-party cloud providers. Data transfer speed can be slower, and users may be subject to cloud storage provider terms and policies. Cloud import requires dependency on third-party providers and may not provide complete control over data.

II. PROBLEM DEFINITION

The absence of an integrated solution results in inefficiencies missed opportunities, and a higher risk of errors when executing cross-platform social media campaigns. There is also a lack of advanced analytics, content scheduling, and collaboration features. The challenge is to design and develop a unified platform that streamlines social media management, automates posting, offers advanced analytics, and ensures compliance with platform-specific regulations. The solution aims to enhance user efficiency and cross-platform consistency while prioritizing data privacy and security. The research objective is to create a user-friendly, customizable, and scalable integrated social media manager.

III. MOTIVATION

Our motivation for developing this model stems from the lack of existing solutions that effectively address the challenges of integrated social media management. With no comprehensive model available, we aim to fill this critical gap and provide users with a streamlined, efficient, and user-friendly platform for managing and posting content on Instagram, Twitter, and YouTube, ultimately revolutionizing the way individuals and organizations engage with their audiences across these social media platforms.

IV. PROPOSED MODEL

Our application helps in social media management and respective tasks which are:

1. Posting Content to multiple platforms from a single application.
2. Scheduling content.
3. Generating Captions with AI.
4. Importing media from the cloud or device.
5. Results. (posted content)

V. IMPLEMENTATION METHODOLOGY

A. Create Post:

Integrating social media APIs into your application involves several key steps to ensure successful communication and interaction between your application and the social media platforms.

Firstly, you need to register your application with the social media platform(s) of your choice. This process usually involves creating a developer account, setting up a new application, and obtaining API keys, access tokens, and client IDs. These credentials serve as the authentication mechanism allowing your application to access the platform's services.

Once you have the necessary credentials, you need to choose the appropriate API for your requirements. Most social media platforms offer a variety of APIs, each tailored to specific functionalities such as posting updates, retrieving user information, or accessing analytics data. Select the API(s) that align with your application's features.

Next, you'll need to implement the API calls in your application. This involves sending HTTP requests to the social media platform's API endpoints, using the authentication credentials you obtained earlier. These requests can be made using libraries like Axios in JavaScript or requests in Python, or specific SDKs provided by the platforms.

It's essential to handle authentication and authorization properly. Social media APIs often use OAuth or similar protocols for user authentication. You'll need to implement the OAuth flow in your application, which typically involves redirecting users to the social media platform's login page, obtaining an authorization code, and exchanging it for an access token that grants your application the necessary permissions.

Error handling and rate limiting are also crucial aspects. Social media APIs can return errors due to various reasons such as network issues, incorrect parameters, or rate limits being exceeded. Implement robust error handling mechanisms in your code to handle these situations gracefully. Additionally, respect the rate limits imposed by social media platforms to avoid being blocked for excessive API requests.

Lastly, keep your API integration secure and up to date. Regularly check for updates from the social media platforms, as APIs can change over time. Ensure that your application's codebase and dependencies are secure to prevent vulnerabilities that could be exploited.

By following these steps and adhering to best practices, you can effectively integrate social media APIs into your application, enabling seamless interaction with social platforms and enhancing user engagement.

B. Caption generation:

Integrating ChatGPT 3.5 into your application to generate captions based on keywords involves a straightforward process leveraging OpenAI's powerful language model. First, you need to obtain an API key from OpenAI, which allows you to make requests to the GPT-3.5 API. Once you have your API key, you can send a POST request to the OpenAI API endpoint, providing the appropriate parameters, including the model name (in this case, "text-davinci-003"), the prompt, and any other relevant instructions or keywords you want to base the captions on.

In your application, you can create an input interface where users provide keywords or topics for generating captions. When a user submits these keywords, your application sends a request to the GPT-3.5 API, passing the keywords as a prompt. The model will then generate captions or descriptive text based on the provided keywords. You can fine-tune the instructions to the model by specifying the format you want the captions in, the tone, or any other specific requirements.

Once you receive the response from the API, you can extract the generated captions and display them within your application's user interface. It's essential to handle API responses effectively, considering error handling and rate limiting to ensure smooth user experience. Additionally, you can experiment with different prompts and instructions to enhance the quality and relevance of the generated captions, tailoring them precisely to your application's requirements.

Remember to review and adhere to OpenAI's usage policies and guidelines to ensure compliance and ethical use of the ChatGPT 3.5 API in your application.

C. Import data:

Integrating cloud file import functionality into your application involves a series of steps to seamlessly connect your application with a cloud storage service such as Amazon S3, Google Cloud Storage, or Microsoft Azure Blob Storage. First, choose an appropriate cloud storage provider and create an account. Set up a specific bucket or container in the cloud storage platform where your application will store and retrieve files. Next, integrate the cloud storage provider's official SDK or API into your application, allowing you to perform operations like uploading and downloading files. Authenticate your application securely using API keys or access tokens provided by the cloud storage provider to ensure authorized access. Implement file upload functionality, enabling users to upload files from their devices to the designated cloud storage location. Additionally, create features that allow users to download files from the cloud when needed. Implement robust error handling mechanisms to deal with various scenarios, including network issues and file upload failures. Ensure security by encrypting sensitive data, validating user input, and implementing access controls to prevent unauthorized access. Thoroughly test the implemented functionality, including edge cases and concurrent user interactions, to guarantee a seamless user experience. Finally, document the integration process and provide clear instructions for users on how to import and export files using the cloud storage service within your application. By following these steps and adhering to best practices, you can successfully implement cloud file import functionality, enhancing the capabilities of your application.

VI. RESULTS

A. Sign-up authentication

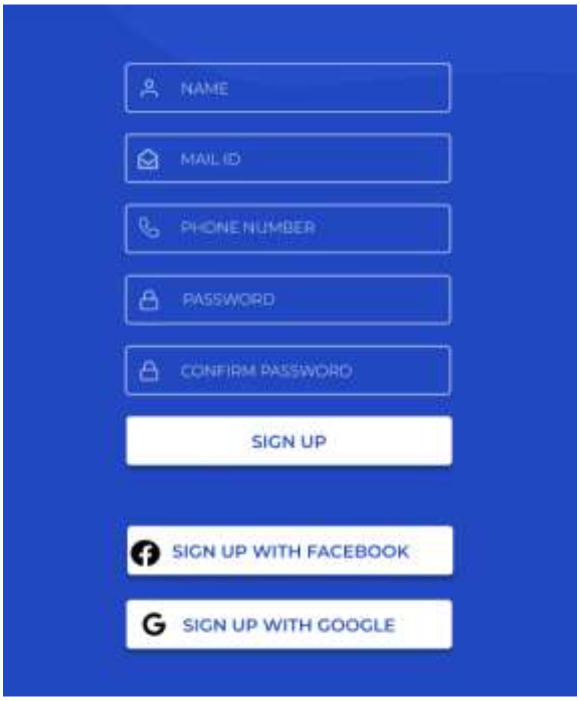

Fig 1: Sign-up page

Using Google O-Auth for sig-in and authentication or our dedicated authentication system user can safely and securely authenticate and login.

B. Import media

Fig 2: Import media option We can import media from the cloud as well as local file

C. Caption Generation

Fig 3. Autogenerate captions

With the help of OpenAI integration, we can generate automated captions for the media.

VII. CONCLUSION

This project helped us to learn about the complicated system of publicly available APIs to the fullest. It works correctly and fulfills all the requirements of users or content creators also we got some insights on how to extend a social media platform. This system properly helps the users to fulfill their tasks related to social media posting.

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FIRE EYE: A REAL-TIME FOREST FIRE AND SMOKE DETECTION BY USING MACHINE LEARNING

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Abstract— This paper provides a comprehensive review of the current landscape of forest fire detection and prediction, emphasizing the integration of computer vision, machine learning, and deep learning algorithms. Traditional methods for forest fire management areinitially discussed, highlighting their limitations and motivating the exploration of more advanced technological solutions. The review explores the role of computer vision techniques in image and video-based forest fire detection, emphasizing the utilization of various features and image processing methods. Machine learning algorithms are then examined for their application in predicting forest fire occurrences, with detailed discussions on model architectures, input features, and evaluation metrics. The study also explores the field of deep learning, demonstrating how various deep learning designs, such as recurrent neural networks (RNNs) and convolutional neural networks (CNNs), can improve the detection and prediction of forest fires. Case studies are presented to illustrate the practical effectiveness of these models. Additionally, the paper explores the integration of multiple modalities, where data from diverse sources, including satellite imagery, weather conditions, and ground sensors, are amalgamated for more accurate forest fire management. Challenges associated with current approaches are addressed, and potential future directions are outlined. In conclusion, the paper emphasizes the critical role of advanced technologies in forest fire management and encourages ongoing research efforts to develop robust systems to mitigate the devastating impact of wildfires on the environment and human safety.
Keywords: Monitoring System, deep learning algorithms, YOLO-v5, early warning system, response time reduction, life and property protection, uncontrollable spread prevention, accuracy.

I. .INTRODUCTION

Wildfires, driven by a complex interplay of environmental factors and human activities, constitute a global challenge with severe repercussions for ecosystems, biodiversity, and human settlements. As climate change exacerbates the frequency and intensity of these events, there is an urgent need for advanced methodologies in forest fire detection and prediction to mitigate their devastating impact. This paper thoroughly explores the current research in this field, specifically focusing on integrating computer vision, machine learning, and deep learning algorithms. Colloquially known as wildfires, forest fires have emerged as a pressing environmental concern, transcending geographical boundaries and impacting diverse ecosystems. Their occurrence results from a dynamic interplay between climatic conditions, vegetation patterns, and human activities. Climate change-induced shifts in weather patterns, prolonged droughts, and rising temperatures contribute to an environment conducive to the rapid spread of wildfires. Moreover, anthropogenic factors such as land-use changes, inadequate firemanagement practices, and human negligence amplify the wildfire risk.

The consequences of uncontrolled wildfires are profound. Ecosystems, characterized by delicate balances among flora and fauna, face severe disruption. Biodiversity loss, soil degradation, and altered landscape structures become enduring legacies of these destructive events. Beyond ecological ramifications, wildfires significantly threaten human life, property, and infrastructure. The intensity and speed at which wildfires can spread make early detection and prediction paramount in formulating effective response strategies. Traditional forest fire detection and prediction methods have proven insufficient in addressing the evolving challenges posed by modern wildfire dynamics. While historically integral, ground-based observation systems and manual monitoring lack the scalability and real-time capabilities required to keep pace with wildfires' rapid onset and progression. Consequently, the scientific community has turned to advanced technologies, leveraging computer vision, machine learning, and deep learning algorithms to enhance our ability to detect and predict forest fires.

Computer vision, as a subset of artificial intelligence (AI), plays a pivotal role in processing and interpreting visual data for forest fire detection. Image and video- based analysis, combined with sophisticated algorithms, enable the identification of smoke plumes, flamepatterns, and other visual cues indicative of a wildfire. Integrating machine learning algorithms further refines the detection process by allowing systems to learn from historical data, adapt to changing conditions, and improve accuracy over time. Machine learning, a broader field encompassing algorithms that can learn and make predictions from data, provides a fertile ground for developing predictive models in the context of forest fires. These models leverage diverse data sources, including meteorological data, topographical information, and historical fire records. By discerning patterns and relationships within this data, machine learning algorithms contribute to creating predictive models capable of forecasting potential wildfire events.

Deep learning is a subset of machine learning that uses deep neural networks, which are multi-layered neural networks, to identify intricate patterns. It draws inspiration from the composition and functions of the human brain. Deep learning models like convolutional neural networks (CNNs) and recurrent neural networks (RNNs) have unparalleled capacity to handle complex spatial and temporal data in managing forest fires. Because of their capacity to automatically extract features from unprocessed data, they are especially good at identifying minor signs that point to potential wildfire hazards.

This work aims to compile and critically assess research on deep learning, machine learning, and computer vision to detect and predict forest fires. We hope to further the current conversation about cutting- edge technology development for efficient forest fire control by analyzing the advantages and disadvantages of these strategies. The subsequent sections will delve into the specifics of each technology, presenting case studies, discussing challenges, and proposing potential avenues for future research.

As the global community grapples with the escalating challenges posed by wildfires, the intersection of technology and environmental science emerges as a beacon of hope. By harnessing the capabilities of computer vision, machine learning, and deep learning, we stand at the precipice of a new era in forest fire management—one where predictive accuracy and early detection become not just aspirations but tangible tools for safeguarding our natural heritage and human habitation.

Fire Eye is a system developed for detecting and monitoring forest fires using two cutting-edge deep learning algorithms (YOLO-v5 and Inception-v3), designed to detect fires at the fieriest stages. This early warning system critically analyses the scope of artificial intelligence, reduces the response time of fire authorities, and helps them mitigate the loss of life and property caused by forest fires before they spread uncontrollably. This system increases the reliability and accuracy of fire detection and monitoring operations and contributes to forest ecosystems' overall sustainability and resilience. The landscape of forest fire detection has witnessed a significant evolution in response to the escalatin

Challenges posed by climate change and human activities. Early detection systems have become pivotal in mitigating.

Climate change has made forest fires more frequent globally, causing significant financial losses and ecological devastation. Waste, other biomes and human carelessness bring on summer forest fires. Forest fires can be man-made or natural. Wildfires can benefit the area's flora, fauna, and ecosystems, but they can also seriously harm property and result in fatalities. The number of forest fire incidents has been steadily rising in recent years. To prevent the devastation of forests, there has thus been an increase in interest in implementing systems for automated observation and detection of forest fires. Many conventional and innovative fire and smoke detection methods have been made available to reduce the damage caused by fire disasters. The research community has focused much on sensor- and vision- based smoke detection systems among these techniques. Depending on the kinds and uses of the sensors employed, the fire detection approach is separated into five primary groups: smoke-sensitive, light-sensitive, gas-sensitive, temperature-sensitive, and composite. For this, temperature and smoke sensors are commonly employed. The speed and range of detection are two significant limits of the sensor-based technique.

Color information has also been combined with motion data. These techniques have increased the dependency on fire detection technologies. However, using photos from security cameras has brought up a new problem with image processing. Continuous streams of images from video cameras need to be processed and stored, which would incur additional costs. Various fire detection systems and approaches have been offered to make the system as autonomous and accurate as feasible. Machine vision image processing and video surveillance technology have progressed in recent years, resulting in faster transmission and sensing. Thus, the development of computer vision-based fire and smoke detection systems has enabled a greater variety of fire detection methodologies. Using video surveillance to collect and extract data from fire and smoke images, computer vision-based fire and smoke detection systems can build a detection model based on these images. Conventional machine learning and deep learning-based computer vision algorithms have been promoted to assess whether fire and smoke are present in pictures.

II.METHODS FOR FOREST FIRE DETECTION

Different methods were implemented to detect forest fires, including machine learning and deep learning. This section describes the different approaches for forest fire detection in detail.

A. *Machine Learning-Based Forest Fire Detection*

B. Pradeep Kumar G et al. [1] detection of forest fires using machine learning methods has used random forest and kto detect the forest fire. Users discuss an innovative fire detection policy that uses all technological tools. Moreover, proposes a platform for artificial intelligence– based. Computer vision for smoke and fire recognition and detection is based on still imagery or streaming information in the pictures taken. To determine the result, using machine learning. These algorithms have implemented data sets and split them into test and train sets, affecting dependability.

To detect forest fires, lasso, ridge, and linear regression are presented by Ahmed M. Elshewey et al. [2]. This study presents three machine learning approaches: ridge regression, lasso regression, and linear regression, using a data set of 517 entries with 13 attributes per row. This work has two versions; the first has all the features, while the second has only 70% of the functionality. The work also uses the test set, which makes up 30% of the data set, and the training set, which makes up 70%. The linear regression approach is more accurate than ridge regression and lasso regression algorithms.

David A. Wood [3] published the Forest Fire Prediction and Data Mining paper: A highly effective data matching and mining system offers insightful information. The multiple forecasting approach offers an instructive feature selection that determines the relative impacts of the crucial parameters on forecast burned-area numbers. Data analysis for each total fired incident requires complementary information, which would be supplied through maximizing with MAE and RMSE as different goal activities. By increasing comprehension of the critical factors that affect each burn occurrence, people will receive insight into farming, biodiversity, the environment, and forestry. Each maximized solution's suitability for correctly guessing burned-area events from a particular type may be evaluated using specific insight obtained from dataset mining the contrasting squared and cumulative total error trends. Such effectiveness and understanding help build strength in the methodology used to make each prediction. It gives the knowledge to behave quickly and minimize individual burn situations as they happen. By attempting to stop specific sorts of burn accidents from occurring once again or spreading, such educated interventions should both have short- and long-term, multifaceted benefits.

Pragati et al. [4] Wireless Sensor Networks (WSN) are becoming more important in current research fields as technology progresses due to their effectiveness in preventing accidents and helping people. An incident is recognized using the sensor devices positioned at various places once an uncommon occurrence in the networks is discovered. The base station receives this event detection information and makes a decision. Such sensor data in WSNs typically generate false alarms because of their static design. Due to their efficient dynamic configuration and autonomous operation, machine learning algorithms can be used to prevent false alarms.

Adithi M. Shrouthy et al. [5] The approach for predicting the danger of forest fires using SVM, Decision trees, Random Forest, KNN, and Logistic Regression are discussed. The results demonstrate that the threat of forest fires can be predicted with some degree of precision. So, based on various characteristics like data input on oxygen, temperature, and humidity by the un front end, designers suggested a system to forecast the percentage of fire occurrence using machine learning methods and algorithms such as Decision Tree, RandomForest, KNN, SVC, and Logistic Regression.

K.G. Shangavi et al. [6] researchers used sensors to examine forest fires at various locations and times in this study. By examining the time it takes to produce the output, the error rate, and a variety of other factors, we can determine whether rattling is an effective instrument. According to the findings, the decision tree is more effective than random forest regarding time and mistakerate.

Mohana Kumar S. et al. [7] Due to several factors, including the rapid advancement of digital camera technology, image processing has been used in this study. When covering large regions, the camera performs exceptionally well, and its response time for handling photographs is faster than that of existing sensor architectures. Moreover, picture preparation frameworks are generally less expensive than sensor frameworks. Final findings reveal that the suggested strategy for detecting forest fires has a high detection rate (92%) and a low percentage of false alarms (8%).

Gomathy, C. K., et al. [8] This article compares machine learning methods like neural networks, SVM, regression, and decision trees. Compared to other machine learning techniques, this paper requires less time to detect forest fires immediately. This study proposes a fire detection method that divides datasets into months and uses regression. The algorithm can achieve high R-squared and low root mean square error.

Ramasubramani Srinivas [9] This study proposes several machine learning algorithms, such as bagging, gradient boosting, SVR, random forest, linear regression, logistic regression, and random forest, for predicting the amount of forest land burned. Consequently, the fire breakouts in Portugal's northeast are used to develop the predictive model. In this research, researchers create a model for predicting the area burned during forest fires using Big Data and machine learning approaches.

Suhas G et al. [10] With this work, researchers want to advance deep learning's ability to detect fire in videos. Artificial neural networks-based deep learning is a new idea that has produced outstanding results in several domains, including computer vision.

A. Deep Learning-Based Forest Fire Detection

Priya and Vani's work [11] explored using InceptionV3 to enhance the satellite image classification of forest fires. 239 fire and 295 non-fire satellite photos, totaling 534, were used to validate their work. The performance of the DL model for each manuscript is detailed, along with augmentation.

The classification job in intelligent forest monitoring systems is one of the oldest and most studied [12]. Image classification is the process of labeling and classifying groups of pixels or vectors inside an image based on predefined criteria, as defined by Shinozuka and Mansouri [95]. They contended that one or more of an image's spectral or textural characteristics could be used to

create the categorization rule [13]. The main objectiveof picture categorization is to guarantee that every photois categorized by its relevant sectors or categories [14].
Using a portable Raspberry Pi platform, Arteaga et al.

[15] evaluate many pre-trained CNN models for forest fire classification rather than focusing on a single ResNetmodel. In this inquiry, 1800 images from a medium-sized database gathered from internet secondary sources were employed. The authors applied and added a set of augmented data to the training dataset. After applying a cropping approach to increase the data's width to 224 pixels, it was rotated horizontally with a 50% chance, andthen its standard deviation and mean values from the ImageNet database were used to normalize it. The authors investigated several pre-trained VGG and ResNet model variations. The outcomes demonstrated that ResNet-18 processed data in less than 2.12 seconds and produced an excellent accuracy performance of 0.9950. Furthermore, their research demonstrated that the ResNet-34, ResNet-101, ResNet-50, and ResNet-18 models are better suited for implementation on mobile platforms than the VGG variants for detecting forest fires. The authors must conduct experiments with larger datasets to determine if the algorithms can handle big datasets in actual forest fire scenarios.
Ban et al. [16] employed their CNN model to extract thetemporal backscatter variations information from Synthetic Aperture Radar (SAR) imagery obtained during wildfire episodes and SAR imaging time-series data gathered before the occurrences to automatically detect burnt zones. Additionally, an inventory map consisting of 10,000 points representing burned and unburned areas has been created using Sentinel-2 photographs to verify and confirm their findings. Additionally, they further employed visual comparisons to enhance the datasets obtained from Sentinel-2's burnedarea maps and SAR-based progress maps. Burnt confidence maps are created by fitting and training the CNN model, which will aid in identifying burned areas. The coarse binary transition map was used to create the training images automatically. The Otsu thresholding technique will then be used to binarize these confidence maps in order to increase output dependability and certainty. Subsequently, the maps will be gradually amalgamated. Sentinel-1 SAR data has limitations, including signal deterioration in certain environmental conditions and spatial resolution, although these are not discussed.
Benzekri et al. [17] presented a novel DL model in this work that predicts the final label by employing an RNN,LSTM, or GRU in the output layer and two hidden layerswith 50 neurons each. The network backpropagated the loss function using the Adam optimizer. Four wrong predictions were made by the LSTM model, two by the simple RNN model, and one by the GRU model. The authors used about 2000 sample data points to analyze the three models. The LSTM model yielded 0.0298 loss and 99.82 percent accuracy on the test data. The accuracyof the baseline RNN model was 99.77 percent, with a lossof 0.0062. For early forest fire detection, the most accurate and appropriate model is the GRU model. According to the authors, the approach is more accurate than traditional monitoring techniques. In contrast to thereal world, a short dataset was used to test the high- accuracy results; a larger sample is required.
A comparison of three DL designs was done by Rahul etal. [18]. The authors utilized the ResNet-50, VGG-16, and DenseNet-121 models in their study to investigate forest fire detection. Flipping, shearing, and other methods are applied to the input pictures once they have been scaled to 224 pixels in width. A softmax layer, a pooling layer, a batch normalization layer, a convolutional layer, and a ReLu activation layer with dropout make up the traditional CNN layer architecture for image classification. The findings determined the best update backpropagation method with the best globalextremum as the stochastic gradient descent (SGD) optimizer. Overall, ResNet-50 performed better than DenseNet-121 and VGG-16. According to the results, theSGD optimizer is more effective at identifying forest fires than the Adam optimizer. However, assessing how broadly the findings may be challenging because the study does not specify the dataset used to train and test the model.
Jiang et al. [19] adjusted the CNN model hyperparameters using a genetic algorithm (GA) to predict fire occurrences accurately. The authors used thebackpropagation (BP), support vector machine (SVM), GA-CNN, and CNN techniques as benchmarks to compare their methodology. The development dataset comprises 1900 images from the testing and training datasets. Positive and negative imagery of smoke and fire situations are included in the bulk of the photographs. It functions well under various assessment scenariosconcerning accuracy, false alarm, and true-positive levels. The accuracy values of the unoptimized CNN, BPneural network, and SVM algorithms are 73 percent, 75 percent, and 85 percent, respectively.
In comparison, the optimized GA-CNN method's accuracy value is 95 percent (90 percent). Additionally,the study found that the GA-CNN approach might potentially identify forest fires. Given that an overfittingissue might arise from the imbalanced data, the authors ought to take the accuracy and recall measures intoaccount for more accurate result interpretation.
Gayathri et al. [20] used LSTM and CNN in a hybrid configuration of a bidirectional algorithm instead of integrating CNN with regular LSTM. The method took advantage of Google's Firebase, which can be connected to mobile or Internet of Things devices through alerts to convey warnings. The recommended model's accuracy rate for the training dataset is 96%, while for the test dataset, it is 92%. The findings imply that superior classification results for forest fires can be obtained by combining two DL models. The study's overfitting problem is apparent from the findings, which show that the precision and recall were poor even with a high accuracy value.
Instead of utilizing a single model, Ghosh and Kumar

[21] integrated CNN and RNN networks to extract the features, which are then sent to two fully linked layers for classification. The Mivia collection comprises 22,500images, 12,000 of which feature scenes involving smokeor fire, and the remaining 10,000 do not. The Kaggle dataset comprises 1000 photographs, of which 755 are classified as fire photos and the other 245 as regular photos.

The study examines many approaches to forest fire detection in this thorough analysis, focusing on combining deep learning (DL) and machine learning(ML) techniques. The study encompasses both ML and DL-based approaches, providing an in-depth analysis ofvarious techniques employed in the literature.
A variety of algorithms, including random forest, k- nearest neighbors, linear regression, ridge regression,lasso regression, and ensemble techniques, are included in the ML-based approaches that have been examined. Researchers propose innovative fire detection policies, artificial intelligence-based platforms, and dynamic wireless sensor networks to prevent false alarms. Using regression models with feature selection and data mining techniques reveals insightful information for predicting burned areas and understanding the impact of crucial parameters.
The DL-based methods investigate the use of hybrid models, recurrent neural networks (RNNs), and convolutional neural networks (CNNs) in detecting forest fires. Researchers aim to improve classification performance and prediction accuracy by utilizing advanced DL architectures like InceptionV3, ResNet-18, and genetic algorithm-optimized CNNs. They delve into integrating synthetic aperture radar (SAR) imagery, bidirectional algorithms, and combinations of RNN and

III. A FIGURES AND TABLES

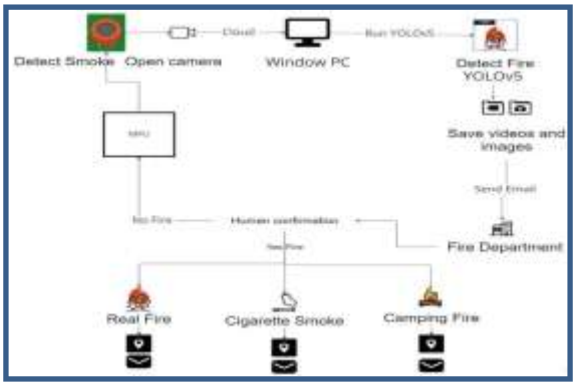
CNN networks to enhance feature extraction and model performance. The discussion emphasizes the strengths of these approaches, including increased accuracy, efficiency, and adaptability to dynamic scenarios. ML models leverage historical data and real-time sensor information effectively, while DL models excel in image classification, feature extraction, and predictive accuracy.
Challenges and considerations for future research are highlighted, encompassing issues such as model interpretability, scalability, biases in datasets, and generalizability across diverse ecological contexts. The discussion underscores the importance of continued collaboration between researchers, technologists, and environmental experts to address these challenges and fully realize the potential of ML and DL technologies inforest fire detection.

Table I: Summary of the recent study for forest fire detection using ML and DL algorithms

Reference	Approach	Algorithms Used	Dataset Used	Key Findings
[1]Pradeep Kumar G et al.	ML	Random Forest, KNN	Not specified	Innovative fir detection technological tools. Platform policy using for AI-based computer vision.
[2] Ahmed M. Elsheweyet al.	ML	Lasso, Ridge, Linear Regression	517 entries, 13 attributes	Linear regression more accurate than ridge and lasso regression.
[3] David A.	ML	Not specified	Not specified	Effective data matching and mining system. Insightful information for forecasting burned-area numbers.
[4] Pragati et al.	ML	Machine Learning Algorithms	Wireless Sensor Networks	ML algorithms prevent false alarms in WSNs due to dynamic configuration.
[5]AdithiM.Shrouthy et al.	ML	SVM, Decision Trees, Random Forest, KNN, Logistic Regression	Not specified	Predicting forest fire danger using various ML algorithms with precision.
[6] K.G. Shangavi	ML	Decision Tree	Sensor data	Decision tree more effective than random forest regarding time and mistake rate.
[7] Mohana Kumar S. et al.	ML	Image Processing	Digital camera technology	High detection rate (92%) and low false alarms (8%) using suggested forest fire detection strategy.

[8] Gomathy, C.K., et al.	ML	Neural Networks, SVM,Regression, Decision Trees	Not specified	Proposed fire detection method with regression achieves high R-squared and low RMSE.
[9] Ramasubramani Srinivas	ML	Bagging, Gradient Boosting, SVR, Random Forest, Linear Regression, Logistic Regression	Fire breakouts in Portugal's northeast	Model for predicting burned area during forest fires using Big Data and ML approaches.
[10] Suhas G et al.	ML	Deep Learning (ANNs)	Videos	Advancing deep learning for fire detection in videos using artificial neural networks.
[11] Praia and Vani	DL	InceptionV3	534 satellite photos	textural characteristics

[12] Shinozu kaand Mansouri	DL	Not specified	Not specified	ResNet-18 performs well for forest fire classification with high accuracy.
[15] Arteaga et al.	DL	Pre-trained CNN models (VGG,ResNet)	1800 images	CNN model extracts temporal backscatter variations from SAR imagery to detect burntzones.
[16] Ban et al.	DL	CNN	SAR imagery, Sentinel-2 photographs	GRU model proves most accurate for earlyforest fire detection.
[17] Benzekri et al.	DL	RNN, LSTM, GRU	2000 sample datapoints	ResNet-50 outperforms other models in forestfire detection. SGD optimizer more effective.
[18] Rahul et al.	DL	ResNet-50, VGG-16, DenseNet-121	Not specified	GA-CNN method achieves 95% accuracy forfire occurrence prediction.
[19] Jiang et al.	DL	CNN, GA-CNN	1900 images	Hybrid configuration of LSTM and CNN for forest fire classification. Superior results butpotential overfitting.
[20] Gayathri et al.	DL	LSTM, CNN (bidirectional)	Not specified	CNN and RNN networks combination achieves high accuracy in identifying forest fires.
[83] Ghosh and Kumar	DL	CNN, RNN	Mivia collection,Kaggle dataset	early forest fire detection.



in **Fig.1** factors. Fires.as shown fig

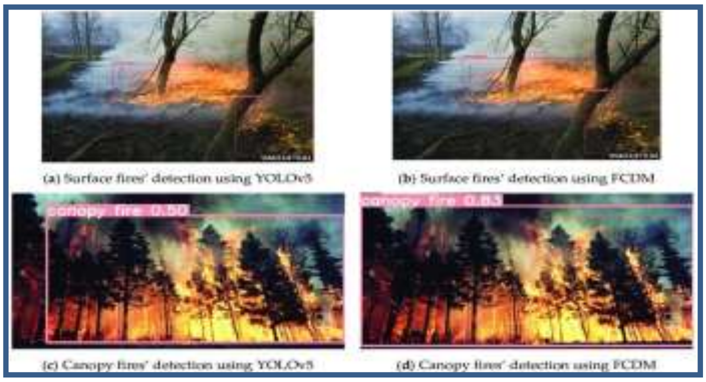


Fig.2 and its intensity, fires andthe degree of damage

Intense, large-scale forest fires are damaging and very challenging to control. Locations, where various types of fire behavior occur, vary depending on environmental factors fires.as shown

IV. CONCLUSION

This review underscores the significant strides in forest fire detection by integrating machine learning (ML) and deep learning (DL) algorithms. The amalgamation of innovative methodologies and advanced technologies has enhanced our ability to predict, detect, and manage forest fires, marking a paradigm shift in wildfire management strategies. The collective findings from the examined literature showcase the diverse applications and effectiveness of both ML and DL approaches, each contributing unique strengths to the overall landscape of forest fire detection. Machine learning-based approaches, ranging from ensemble methods like random forest to regression models and data mining techniques, have demonstrated promising results. These techniques leverage historical data, sensor networks, and dynamic wireless sensor configurations, providing insights into predictive modeling and feature selection. The exploration of ML algorithms enhances the accuracy of forest fire predictions and addresses the critical issue of false alarms, a common challenge in traditional detection systems.

With its robust convolutional neural networks (CNNs) and recurrent neural networks (RNNs), deep learning offers robust solutions for image classification, feature extraction, and complex pattern recognition. Using sophisticated DL architectures, such as InceptionV3 and ResNet-18, signifies a breakthrough in satellite image analysis and mobile platform implementations. The integration of SAR imagery, bidirectional algorithms, and combinations of RNN and CNN networks showcasesthe adaptability and effectiveness of DL models in diverse scenarios.

While the advancements are promising, challenges persist. Critical considerations include model interpretability, scalability to handle diverse datasets, and addressing biases in training data. Future research directions should focus on integrating multiple modalities, including satellite imagery, ground-based sensor data, and real-time weather information, to further enhance the accuracy and reliability of forest fire predictions

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DATA-POWERED VOICE MATIC CHATBOT CONVERSATION FOR ENHANCED LEARNING

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Abstract — In the contemporary landscape of education and technology, the demand for innovative learning solutions has paved the way for the development of cutting-edge projects. One such endeavor is the creation of a Data-Powered VoiceMatic Chatbot Conversation designed to enhance the learning experience. This project converges advancements in chatbot technology, machine learning, and Android application development to offer a dynamic and personalized learning platform.

The primary objective of this project is to revolutionize traditional learning paradigms by introducing an intelligent and conversational interface. Users can engage in interactive conversations with the Voice Matic Chatbot, receiving personalized guidance, educational content, and real-time feedback. Through theutilization of machine learning, the chatbot continuously refines its understandingof user preferences, thereby optimizing the learning journey for each individual.

Keywords: Voice Matic Chatbot, Machine Learning, Android Application, Real-time Feedback

I. INTRODUCTION

In essence, the project envisions the creation of a Voice Matic Chatbot—a sophisticated and intelligent conversational interface—that harnesses the power of machine learning to offer an enriched and personalized learning experience. By being data- powered, the chatbot leverages insights from user interactions to continuously adapt and refine its responses, tailoring the learning journey to individualpreferences and needs. The emphasis on voice interaction adds a dynamic layer to the traditional learning paradigm, making the educational process more engaging and accessible. This project aligns with the contemporary shift towards user-centric learning, acknowledging the diverse ways in which individuals absorb information and providing a tailored, responsive, and interactive learning environment.

II. LITERATURE SURVEY

The literature survey for the project "Data-Powered voice Matic Chatbot Conversation for Enhanced Learning" from a machine learning perspective involves exploring key domains within the field. Initial research focuses on the integration of chatbots, emphasizing studies that employ machine learning techniques to enhance conversational capabilities in educational contexts. Investigations into natural language processing (NLP) contribute insights into how advanced language models can improve the chatbot's understanding and response generation. The survey extends to machine learning applications in adaptive learning systems, analyzing approaches that dynamically adjust content based on user interactions. Additionally, studies on voice interaction in machine learning models are explored, emphasizing how voice-enabled technologies leverage ML algorithms to simulate human-like communication patterns. The literature review also incorporates research on data-driven learning analytics, highlighting howmachine learning algorithms can extract valuable insights from user interactions to optimize the learning journey. Challenges and opportunities in deploying machine learning-based chatbots are discussed, considering factors such as model interpretability and ethical considerations. The survey concludes by examining emerging trends in machine learning within educational technology, providing a foundation for the development of the proposed Data-Powered voice Matic Chatbot for Enhanced Learning.

III. PROBLEM STATEMENT

"Data-Powered voice Matic Chatbot Conversationfor Enhanced Learning"

OBJECTIVE

Natural Voice Interaction: Develop a chatbot that enables users to engage in conversations using spoken language, creating a more intuitive and human-like interaction experience. Enhance Accessibility: Create a chatbot that caters to individuals who may face challenges with text-basedinterfaces, ensuring inclusivity and accessibility for adiverse user base. Seamless

Multitasking: Design thechatbot to accommodate users' multitasking needs byallowing them to interact and gather informationwhile performing other tasks.

IV. .FUTURE SCOPE

This project uses artificial intelligence and machine learning techniques to create chatbots. Chapter Harassment Chapter chatbot learns as itprogresses because it is different from human- created relationships Chapter Rapid change Thelanguage used in this project is in Python. ArticleThe field of machine learning and artificial intelligence is one of the current trends in computer science and technology. In these sectors, 4,444 new technology announcements are made every year. Chapter Research in these areas is still ongoing. However, they are not fullydeveloped and are still "learning". Our chatbot can learn new things every day. So there are no fixed standards for chatbot.

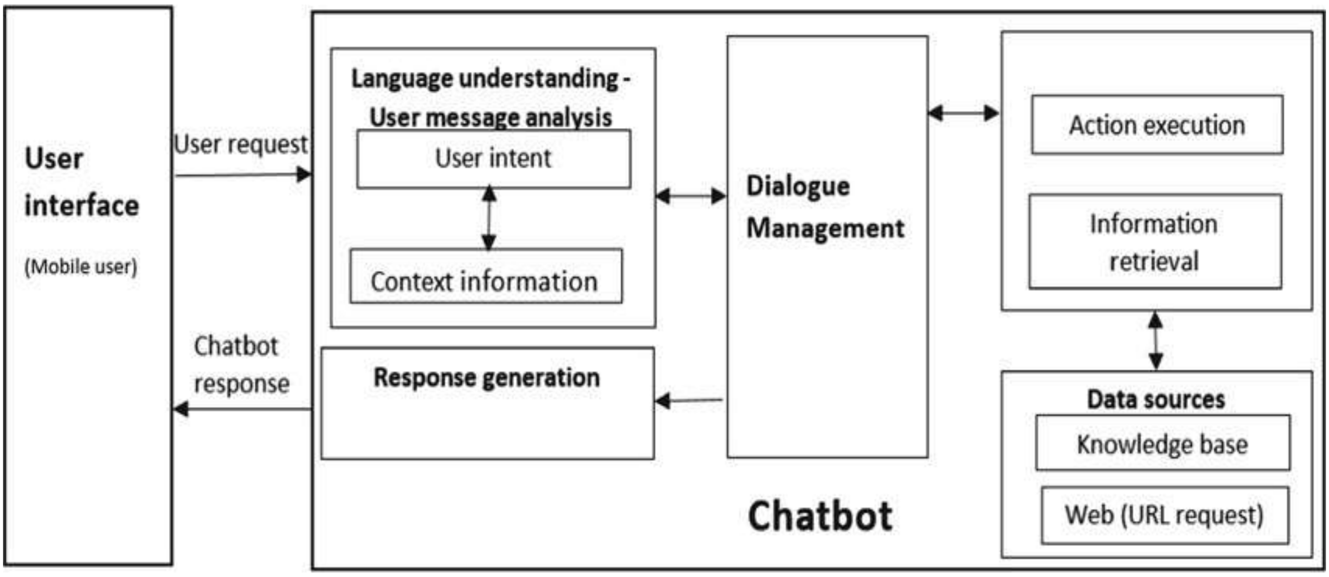

Fig. chatbot

V. PROPOSED SYSTEM

24/7 Availability: Chatbots can provide instant responses and support round the clock, enhancing customer service and user engagement.
Efficiency: Chatbots can handle multiple conversations simultaneously, improving efficiency and reducing waiting times for users.
Cost Savings: Automated interactions with chatbots reduce the need for human customer support, resulting in cost savings for businesses.
Consistent Responses: Chatbots provide consistent and accurate information to users, minimizing the risk of human error.
Instant Information: Chatbots can quickly retrieve and present information, helping users access relevant data without delays.
Scalability: Chatbots can scale easily toaccommodate increased user demand without significant resource allocation.

VI. CONCLUSION

The integration of a voice chatbot represents a significant advancement in conversational AI technology, offering a seamless and natural interaction between users and digital systems. Through the utilization of voice-based interfaces, the chatbot facilitates a more intuitive and user- friendly experience, eliminating the need for traditional text-based input. The project's exploration of voice chatbot technology has shown promising results, opening avenues for enhanced accessibility and engagement. The adaptability of voice interactions in diverse applications, from customer service to interactive learning, highlights the versatility and potential impact of this technology. As the project recognizes theimportance of continuous improvement and user feedback, the voice chatbot emerges as a dynamic tool with the capacity to evolve and meet evolving user needs. Overall, the project underscores the transformative role of voice chatbot technology in shaping the future of human-computer interactions, promising a more natural, efficient, and user-centric digital experience.

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INCLUSIVE PUBLIC TRANSPORTATION: A HOLISTIC APPROACH TO ACCESSIBILITY AND USEREXPERIENCE FOR VISUALLY IMPAIRED TRAVELERS

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Abstract— The integrated mobile solution for visually impaired individuals represents a cutting-edge technology designed to significantly enhance mobility and independence, particularly in the realm of public transportation. By leveraging artificial intelligence (AI) and location-based services, the system offers a comprehensive suite of features, including advanced bus number recognition, precise map navigation, and valuable information on key points of interest such as bus stops, restaurants, hospitals, banks/ATMs, educational institutions, and public buildings. In addition to its navigation capabilities, the system endeavors to assist visually impaired users in providing a holistic solution to improve overall accessibility and empower individuals in navigating both transportation systems and daily activities. This research paper explores the comprehensive scope, objectives, and technological components of this innovative solution, emphasizing its potential to positively impact thequality of life for visually impaired individuals.
Keywords: OCR, Edge detection, GPS.

I.INTRODUCTION

The primary purpose is to provide visually impaired individuals with equal access to essential services and public transportation. By recognizing bus numbers, identifying nearby points of interest, and offering navigation guidance, the system ensures that visually impaired individuals can participate more fully in society. The system empowers visually impaired users to navigate public transportation systems confidently. It assists in locating bus stops, reading bus numbers, and providing real-time information, reducing the risk of accidents or getting lost. The system's integration with various points of interest, such as restaurants, hospitals, banks/ATMs, educational institutions, and public buildings, enhances the quality of life by making daily tasks and activities more accessible and manageable.

The scope of the bus number recognition system for visually impaired individuals is comprehensive and focuses on enhancing accessibility, independence, and overall quality of life. The system's primary objectives include recognizing bus numbers through advanced AI and computer vision, assisting users in identifying the correct buses, and integrating seamlessly with mapping and navigation services to provide real-time directions and routes [17]. It will also identify nearby bus stops, provide essential bus stop information, and assist users in reaching their destinations efficiently. Furthermore, the system extends its capabilities to include locating nearby restaurants, hospitals, banks/ATMs, educational institutions, and public buildings, offering users valuable information, directions, and the ability to filter options based on their preferences. To ensure a user-friendly experience, the system supports various accessible means of interaction, such as voice commands, while prioritizing data security, privacy, scalability, and reliability. Extensive testing and quality assurance will be integral to the project to guarantee the accuracy and usability of all features, making the system an indispensable tool for visually impaired individuals seeking to navigate and access essential services seamlessly

II.METHODOLOGY

the essential details, making it easier for OCR to precisely identify and recognize bus numbers. This contributes to the overall accuracy of the system, ensuring visually

The Optical Character Recognition (OCR) component within the integrated mobile solution for visually impaired individuals plays a pivotal role in enhancing accessibility. The system's OCR functionality utilizes advanced artificial intelligence (AI) and computer vision techniques to recognize and announce bus numbers, facilitating independent navigation for visually impaired users

Here's an overview of the OCR information for the research paper:

OCR Component:

The OCR component, integral to the system's functionality, employs cutting-edge AI and computer vision techniques for recognizing text elements, specifically focusing on bus route numbers. This component, referred to as the 'Scanner,' captures and processes images, employing techniques like edge detection to enhance features and remove distortions. Following image processing, Optical Character Recognition (OCR) is applied to extract relevant text information, such as bus numbers, from the scanned images. This OCR process enables the system to effectively read and communicate bus route numbers to visually impaired users.

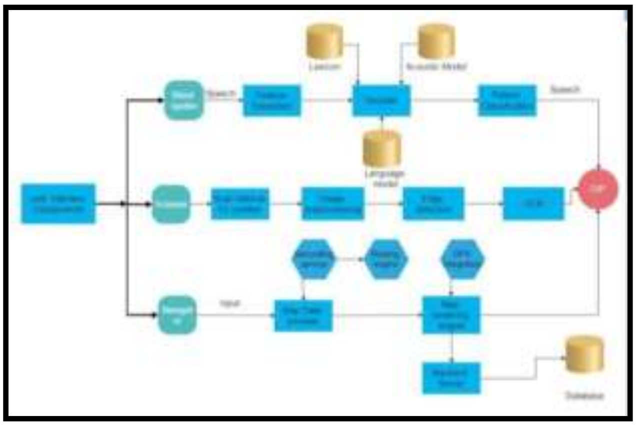
OCR Workflow:

1. Image Capture: The 'Scanner' captures images of vehicles, specifically designed for scanning bus route numbers.
2. Image Processing: Image processing techniques, including edge detection, enhance features and remove distortions to optimize text recognition.
3. Optical Character Recognition (OCR): After image processing, OCR is applied to extract text, such as bus route numbers, from the images [10].
4. Announcement: The recognized text is then announced to the visually impaired user, providing real-time information about bus numbers and ensuring accurate identification.
5. Edge Detection
6. Edge detection plays a crucial role in our project for visually impaired individuals, specifically in the bus number recognition system (Scanner). It serves to enhance image quality, reduce noise, and improve feature extraction for accurate Optical Character Recognition (OCR). By highlighting edges, the algorithm focuses on

7. impaired users can confidently and independently locate the correct buses with minimal risk of errors or misinterpretations.
8. Image Enhancement: Edge detection is crucial to improve image features and reduce distortions before recognizing bus numbers, enhancing clarity for accurate identification.
9. Noise Reduction: Edge detection filters out unnecessary details and noise in real-world images, ensuring accurate Optical Character Recognition (OCR) by focusing on essential bus number features.
10. Improved Feature Extraction: Edge detection isolates and emphasizes text or numbers on the bus, contributing to accurate feature extraction for precise OCR during recognition.
11. Facilitating OCR Processing: Identified edges guide the OCR algorithm, allowing it to focus specifically on highlighted edges, streamlining the identification and recognition of characters like bus numbers.
12. Enhancing Overall System Accuracy: Edge detection improves image quality and feature focus, crucial for the accuracy of the bus number recognition system. This enhances the confidence and independence of visually impaired users in identifying the correct bus.

III.MODELING AND ANALYSIS

The modeling and analysis for the bus number recognition system involve developing image processing models with edge detection algorithms to enhance clarity and reduce noise in real-world bus images. Integration of OCR with these processed images ensures accurate bus number identification. A feature extraction model emphasizes text edges on buses, contributing to precise OCR. The navigation and routing model integrates location-based services, while the user-friendly interaction model supports voice commands. Seamless integration with points of interest is achieved for enhanced accessibility. A robust testing and quality assurance model ensures accuracy and reliability, evaluating system performance in diverse scenarios, making the system an effective tool for
visually impaired individuals.



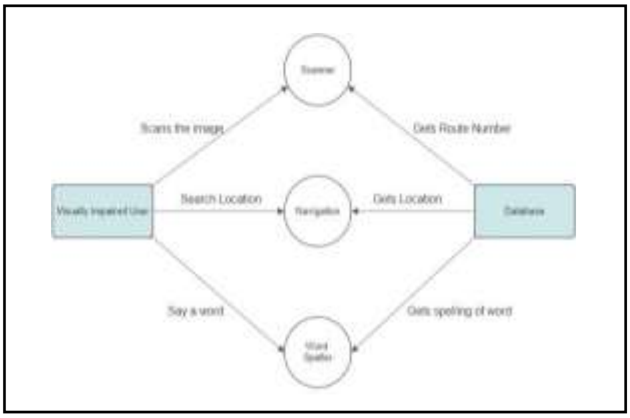


Figure 1: System Architecture

1. **Scanner:** The system uses artificial intelligence and computer vision techniques to recognize and announce the bus number to visually impaired users. This helps them locate and board the correct bus with ease, reducing the need for external assistance. The 'Scanner' will captureimages, specifically designed to scan vehicles fortheir bus route number. First the image will be processed to enhance features or remove distortions using edge detection. Optical Character Recognition (OCR) is used after edge detection to read text from images, such as numbers on a vehicle.
2. **Navigator:** The 'Navigator' is part of the system that deals with providing directions and routing. The system integrates with location-based services, such as the Google Maps API, to provide navigation guidance. It helps visually impaired individuals identify their current location, find nearby bus stops, and navigate to their desired destinations. It likely includes GPS technology to assist with real-time location tracking and guidance. It takes input directly from the 'Map Data Provider', which suggests that it uses both real-world scanning information and digital map data to function. The navigator would process this information, using a 'Routing Engine' to determine the best course of travel, and then integrate this with 'GPS Integration' for real- time navigation support. The processed navigation data likely contributes to the final output of the system, which could be visual directions on a map or spoken navigation cues.

Information about Points of Interest: The system integrates with various points of interest,such as restaurants, hospitals, banks/ATMs, educational institutions, and public buildings. It provides visually impaired users with information about these locations, making daily tasks and activities more accessible and manageable.

3. **Word Speller:** The system assists visually impaired individuals in spelling words correctly. This feature can be particularly helpful when they need to input or verify text information. The'Word Speller' refers to a component in a speech recognition system that takes spoken input and converts it into its corresponding spelled-out form. In the diagram, it receives speech input, which it sends to the 'Feature Extraction' process.This part of the speech recognition process where distinguishing features of the spoken words are extracted to be analyzed. Lexicon and Acoustic Model are databases which are used for speech recognition. The lexicon matches sounds to words, and the acoustic model interprets the audio signals. Decoder processes the extracted features using the lexicon and acoustic model to decode the spoken words into text. After speech is decoded, it goes through a pattern classification process, likely to understand the context or meaning [12].

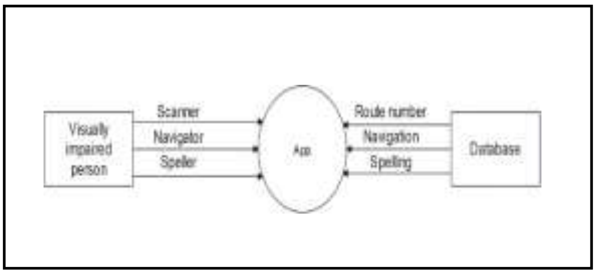


Figure 2: DFD Level 0

IV.RESULTS AND DISCUSSION

We have used Tesseract OCR for model image detection that yielded promising results with an achieved accuracy of 87%. Tesseract, an open-source OCR engine developed by Google, has proven effective in extracting text from images. In this scenario, the model was tasked with recognizing and extracting textual information from images, and the achieved accuracy of 87% reflects the ability to accurately decipher and interpret the text present in the images. The success can be attributed to Tesseract's robust character recognition capabilities, which enable it to handle various fonts, sizes, and styles of text. The 87% accuracy indicates a strong performance in accurately transcribing the textual content from the model images, showcasing Tesseract's suitability for OCR tasks in image- based data processing. Fine-tuning or preprocessing techniques may further enhance accuracy for specific use cases or challenging image conditions.

V. CONCLUSION

Our proposed framework for visually impaired people marks a significant advancement in utilizing technology to cater to their specific needs within the realm of public transportation. This cutting-edge solution, driven by a strong sense of social responsibility and a commitment to technological innovation, combines artificial intelligence and location-based services. By seamlessly integrating bus number recognition, maps navigation, and information about key points of interest, the system empowers individuals with visual impairments, facilitating independent use of public transportation and enhancing overall mobility. The incorporation of Optical Character Recognition (OCR) technology further extends its utility, enabling users to interact with textual information independently. This comprehensive and inclusive approach aims to reduce reliance on external assistance, fostering greater autonomy for visually impaired individuals.

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DISCOVER YOUR STRENGTHS WITH ACHIEVEAI'S NLP-POWERED PLATFORM

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Abstract: "AchieveAI: Uncover Your Strengths with NLP" addresses the escalating need for a transformative self-assessment platform in the digital age. This innovative web application allows users to upload academic and personal documents, utilizing advanced Natural Language Processing (NLP) algorithms for analysis. The paper outlines methodologies, technologies, and NLP algorithms, emphasizing the platform's significance in education, career development, and personal growth. "AchieveAI" generates personalized reports, evaluating strengths in key areas like communication skills and project ideation. By integrating NLP and machine learning, the project provides actionable insights, fostering personal and professional development with implications in education, human resources, and personal growth.
Keywords: AchieveAI, NLP, self-assessment, personal development, machine learning, education, career development, communication skills, project ideation.

I. INTRODUCTION

In the contemporary digital landscape, the exponential accumulation of personal and academic documents has brought to The fore the pressing need for a transformative self-assessment platform.This conference paper introduces "AchieveAI: Uncover Your Strengths with NLP," an innovative web application designed to address this need comprehensively. In an era marked by data abundance, this project redefines the boundaries of self-assessment and personal development. The significance of "AchieveAI" lies in its ability to harness the power of Natural Language Processing (NLP) and artificial intelligence (AI) to provide registered users with a dynamic, introspective journey.
Through the seamless uploading and analysis of an array of documents, including academic transcripts, certificates, and achievement records, this platform unlocks a deeper understanding of one's strengths and potential areas for growth [5]. By focusing on criteria such as communication skills, stage daring, and project ideation strengths, "AchieveAI" generates personalized reports that offer actionable insights, illuminating users' unique capabilities. This paper provides a comprehensive overview of the project's methodologies, technologies, and NLP algorithms, underlining its transformative potential in education, career development, and personal growth. As we navigate the complex terrain of personal and professional development, "AchieveAI" emerges as a beacon of empowerment, fostering self-awareness and offering a roadmap to unlock untapped potential. This conference paper explores the multifaceted contributions and prospects of "AchieveAI" in the context of self- assessment, NLP, and personal growth [4].

RELATED WORK

The development of "AchieveAI: Uncover Your Strengths with NLP" draws upon a substantial body of prior research in several related domains:
NLP in Document Analysis
A considerable body of research has delved into the application of Natural Language Processing (NLP) for text analysis. Research in sentiment analysis, keyword extraction, and entity recognition has been pivotal in shaping the NLP components of our project.

Personal Assessment Platforms
Previous projects and platforms have explored self- assessment and personal development. E-portfolios, career assessment tools, and digital resume builders have paved the way for our endeavor, indicating a growing need for comprehensive self-evaluation tools [2].

Educational Technology and E-Learning

The field of educational technology has seen an evolution in e-learning platforms and digital education tools. These have set a precedent for integrating technology into the educational and self-assessment processes, aligning with the educational applications of our project.

Web Development and User Interface Design
The realm of web development and user interface design has offered insights into building user-friendly interfaces. Lessons learned from previous projects in web design and user experience have informed the design of our application.

Machine Learning in Personalization
Projects focused on recommendation systems and personalization have demonstrated the power of machine learning in tailoring user experiences. Our project's recommendation of areas for improvement leverages the principles of machine learning in personalized guidance[3].

II. METHODOLOGY

The development of "AchieveAI: Uncover Your Strengths with NLP" involved a structured and systematic approach that integrated web development, NLP algorithms, and machine learning techniques. This section outlines the key steps and methodologies utilized in building the project:

Frontend Development

User Interface Design: The project began with the creation of a user-friendly web interface using HTML, CSS, and JavaScript. The design aimed to provide a seamless and intuitive experience for users.
User Registration: User registration and authentication mechanisms were implemented to ensure secure access to the platform.
Document Upload: The system was designed to allow users to upload a diverse range of documents, from academic transcripts to certificates and awards.
User Dashboard: A user dashboard was created to enable users to manage their uploaded documents and access the generated reports.
Report Visualization: JavaScript libraries were utilized to visualize and present the data in the generated reports, ensuring a user-friendly and interactive display.

Backend Development

Database Setup: A secure database system (e.g., MySQL) was established to store user data, uploaded documents, and generated reports.
API Development: Backend APIs were developed using a framework such as Node.js with Express.js.
Integration with NLP Algorithms: NLP algorithms and libraries such as spaCy and NLTK were integrated into the backend to analyze document content and extract valuable insights.
Report Generation: A module was developed to create personalized reports based on the results of NLP analysis.
User Management: Functionalities for managing user accounts, including profile updates and password resets, were integrated into the backend.

I. NLP Algorithms

Text Preprocessing: Document content underwent preprocessing to clean and format text for analysis.
Sentiment Analysis: Sentiment analysis was applied to assess the emotional tone expressed within the documents.
Keyword Extraction: Keywords and key phrases were extracted to highlight significant achievements and skills.
Named Entity Recognition (NER): NER algorithms identified and classified important entities within the text, such as names of people, organizations, and places.
Classification Algorithms: Classification algorithms categorized strengths into specific domains, such as communication skills, project ideation, and other criteria.

This structured methodology ensured the development of "AchieveAI" as a comprehensive and user-centric platform that merges web development, NLP capabilities, and machine learning techniques to offer actionable insights into individual strengths and areas for improvement [1].

III.DISCUSSION

The development and implementation of "AchieveAI: Uncover Your Strengths with NLP" represent a significant step towards empowering individuals with a transformative self-assessment tool. In this discussion, we delve into the multifaceted implications and the potential contributions of this innovative platform.

Firstly, "AchieveAI" is poised to bridge the gap between the digital age and personal development. In an era marked by data abundance, the ability to comprehensively analyze and extract meaningful insights from diverse documents, spanning academic transcripts to achievement certificates, is of paramount significance. The integration of Natural Language Processing (NLP) algorithms, coupled with machine learning techniques, offers users a unique opportunity to reflect on their strengths and potential areas for growth.

From an educational perspective, "AchieveAI" holds the potential to reshape the way students approach their learning journeys. By providing personalized reports that pinpoint their communication skills, stage daring, and project ideation strengths, students can make more informed decisions about their educational and career paths. Similarly, for professionals, the platform offers a critical self-assessment mechanism to enhance career development. The discussion extends to the implications for the broader context of NLP and AI. The successful integration of NLP algorithms into a user-friendly web application signifies the practical applications of NLP in personal development, education, and professional growth.

IV.CONCLUSION

In an era defined by the digital transformation of our daily lives, "AchieveAI: Uncover Your Strengths with NLP" stands as a pioneering platform with the potential to reshape how individuals perceive their personal and academic achievements. This conference paper has presented the development, methodologies, and implications of "AchieveAI," and it is evident that this innovative web application brings forth a multitude of possibilities. The significance of this project lies not only in its sophisticated integration of Natural Language Processing (NLP) algorithms and AI but also in its user- centric design. "AchieveAI" provides a simple yet powerful means for individuals to gain insights into their strengths and areas for improvement. By analyzing a wide spectrum of documents, from academic transcripts to certificates and beyond, users can uncover facets of their achievements they might have overlooked. For educational institutions, "AchieveAI" offers an invaluable tool for career counseling and student development. For professionals, it provides a path to self-improvement and career advancement. In the context of NLP and AI, this project demonstrates the real-world applications of these technologies in enhancing personal development. The journey of "AchieveAI" is far from over; it is a testament to the ongoing evolution of technology in serving individuals' needs. As we stand at the intersection of digital innovation and personal growth, "AchieveAI" emerges as a beacon, illuminating the way forward for individuals looking to understand and maximize their unique potential. In doing so, it not only addresses the immediate problem of self-assessment but also signifies the promise of a more informed, empowered, and confident generation.

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5G AND BEYOND COMMUNICATION

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Abstract:

This article provides an overview of the 5[th] Generation of cellular communication (5G) and beyond. It present the transmission techniques of current 5G communication and those expected of future development .study of non-orthogonal multiple access(NOMA) using the single carrier with frequency domain equalization block transmission technique, evidencing its value in terms of spectral efficiency. An introduction to 6[th] generation of cellular communication (6G) is also provided. The 5G mobile networks have revolution of communication but are not yet realized globally. The 5G promises to provide higher data rates, higher capacity, low latency, massive devices connectivity consists QoE (quality of experience), reduced cost as compared with 4G and take mobile communication to a new standard. The communication industry is rapidly advancing towards 5G and beyond 5G (B5G) wireless technologies in order to fulfill the ever –growth needs for higher data rates and improved quality –of –service (QoS).

Keywords: 5G mobile communication, computer architecture, MIMO communication, antenna array, microprocessor, NOMA, IoT, millimeter wave.

I. INTRODUCTION

Artificial intelligence for 5G and beyond 5G implementations, algorithm and optimizations. Wireless communications and networks for 5G and beyond enables to access various multimedia services such as stored multimedia (e.g. Video on demand),live streaming (e.g. Internet live sport networks, internet radio station) and real-time interactive streaming (e.g. Online games, video conference ,e-education). Consequently wireless communications technology has rapidly gain a role become an important aspect of life. There is a strong, credible body of evidence, suggesting that mobile network operators are facing many formidable task.5G cellular network which achieve 1000 times data rates,50 billion devices connected to internet. Data rates are projected to increase by factor of ten every year. IoT connected trillion of devices across the globe. Wireless communication and network of 5G and beyond.

II. RELATED WORK

Today 5G support human to human (H2H) interaction data for multimedia content and signal exchange. Providing full function for IoT when combining device to device (D2D) communication, collecting of sensing data, data analyzing during an interaction.

QoS / QoE mechanism for wireless communication and networking 5G wireless heterogeneous network design and optimizing 5G cognitive network and IoT, experimental result prototype and test beds for 5G wireless communication provide security and privacy. NOMA Full duplex, massive MIMO, and green 5G multimedia upcoming 5G wireless network joint design shown in Fig no 1. The 5G is based on OFDM (Orthogonal frequency-division multiplexing), a method of modulating a digital signal across several different channels to reduce interference. 5G uses wider bandwidth technologies such as sub -6 GHz and5G NR air interface alongside OFDM principles. 5G also uses wider bandwidth technologies such as sub-6 GHz and mm Wave.

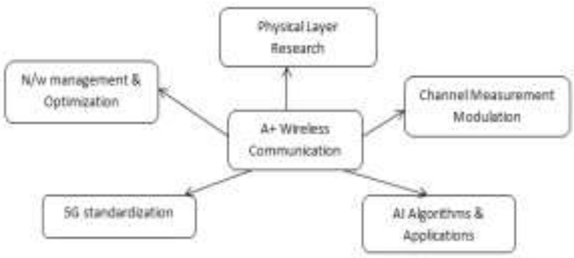

Fig no 1: Artificial intelligence enables wireless networking

The 5G protocol is designed more efficient, reliable and secure than previous generation of wireless technology such as 4G LTE .it is based on the latest advancement in technology including artificial intelligence, edge computing and internet of things (IoT), increase friendliness and higher data rates are achieved when 5g-tcp is employed in predefined simulation environment protocol defined to be used in future 5G data networks engaged MAC Layer. It defined several response functions for variety of speed up to 400 Gbps.

The 5G Network Architecture: the architecture of the 5G network is based on three main components: the User Equipment (UE), the radio access network (RAN) and core network (CN). The UE is device that connects to 5G networks.

III. BEYOND 5G COMMUNICATIONS

As the commercial deployment of 5G of cellular networks (5G) is well underway in many countries the world. Academia and industrial research organization turn their attention to comes next develop a new cellular communication standard. Foundation for 6G and moving from 4G to 5G changes to physical layer support a set of diverse application with different throughputs and latency and reliability requirement thanks to flexible OFDM by supporting large bandwidth and antenna array at base station that is massive MIMO.

The 6G will be driven of mixed past trends. 5G services have been commercially deployed since 2019 but realize the benefits of ultra-high speed and ultra-lowlatency by technology in carrier aggregation which boosts communication throughput utilizing multiple frequency bands simultaneously and TDK's ultra-compact DC-DC converters are helping to bring it reality by powering the FPGA's and next generation chipsets in networks.

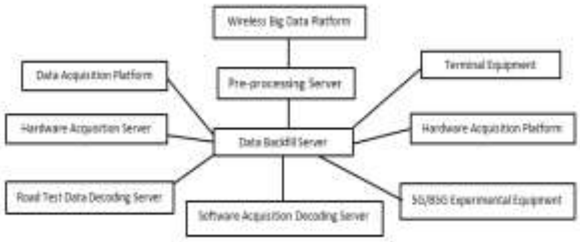

Fig 2: 5G/B5G Intelligent network.

Challenges facing carrier aggregation –

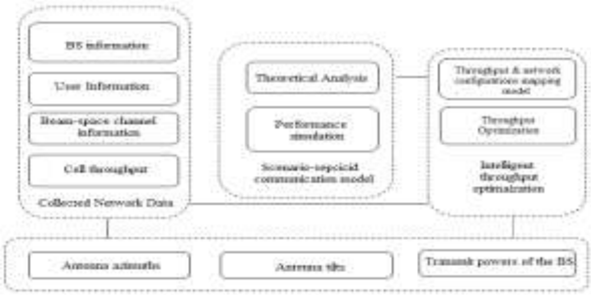

Fig 3: Schematic diagram of the intelligent throughput optimization approach.

IV. A key technology in beyond 5G

A 5th generation mobile communication services rolled out globally around 2020 people benefits of 5g to improve our lives and society more substantially numerous challenges remain addressed, including the build out of base system based on 5G and featuring even advanced capability referred to beyond 5G around 2023 .reliability against security threats and disaster autonomy that allows working together without human.

V. Overview of Beyond 5G

This refers to mobile communication system that follows 5G features capability that will drive new value creation such as ultra-low power consumption high speed**.** 6G smart network and services industry association -5G and beyond 5G ecosystem business model .application of block chain in 5G and beyond network ,taxonomy ,field –trials ,challenges and opportunities.

VI. 5G Specifications

- Up to 10 Gbps data rate -10 to 100x speed improvement over 4G and 4.5G network.
- 1-millisecond latency
- 1000x bandwidth per unit area
- Up to 100x number of connected devices per unit area (compact with 4G LTE)
- 99.999% availability
- 100% coverage
- Up to 10 year battery life for low-power IoT device.
- 5G IS 10 *100 FATER THAN 4G

VII. WHAT MAKES 5G faster

According to communication the shorter the frequency the larger the bandwidth. Using shorter frequency (millimeter wave between 30 GHz and 300GHz) for 5G network is 5G faster high speed 5G spectrum provides the expected boost in speed and capacity, low latency and quality.

VIII. HOW FASTER IS 5G

- Use cases associated with low latency are: V2X (vehicle-to-everything) communication: V2V (vehicle-to-vehicle) V2I (vehicle-to-infrastructure) autonomous, connected cars, immersive virtual reality gaming (5Gwill bring VR to masses), remote surgical operations, simultaneous translating.

- Fixed wireless access(from 2018-2019 onwards)
- Enhanced mobile broadband with 4G fallback (from 2019-2020-2021)
- Massive M2M /IoT (from 2021-2022)
- Ultra-low –latency IoT critical communication (FROM 2024-2025).

IX. 5G Rollouts

Over 4 years since its launch 5G technology has significantly matured, achieving broader and faster coverage.as of June 2023 5G has reached 1.1.billion subscriptions globally, with an addition of 125 million in the first quarter 240 services provides have

established 5G network and 35 have launched 5G standalone network.as of early 2023 users have over 700 5G smartphone models to choose from GSMA intelligence predict rapid 5G expansion with 2 billion by 2025 outpacing 3G and 4G rollouts. By 2028, 5G is expected to encompass 4.6 billion subscriptions, overtaking half of all mobile subscriptions

X. 5G in India

India Telco's started their 5G rollouts in October 2022 the number of users now exceeds 100 million according to the main operators Bharati Airtel and Reliance Jio driving the push its one –sixth of the 600 million phone users according to the GSMA median 5G download speed are 25 faster than 4G in the country**.**

XI. What's the relation between 5G and satellites?

A new generation of satellites will bring on board 5G capabilities to ensure full 5G coverage of the earth and terrestrial mobile 5G networks. With space –based system offer higher accessibility, reliability resilience and broadcasting and multi-broadcasting capability.5G support a wide variety of application (e.g. Agriculture logistic public safety) so everybody in the world can be connected along with space the effort of 3Gpp to develop solution embracing the vision of a single global –based network fully integrated with mobile operators G network. With the increased impact of IoT services the need for 5g security privacy and trust will be as strong as for 4g if not stronger.

XII. How will 5G network use cases change the world: its set to change our world many ways?

Healthcare: imagine having a doctor appointment over a crystal –clear video call or surgeons operating remotely with robotics precision -5G makes it possible with its fast and stable connection.

Smart Cities: city life will become more efficient as 5G helps manage traffic hanks to the quick reliable data 5G can used.

Driverless Car: these vehicles will be able to communicate with each other to avoid accident and ease traffic thanks to quick and reliable data 5G can send.

Manufacturing: factories will become more automated and efficient.

Education: student should take virtual trips or get hands on with complex subject through arguments reality all facility by 5G speedy connections.

Energy: managing power grid more helping

Emergency services: faster communication

Conclusion: Although the network key performance indicators of the 5th G mobile network have been optimized to support drone use cases for both high data rates and low latency application ,future aerial transport system will require stricter network key performance indicators to support the expected massive.5G network have revolutionized communication has improve 5G mobile devices provide higher data rates, higher capacity, low latency, massive device connectivity consistent QoE (quality of experience) reduce cost compare with 4G.

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A DATA-DRIVEN APPROACH USING PLACEMENT ASSISTANCE SYSTEMS

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Abstract - Information systems based on computers are made to enhance current systems. Since automated systems are becoming more and more advantageous, many manual processes are now automated. Colleges and other educational facilities needed their manual systems to work on computers because automated systems are now required. Placement automation is one such system that is crucial for recruiting on campuses. The goal of this project is to create a web application for the college's placement department. The college's placement officer can use this system as an application to manage the student data related to placement. Students who log in can upload a resume and their personal data. As a result, all of the data will be stored about the students, including their educational background, personal information, marks from their universities, and resume uploads. Students can view the training schedule and upcoming campus events after logging in. The system makes it easier for the college's placement officer to access student data. The chosen student's information, including their offer letter and company, can then be listed in another table by him. Through email, the placement officer can inform the students about the training schedule and campus. Colleges can use this system as an application to manage student records based on placement.

Keywords - Placement, Assistance System, Colleges, Diagrams.

I. INTRODUCTION

The main issue with the current system is that data filtering is done manually, takes a lot of time, and is subject to human error. The fact that the entire system must be maintained by hand makes it difficult and time-consuming to store, maintain, and retrieve information, which is one of the many problems with the current setup. The records were never kept in a methodical sequence. Information systems based on computers are made to enhance current systems. Since automated systems are becoming more and more advantageous, many manual processes are now automated. Colleges and other educational facilities needed their manual systems to work on computers because automated systems are now required. Placement automation is one such system that is crucial for recruiting on campuses. The purpose of this paper is to develop a web application for the college's Placement Department. The college's placement officer can use this system as an application to manage the student data related to placement. [1,2,3]

Students who log in can upload a resume and their personal data. As a result, all of the data will be stored about the students, including their educational background, personal information, marks from their universities, and resume uploads. Students can view the training schedule and upcoming campus events after logging in.

In terms of placement, the system facilitates access to student data for the college Placement Officer. Then he can create a table with the offer letter and company details of the chosen students. By emailing the students, the placement officer can inform them about the training schedule and campus. An application for managing student records based on placement can be used with this system by colleges.

II. LITERATURE REVIEW

Many researches have done study on placement management system as below:

Nicholine et al. has presented system allows the students in the college to view a list of companies who have posted for vacancy. The admin has the complete control over the system and can modify/delete anything that doesn't meet the standards of the college management. The system maintains the database of the students as well as the company details efficiently and displays the data to the respective ends.

Banu et al. has studied system can be used by institutions to manage student information and placement details. Students should be able to access their accounts and upload their work. This project helps students to keep track of their personal and academic information. It saves time by decreasing manual labor and reducing the amount of paper used.

Dhopavkar et al. has presented the details about development of a "Training & Placement Portal" system. The objective to develop such system is to automate the Training and Placement management system. This developed system helps students and people working at the Training and Placement cell to easily carry out regular tasks with high precision and in less time.
Thai-Nghehs et al. presented One of the educational data mining tasks is predicting student performance (PSP), where the goal is to determine the students' level of knowledge and their ability to complete the tasks (or exercises) correctly.
Jose et al. has presented creating an application for the college's placement office. The system is an application that, with the right login enabled, can be accessed and used efficiently across the entire organization. It can also be used as an application by the college's placement officers to manage student placement data, which cuts down on manual labor and paper consumption. Additionally, the system allows users to view the student's academic and personal data

NEED OF PLACEMENT ASSISTANCE SYSTEMS

Since the entire system had to be maintained by hand, the process of storing, maintaining, and retrieving the information was very time-consuming and laborious. The old manual system had a number of disadvantages. The records were never kept in a methodical sequence. It used to be very difficult to connect any given transaction with a specific context. Report generation would never exist; one had to search through various registers and documents in order to find any information. When entering and retrieving records, time would always be spent needlessly. Another issue was how challenging it was to identify mistakes made when entering the records. It was very difficult to update the records once they were entered. [4,5,6]

III. PROPOSED SYSTEM

This paper is aimed at creating a web application for the college's Placement Division. All of the schedule and events are accessible to everyone as soon as you launch the front end of this web application. There are three primary categories of users: students, college placement officers (administrators), and department staff. Being the master user, the administrator has more priorities than any other user. The duties involved in the role of Placement Officer include viewing all student information, creating and sending notifications, adding department personnel, and viewing specific student information. Placement Officer after login will be able to see admin panel where he will have number of options to go with. He can view details of all registered students of respective departments. He will mark the students who are selected in recent campus drive. He will also be able to view the non-selected students list. Placement Officer will have a right to add one department staff called sub admin of each department with their Name, Email, contact number and department. This sub admin will have authentication to view all registered students of his department. He can also view the notification sent by Placement Officer. [7,8]

Student registration will be the very primary work to do by the students in this system. Every student will register independently, and each student will have a unique profile. There is need to register their all details like personal details, academic details, Email, contact number etc. Only the registered students can log in to student panel. Students when logged in will go to their student panel. Students will have the options of View new notification; view their own profile; to download their CV uploaded at the time of registration and editing previous details. Students can edit their Resume and update them constantly. Students can look up and view company and vacancy details with a great deal of flexibility. Students have access to online resources that are relevant to them. The current student will benefit from this since other students will be sharing their ideas. Additionally, students will use the system to read important announcements in the newly created notification field, get information on assessments, and view the system-recorded results of assessments. Every user submitted a unique authorization. Furthermore, the Placement Officer has the ability to search for eligible students based on company criteria and produce a list of them. The system has the ability to automatically email the qualified student. All students for whom the Placement Officer has the necessary authorizations can have their information gathered. In the cutthroat world of today, this aids the organization in winning the war.

SYSTEM DESIGN

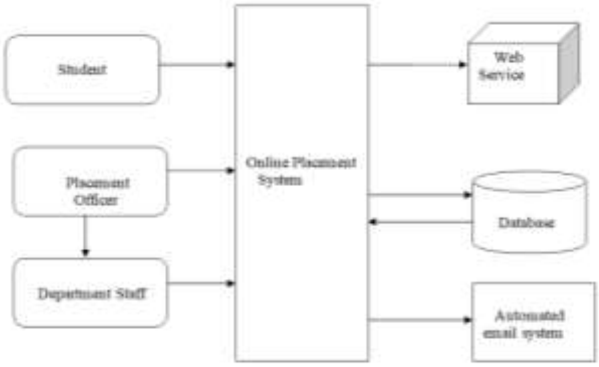

Fig. 1 Block diagram for Online Placement System

The administration module, student module, and department staff module are the three modules that make up the system. Every login module has an identical login page with a user ID and password field; the user must log in to the system by entering a value in those fields shown by above figure 1. [2]

1) Student: The notification appears on the homepage of the student module after the student logs in. Adding all the information allows them to manage the profile. The resources uploaded by users are available for download.
2) Placement Officer: The Placement Officer has the ability to create company schedules and events and upload them to the front page and every student's login. They have the option to get in touch with the business and request detailed information.
3) Department Employees: A single authorized employee may sign up for an account on the system. Any notice that the placement officer sends out is visible to the staff. Workers' logins allow them to view the schedule or event. An enrolled student's status is visible to staff.

A. USECASE DIAGRAM:

Use case diagrams show the relationships between the actors and use cases. The system or subsystem of an application is modeled using the diagram. Specific system functionality is captured in a single use case diagram. As a result, several use case diagrams are used to model the complete system.

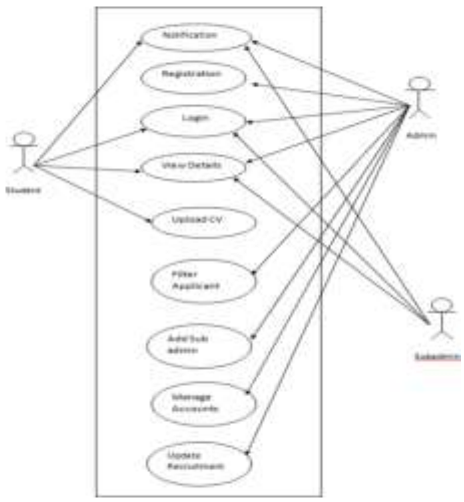

Fig. 2 Usecase diagram for Online Placement System

B. SEQUENCE DIAGRAM:

An interaction's participants and the messages that flow between them are depicted in a sequence diagram. A sequence diagram illustrates how an actor and system interact to carry out all or a portion of a use case. Figure. The Admin Login Flow Chart's Sequence Diagram 3 essentially depicts a collection of classes, interfaces, partnerships, and the connections that exist between these classes and interfaces. Their primary purpose is to model object-oriented systems. In class models, classes, associations, and generalizations are the most crucial concepts. Groups of related objects are described by classes. A set of related connections between objects is referred to as an association.

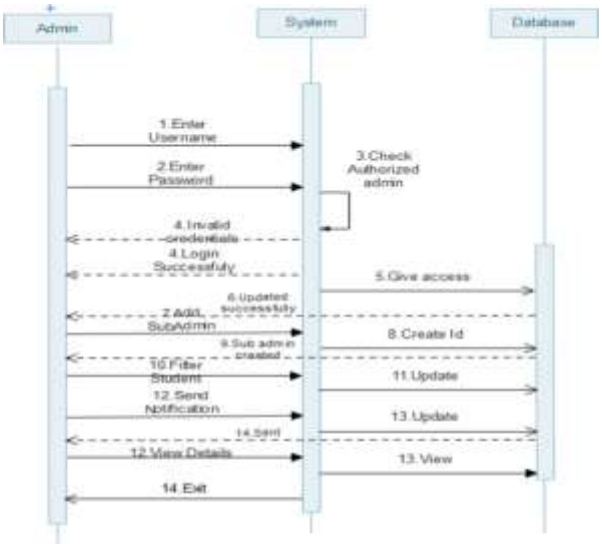

Fig. 3 Sequence diagram for Admin Login

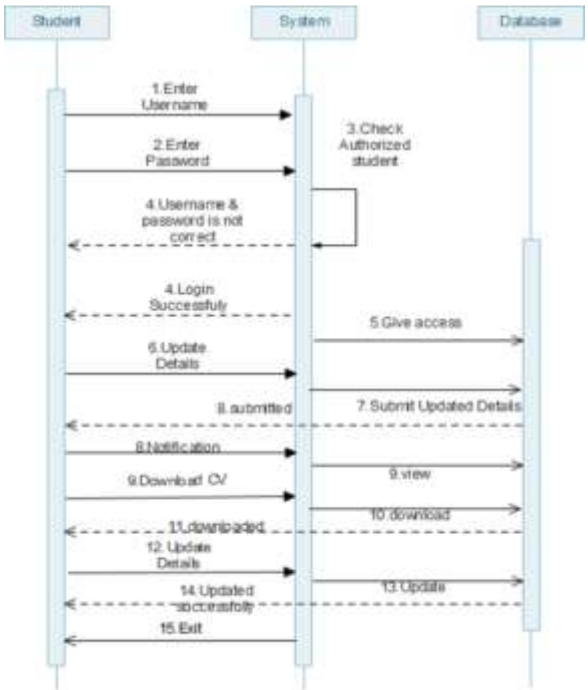

Fig. 4 Sequence diagram for Students Login

C. SOFTWARE DESIGN FLOW CHART:

A flow chart essentially displays a collection of classes, interfaces, teamwork, and the connections that exist between these classes and interfaces. They are primarily used in object-oriented system modeling. Classes, associations, and generalizations are the key concepts in class models. A class is a collection of related objects. Furthermore, association denotes a collection of related relationships between objects. [1]

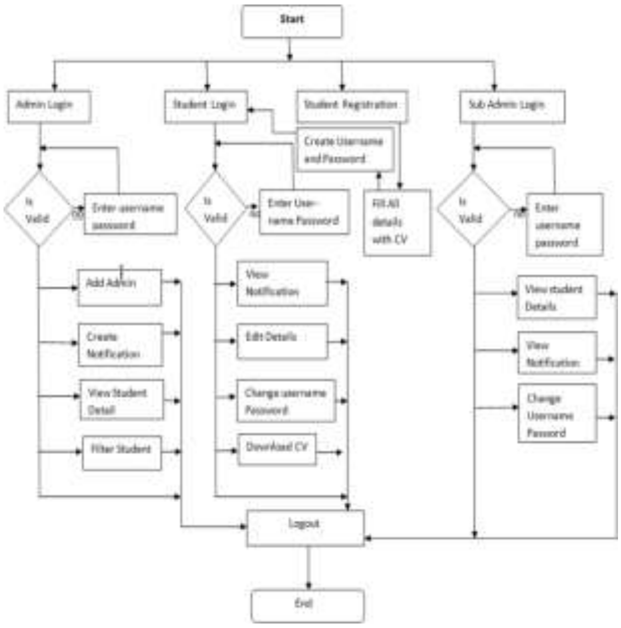

Fig. 5 Flow Chart for Software Design

D. SYSTEM ARCHITECTURE/ALGORITHM

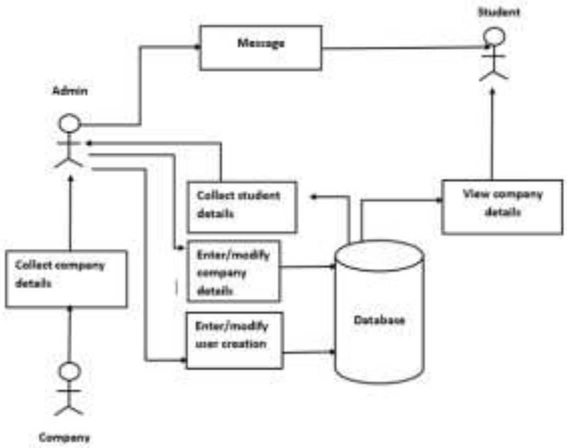

Fig. 6 System Architecture/Algorithm [1]

SOFTWARE IMPLEMENTATION

In 'Online Placement System' everything is made computerized where Placement Officer can send all campus and training schedules through the notification option provided in system to students via Emails. The Training and Placement officer can also add the departmental staff who will be the placement coordinator of the department. All the students need to register their all details like personal details and educational details at the time of registration. Only registered students are allowed to login. After login students will able to see new notification if available, download their CV, edit details and also can change login credentials. Hence the system is less labored and paperless.

II. RESULTS AND DISCUSSION

Student can create their profile by filling the form with valid information, once registered admin need to accept or reject the candidate profile by checking whether it is authorized user.

Fig. 7 Students profile dashboard

The role of the admin would be to oversee and manage the system's operations. The key responsibilities of an admin in a placement management system are data
management, system configuration, user management, analytics and reporting, security and compliance etc.

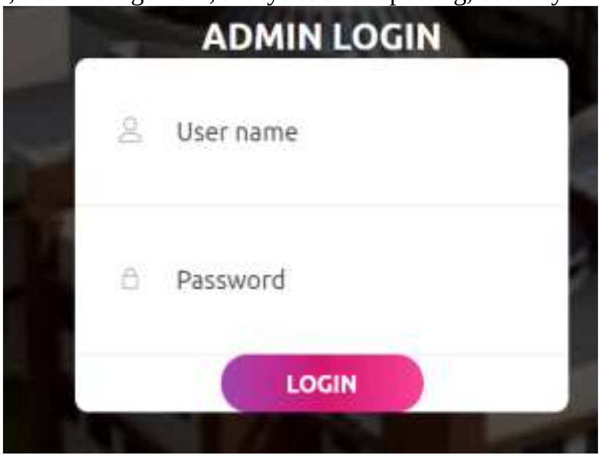

Fig. 8 Admin dashboard

After filling the data by the students the final results will be received in form of excel file shown below:

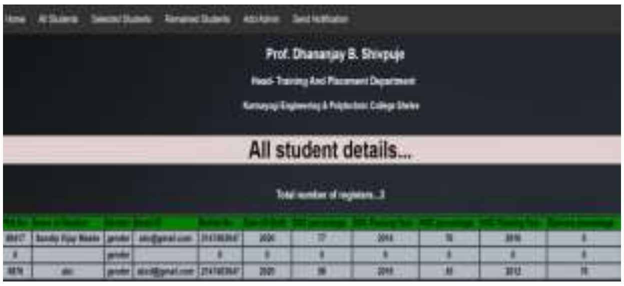

Fig. 9 Students data output

IV. CONCLUSION

The following conclusions are drawn through this study:

1. Any modifications to the current Placement system take time because it is primarily done by hand, prone to error, and complicated.
2. One of the main issues is the lack of a notification system for students other than the notice board, which makes it difficult to find, sort, and update student data.
3. The online enrollment process for every student is automated by the proposed system. It is possible for the administrator to view student data, create a student list based on company standards, give students access to company information, and quickly generate results by sorting students. In
4. During the recruitment process, the system's easy accessibility and portal functionality will aid in managing the allocation process.
5. We can expect there to be a high demand for these portals in the near future due to the growing need for digitalization in all facets of daily life and the comfort it will bring to everyone.

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ELECTRICAL ENGINEERING

Adaptive Load Frequency Controller using Fuzzy Logic Technique for Parallel Resonant SIC Inverter in Surface Hardening Application

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Abstract— For converting DC electrical power into AC inverters are preferred choice. They are constructed in various forms, size and types according to the requirements of the given application. The parallel resonant inverter with key element of resonant tank circuit which finds applications in various domains, including power supplies, renewable energy systems, and induction heating. The resonant tank circuit is used to achieve soft switching of switching devices which results in reduced switching losses and improved efficiency. However, parallel resonant inverters are susceptible to load transients which causes voltage fluctuations. Hence, this paper focuses on frequency control of parallel resonant inverter with fuzzy logic control. The principle of fuzzy logic control is used to frequency regulation which improves the dynamic response of the system. The details of MATLAB simulation and results are presented which demonstrates that the fuzzy logic control is a viable solution for enhancing frequency control in parallel resonant inverters, enabling them to meet the demanding requirements of modern power conversion systems.

Keywords: parallel resonant inverter, frequency control, fuzzy logic, induction heating

I.INTRODUCTION

The choice between a current source inverter (CSI) and a voltage source inverter (VSI) depends on the specific application and system requirements. Both types of inverters have their advantages and disadvantages. For induction heating applications, CSI is preferred over VSI on account of better current control compared to VSI, robustness to load variations, fault tolerance and low dv/dt stress on switching devices.

A parallel resonant inverter is a type of power electronic device that converts DC into AC at a certain frequency. It is commonly used in applications like power supplies, renewable energy systems, and induction heating. A parallel resonant inverter consists of a DC power supply, a switch or switching matrix, a parallel resonant circuit, and a load. The switch is controlled to turn on and off at the resonant frequency of the parallel resonant circuit. This causes the current in the circuit to flow in a sinusoidal manner, with zero voltage at the switch terminals. The parallel resonant circuit consists of an inductor and a capacitor. The inductor stores energy when the switch is turned on, and the capacitor releases this energy when the switch is turned off. The combination of the inductor and capacitor creates a resonant circuit, which has a single frequency at which it resonates. The load is connected to the parallel resonant circuit. The current from the parallel resonant circuit flows through the load, providing power to the load. The circuit diagram of a parallel resonant inverter is shown in figure 1.

In parallel resonant inverter, the switching frequency of the inverter is often determined by the LC tank circuit in the load side. The switching pulses are to be provided to the semiconductor switches i.e. MOSFETs such that the inverter can supply constant power to the load [1]. The parallel resonant circuit is used to improve the efficiency of the inverter by reducing the switching losses. The resonant circuit also helps to improve the electromagnetic compatibility of the system by reducing the emissions of the inverter [3]. The switching frequency of current fed parallel resonant inverter can be controlled with phase locked loop (PLL). The PLL compares the phase of the output voltage to the phase of the output current, and generates a control signal that is used to adjust the switching frequency. This allows the output power of the inverter to be controlled accurately, even in the presence of changes in the circuit parameters [2]. The laboratory setup [4] of parallel resonant inverter for induction heating consists of a full bridge series resonant inverter, a power supply, a load, and a controller. It is used for heating the metal work piece. If the frequency of the inverter is controlled, the temperature of the metal work piece can be controlled accordingly. A low-cost DSP based PI controller [5] can regulate the output voltage of the inverter accurately with high efficiency. The pulse density modulation [6] based controller always maintains soft switching condition irrespective of load variation and transfers maximum power to the induction heating load but It requires a high-speed DSP processor to generate and decode the pulse stream and can be susceptible to interference from other signals. The PLL based control [7] allows output power control by adjusting the on time i.e. duty cycle. For induction heating applications, to achieve precise temperature, frequency control is desired. The inverter efficiency is maximum at resonance and decreases significantly off resonance conditions [8]. Hence precise control of frequency is demanded for parallel resonant inverters. This paper describes fuzzy logic controlled current source parallel resonant inverter for induction heating applications. MATLAB simulation results are presented to demonstrate the tracking of resonant frequency.

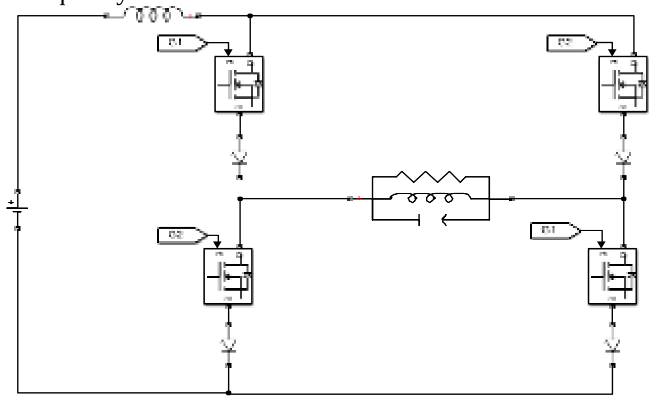

Fig. 1: circuit diagram of parallel resonant inverter

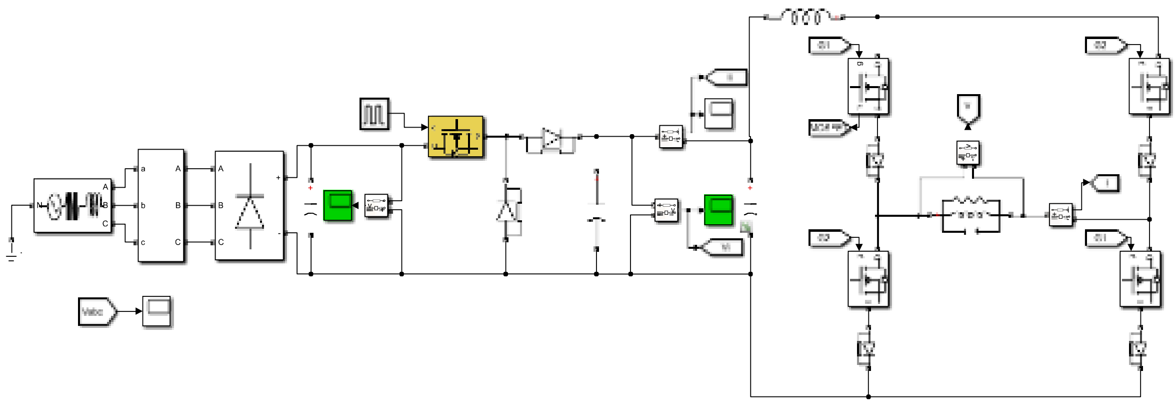

Fig. 2: MATLAB model of current source fed parallel resonant inverter.

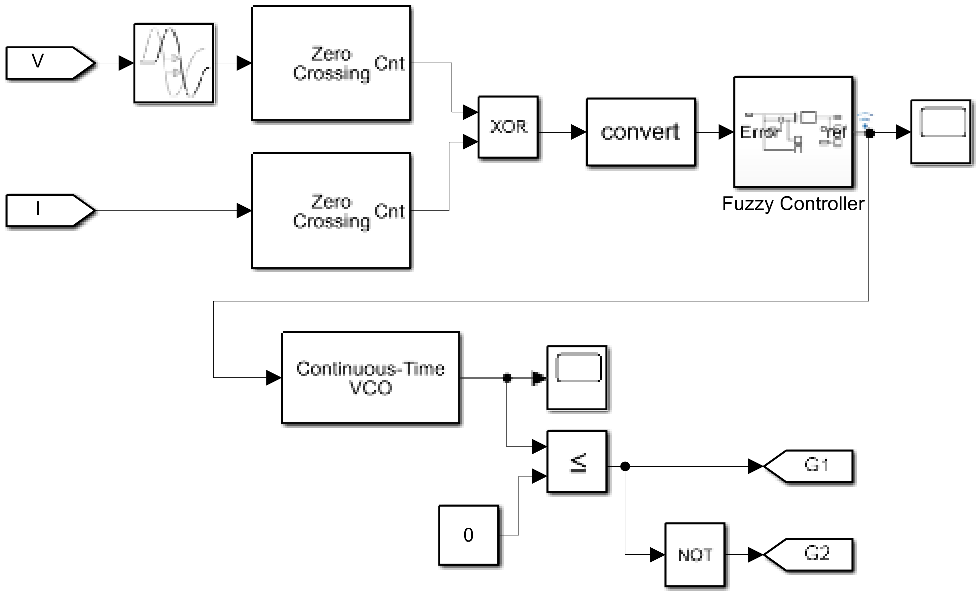

Fig. 3: Fuzzy logic controller-based control scheme.

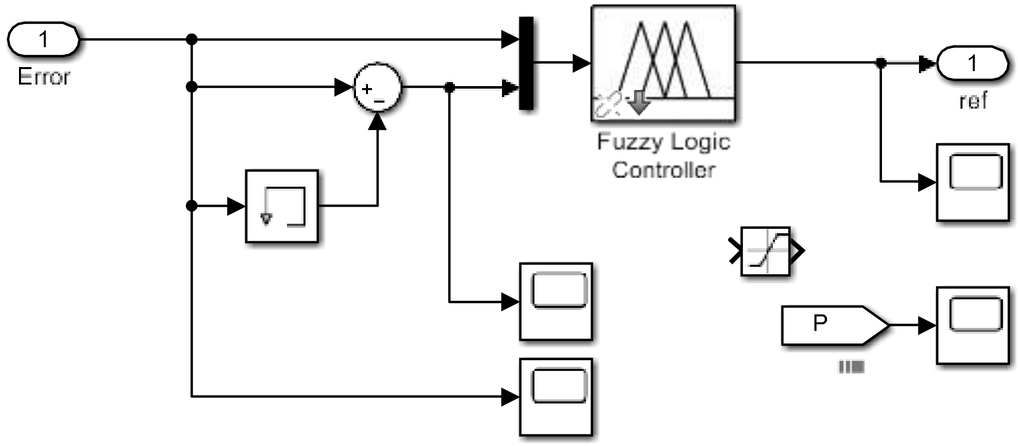

Fig. 4: Fuzzy logic controller.

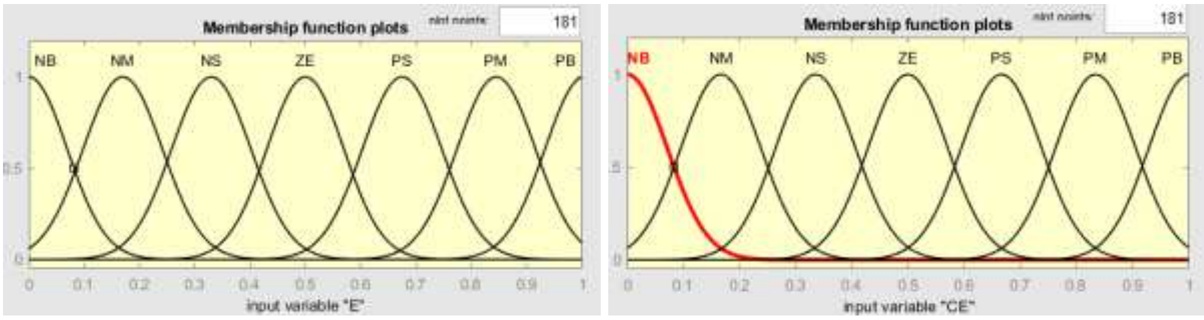

Fig. 5: Fuzzy membership function for error and change in error.

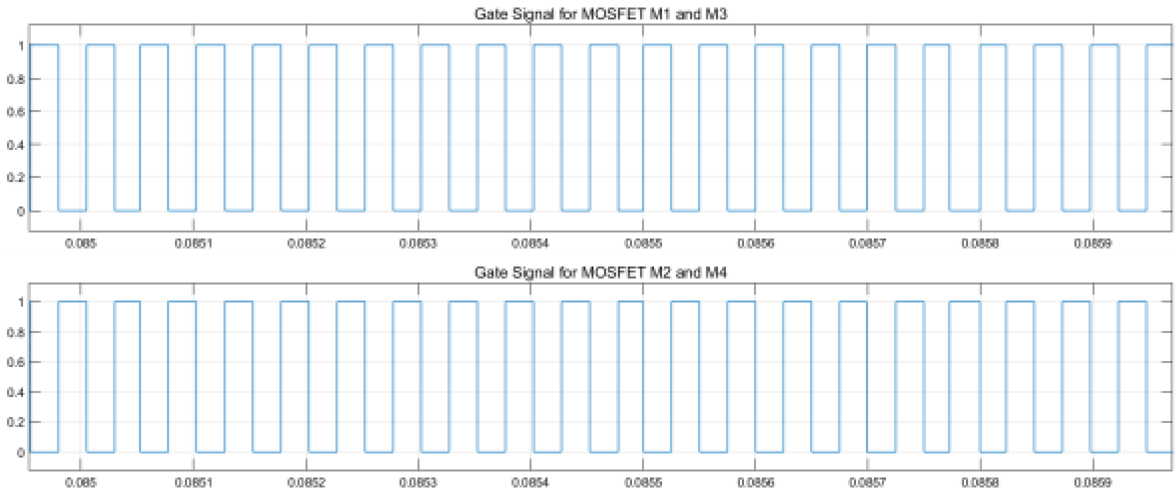

Fig. 6: Gate signals for MOSFET

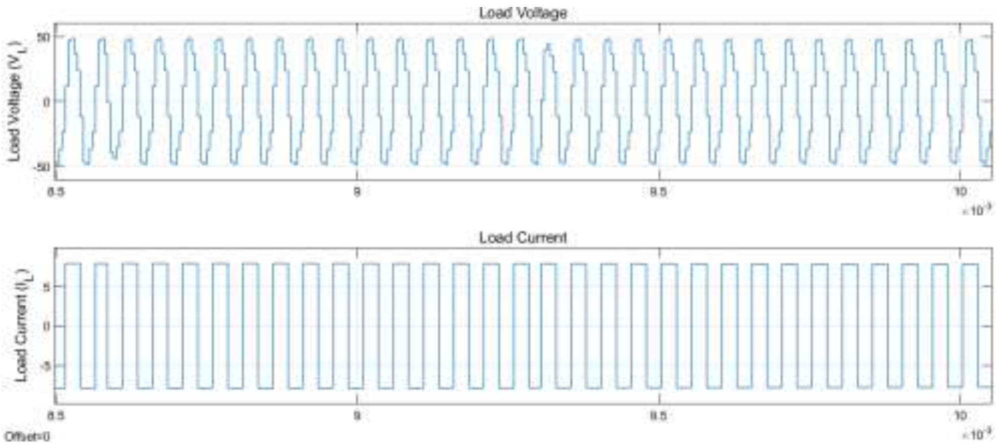

Fig. 7: Voltage and current waveforms

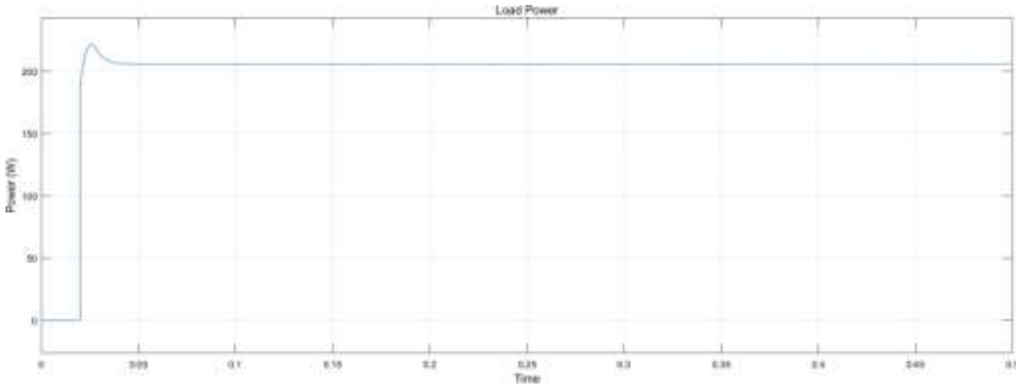

Fig. 8: Load Power

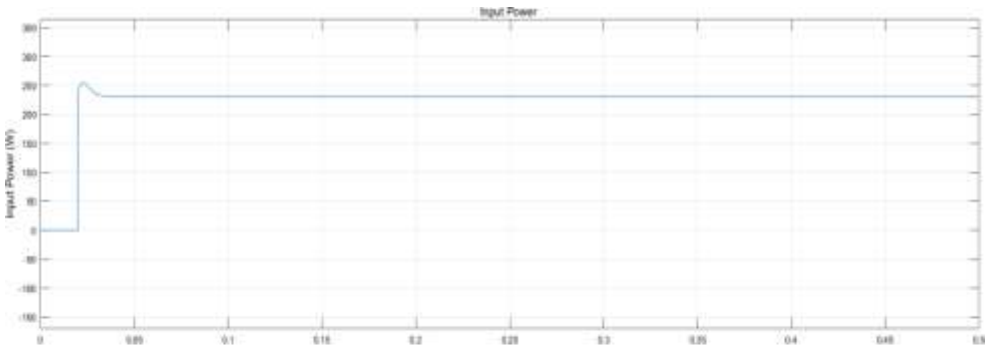

Fig. 9: Input Power

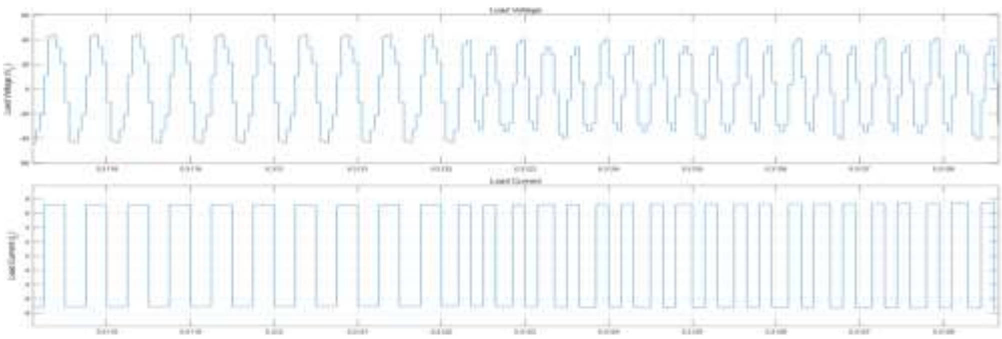

Fig. 10: Frequency change regulated by fuzzy logic controller at t= 0.3122s

I. PARALLEL RESONANT INVERTER

Figure 2 shows the MATLAB model of current source parallel resonant inverter. The system consist of a diode bridge rectifier to convert AC from grid into DC followed by a DC to DC converter. The DC to DC converter adjusts the DC voltage to the required value. A large inductor at the input side of the H-bridge is used to converter the voltage source into current source and hence making the current source fed parallel resonant inverter. The parallel resonance is obtained in the LC tank circuit. The fuzzy logic based controller is shown in figure 3. The X-OR gate acts asphase detector. It takes inputs from zero crossing detectors ofvoltage and current and produced a pulse whose pulse width is proportional to the phase difference between voltage and current. This phase difference is further give to a fuzzy logiccontroller as shown in figure 4. It processes this pulse width as error signal. Taking into account the fuzzy rule table of figure 5, the controller generates switching pulses for gate terminals of the MOSFET in the inverter bridge. The changes in frequency are tracked by the fuzzy logic controller based frequency controller and the system responds in single cycle. The change in frequency takes place whenever there is change in load. The efficiency of inverter with fuzzy logic based frequency control is observed to be 89.4%.

Table 1: Specifications of the parallel resonant inverter

Source	Voltage = 26V, 3 phase Frequency = 50Hz
Rectifier	Diode bridge rectifier with capacitor falter C1 = 2200μF
DC – DC Converter	Buck Converter with capacitor filter C2 = 1000 μF
Inductor for current source	20mH
Tank circuit and load	R = 5Ω,L = 63.33mH,C = 1 μF

III.CONCLUSION

Frequency control of a current source fed parallel resonant inverter with fuzzy logic control is discussed in this paper. The fuzzy logic controller for frequency control is effective in the regulation of switching frequency. The controller responds to change in load and regulates the frequency of parallel resonant inverter in single cycle. Thepractical implementation of the proposed controller can bemade with DSP controller.

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A Fuzzy based Approach for Battery Controller for Microgrid

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Abstract— This paper presents a fuzzy-based approach for designing a charging-discharging controller for lithium-ion batteries in microgrid applications. The goal is to enhance the efficiency and performance of battery systems within microgrids. The proposed controller utilizes fuzzy logic techniques to handle uncertainties and imprecise information, providing robust and adaptive control in real-time scenarios. The controller's fuzzy rules consider factors such as battery state of charge, load demand, and renewable energy availability to determine optimal charging and discharging strategies. Simulation results demonstrate the effectiveness of the fuzzy-based controller in improving battery utilization, ensuring stable microgrid operation, and enhancing overall system performance. This research contributes to the advancement of battery control strategies in microgrids, promoting more efficient and sustainable energy management systems.

Keywords— fuzzy logic, charging-discharging controller, lithium-ion battery, microgrid applications, efficiency, performance, robust control, adaptive control, battery state of charge, load demand, renewable energy, optimal strategies, simulation results, system performance, energy management.

I. INTRODUCTION

Lithium-ion batteries have become increasingly popular forenergy storage in microgrid applications due to their high energy density, long cycle life, and fast charging capabilities. Effective control of these batteries is essential to ensure efficient utilization and reliable operation within microgrid systems. However, traditional control methods like proportional-integral-derivative (PID) control often struggle to handle the uncertainties and dynamic nature of microgrid environments [1-3]. To address these challenges, fuzzy logic control has emerged as a promising alternative due to its abilityto handle imprecise and uncertain information.

The main objective of this research is to develop a charging- discharging controller for lithium-ion batteries in microgrid applications using a fuzzy-based approach. Fuzzy logic control offers advantages such as adaptability, robustness, and flexibility, making it well-suited for dynamic and complex microgrid scenarios. By incorporating fuzzy logic techniques, the controller can effectively handle uncertainties arising from variations in renewable energy availability, fluctuating load demand, and battery state of charge (SOC) fluctuations. [3-6]

The proposed fuzzy-based controller aims to optimize the charging and discharging strategies of the lithium-ion battery, considering multiple factors that influence battery performanceand microgrid operation. These factors include the current SOCof the battery, the demand for electrical energy from the microgrid, and the availability of renewable energy sources. The fuzzy rules embedded in the controller are carefully designed to adaptively adjust the battery charging and discharging rates based on real-time system conditions [7-8].

Simulation studies are conducted to evaluate theperformance of the proposed fuzzy-based controller comparedto traditional control methods. The simulation results demonstrate the superiority of the fuzzy-based approach in terms of battery utilization, microgrid stability, and overall system performance. The findings of this research contribute to the advancement of battery control strategies in microgridapplications, aiming to enhance the efficiency and sustainability of energy management systems [9].

In the subsequent sections, the methodology used for developing the fuzzy-based charging-discharging controller will be discussed in detail. The design considerations,formulation of fuzzy rules, and control algorithm will be elaborated upon. Following that, the simulation setup and experimental results will be presented and analysed. Finally, the paper will conclude with a summary of the achieved outcomes, limitations, and potential avenues for future researchin this field [10-12].

II. LITERATURE REVIEW

- The development of efficient charging-discharging controllers for lithium-ion batteries in microgrid applications has been the subject of extensive research in recent years. Numerous studies have investigated various control strategies and optimization techniques to improve battery performance, enhance microgrid stability, and achieve optimal energy management [13].
- One common approach in battery control is the use of PID control, which relies on proportional, integral, and derivative terms to regulate the charging and discharging processes. PID control has been widely applied in microgrid systems due to its simplicity and ease of implementation. However, it may struggle to adapt to changing operating conditions and handle uncertainties effectively [14].
- To overcome the limitations of PID control, researchers have turned to fuzzy logic control as an alternative. Fuzzy logic enables the representation of imprecise and uncertain information using linguistic variables and fuzzy rules. This allows for more robust and adaptive control in dynamic microgrid environments [15].
- Several studies have employed fuzzy logic techniques to develop charging-discharging controllers for lithium-ion batteries. For instance, Zhang et al. (2018) proposed a fuzzy-based controller that considered battery SOC, load demand, and renewable energy availability to optimize the battery operation in a microgrid. The results showed improved battery utilization and enhanced microgrid stability compared to traditional control methods.
- In another study by Li et al. (2019), a fuzzy logic-based energy management system was developed for a hybrid microgrid with renewable energy sources and energy storage. The fuzzy controller effectively regulated the battery charging and discharging rates based on real-time system conditions, leading to optimal battery utilization and improved energy management efficiency [16].
- Additionally, machine learning techniques, such as fuzzy neural networks and adaptive fuzzy systems, have been explored for battery control in microgrids. These approaches combine the advantages of fuzzy logic and neural networks to enhance control accuracy and adaptability. For example, Guo et al. (2020) proposed a fuzzy neural network-based controller for lithium-ion batteries in microgrids, achieving accurate and adaptive control under various operating conditions [17].
- Furthermore, optimization algorithms, including genetic algorithms and particle swarm optimization, have been integrated with fuzzy control to optimize battery charging and discharging strategies. These algorithms enable the search for optimal control parameters, considering multiple objectives such as battery lifespan, energy efficiency, and microgrid stability.
- Overall, the literature highlights the effectiveness of fuzzy- based charging-discharging controllers for lithium-ion batteries in microgrid applications. Fuzzy logic techniques offer robustness, adaptability, and the ability to handle uncertainties, leading to improved battery performance and microgrid operation. However, further research is still required to investigate advanced control strategies, optimization techniques, and integration with emerging technologies such as artificial intelligence and machine learning, to further enhance the capabilities of battery control in microgrids.

III. METHODOLOGY AND ALGORITHM

Figure 2 depicts a typical configuration of a PV panel, consisting of PV cell strings connected in series and divided into three sections by bypass diodes. These bypass diodes serve the purpose of preventing the occurrence of hot spots and protecting the PV module from potential damage. To ensure optimal performance, the PV module is combined with a maximum power point tracking (MPPT) converter.

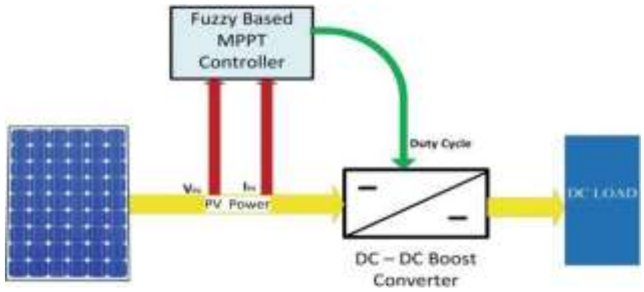

Fig 1 Fuzzy based MPPT of Photovoltaic power system.[6]

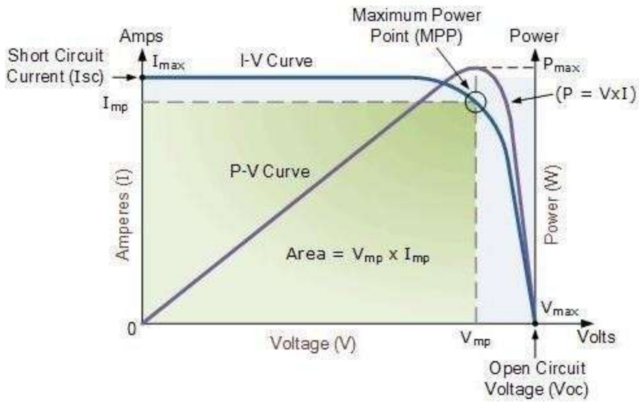

Fig 2 V-I Characteristics (Source: CPES) [7]

This converter continuously adjusts the operating point of the PV module to maintain it at the maximum power point. Consequently, the combination of the MPPT converter and the PV module acts as a constant power source, where the power output is determined by the peak power of the PV module. The output side of the converter accommodates a relatively wide range of voltage and current, allowing for series or parallel connection with other converters. Essentially, the distributed MPPT converter expands the range of voltage and current values, transforming the single voltage/current point of the PV panel into a broader range, as shown by the green solid curve in Figure 1[18-20].

In contrast, in traditional PV systems with a centralized MPPT architecture, any disturbance can cause a shift in the maximum power point of the module, resulting in a significant reduction in power output unless the module's output voltage is adjusted [21].

Currently, there is growing interest in the application of energy storage technologies in power systems. Energy storage options include various types of batteries, high-speed flywheels, supercapacitors, and regenerative fuel cells, each offering unique characteristics and being at different stages of development. Local energy storage systems can act as a buffer between variable supply and demand, supporting embedded generation from renewable sources. Depending on specific technical requirements and geographical conditions, utilities may choose to employ one or more of these technologies. Despite the existence of pumped storage plants in some utilities, little attention has been given to the potential roles of load management in filling demand troughs or reducing demand peaks. This approach enables a partial decoupling of energy production from energy consumption. Energy storage systems can serve similar functions as load management while also acting as a source of generation. They can replace costly and inefficient storage capabilities or facilitate load scheduling [22- 25].

IV. RESULT ANALYSIS

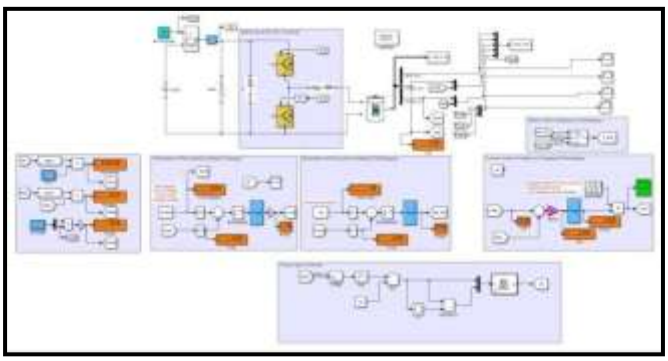

Fig. 3 Simulation of fuzzy control to maintain desired SOC of the battery [10].

Fuzzy control theory is specifically tailored for hybrid systems to achieve optimal system performance. In this context, the design criterion involves implementing maximum power point trackers for both the photovoltaic device and the wind turbine to ensure they operate at their respective maximum power points. Additionally, the control strategy considers the discrepancy between the actual load and the total generated power, with the Li-ion battery being involved in both charge and discharge modes. The lifetime of the battery is directly influenced by its state of charge (SOC). To enhance the battery's lifespan, fuzzy control is utilized to regulate and maintain the SOC of the battery. This fuzzy control approach contributes to prolonging the Li-ion battery's life while ensuring efficient energy management within the system [26].

•Simulation Results and Discussion

The proposed model has been validated and demonstrates efficient control of battery charging and discharging operations within a safe operating region. The analysis reveals that with variations in load demand, both simulation and experimental results exhibit similar trends of increasing or decreasing state of charge (SOC). However, there is a slight variation observed, which can be attributed to disparities in voltage fluctuations between the simulation and experimental setups [27].

Fig.4. Battery Current v/s Reference current.[8]

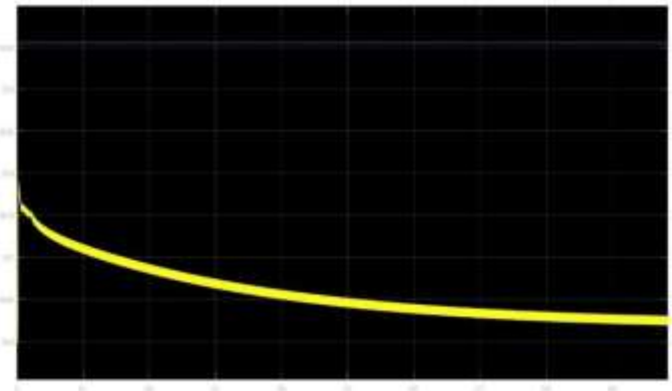

Fig.5 Battery Voltage v/s Reference Voltage.[15]

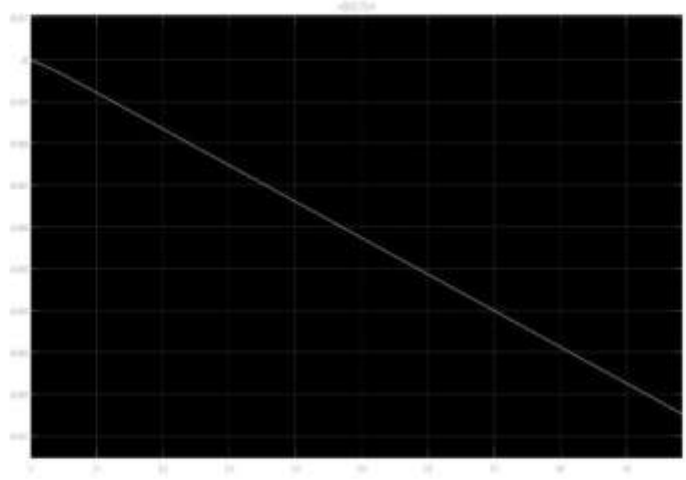

Fig.6 SOC of the battery [17]

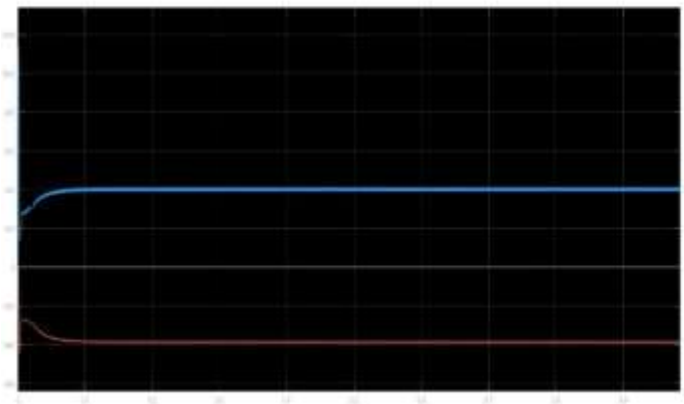

Fig.7 Power across Battery, Power load, Power reference using Fuzzy Logic controller [18].

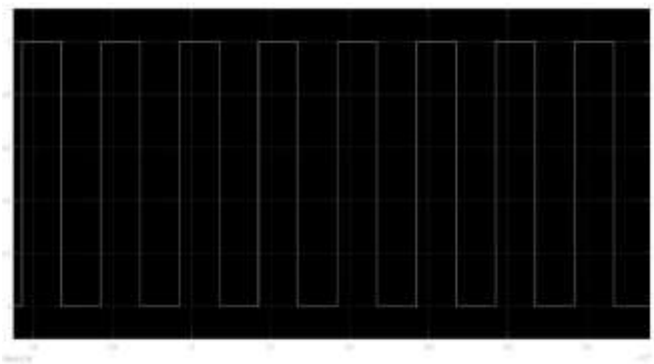

Fig.8 Gate Pulses applied across the converter using Fuzzy Logic Controller [25].

V. CONCLUSION

This paper introduces a fuzzy model based on the ampere hour technique to address the issue of balancing load demand with the available power supply from various sources and the state of charge (SOC) of the storage. The ampere hour technique model is chosen due to its widespread use for evaluating SOC and its ease of implementation. A fuzzy controller has been developed to regulate the charging and discharging of the battery within the safe operating range. A set of 25 carefully calibrated rules has been formulated, considering the load demand, available power from the microgrid

(MG), and battery SOC. To minimize grid energy consumption and optimize the utilization of the battery and distributed sources, the grid is only utilized during specific periods in the simulation. The thesis also investigates the SOC variation in response to different load fluctuations.

VI. FUTURE SCOPE

- The primary contribution of this study is the development of an enhanced fuzzy model and its implementation in a real-time application for controlling the charging and discharging of the battery.
- The proposed approach enables a seamless and uninterrupted operation of the battery's charging and discharging processes, aligning them with the available power sources and the load demand.

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Analysis of Electricity Consumption Using LSTM Model

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Abstract—Estimating the electrical demand is critical for grid planning. It is challenging to foresee electrical consumption since the amount of power used on the power grid varies with time. This study focuses on Karnataka state's electricity usage over a quarter period and created a data analysis model utilising ML algorithm to analyse energy consumption patterns. The proposed model trained using historical data from KPCL Karnataka, and the results were compared to auto regression and LSTM methods. The performance of the trained model evaluated by measuring MPE and RMSE values. This research assists companies in planning the production of electricity based on load demands, which improves the power quality and reliability of the grid.

Keywords— Electrical demand, grid planning, LSTM, auto regression, RMSE.

I. INTRODUCTION

The need for electrical power is growing every day; however, because India is an emerging nation, distributing electricity to all users is complex. The amount of electricity needed on the electrical system fluctuates over time; to satisfy this need, algorithms based on ML and AI are used to precisely forecast demand for loads. The advantages of demand predictions include reduced outages, losses, and total operating expenses, as well as enhanced resilience, security, and quality of power.

The rising use of energy in the distribution networks may jeopardise system resilience. So, to improve grid efficiency [1] presented forecasting power using DNN technique based on LSTM networks. This research work compares the LSTM and other models. [2] This research proposes a novel artificially intelligent neural network model for STLF that was evaluated in day and weekly forecasting, the model displayed accuracy and RMSE values. A new prediction model for small scale load prediction in buildings or sites has been proposed in [3]. An upgraded form of empirical mode decomposition (EMD), a new feature selection technique, and a hybrid forecast engine are used in the model. The effectiveness of the model is assessed using real-world engineering test cases. [4] Deep learning theory can help with day-ahead load projections for the future waste reduction, and generator unit placement. It uses stacked denoising auto-encoders to refine features from load data and SVM models. [5] This paper presents an AI-based RAP-NN for smart grid measurements, enhancing reliability and power quality by avoiding memory usage for recurrent updates, resulting in precise prediction parameters. [6] FE- SVR-mFFO hybrid technique improves real-time, accurate, and stable forecasting for smart grid strategic decisions by combining feature engineering and modified fire-fly optimization, outperforming benchmark frameworks in accuracy, stability, and convergence rate, as demonstrated by real-world load data. [7] The paper presents a system for predicting daily energy load in smart homes using LSTM and ARIMA models, with STDAN algorithm for improved accuracy. [8] This work examines accurate voltage fluctuation modelling and forecasting, with a focus on power-quality improvement and corrective device management. For precision, grey system theory-based models, such as the Fourier correction Grey Model, are used. [9] On three nonlinear electric load datasets, the paper analyses the multi-step forecasting performance of Auto-Regressive Integrated Moving Average (ARIMA) and Long-Short-Term-Memory (LSTM) based Recurrent Neural Networks models.

The proposed work uses KPCL Load curves for analysis of electricity consumption; it contains 360 hourly samples to predict the load. Load curves available at http://218.248.45.137:8282/LoadCurveUpload/lcdownloadvie w.asp".

Section 2 provides a literature /background, while Section 3 addresses the execution of load estimation using LSTM networks and presents results of different models for prediction. Section 4 presents the conclusion.

II. LITERATURE

- H. Dagdougui et al. [10] assessed the performance of neural network (ANN) in STLF on a Montreal campus, analysing hourly and daily forecasts for various building types. S. Hosein et al. [11]. This research investigates the use of DNN and other machine learning approaches to estimate STL consumption in a grid. Elvisa and Marijana [12]. This paper discusses machine-learning algorithms for STLF, including SVM, random forest regression, and LSTM network, with a fusion forecasting approach and data pretreatment technique.

- Ammar O et al. [13] The paper introduces a novel method for renewable power forecasting using a multicolumn radial basis function neural network, utilizing a modified error correction algorithm to speed up convergence. Stefan Hosein et al. [14] The study utilized ML techniques on SM data to calculate STLF in a power system, discuss variable pricing for peak load, and calculate MAPE.
- J. Zheng et al. [15] This study examines smart metres' position in the SG, concentrating on its functionality, electronic communications (RF and PLC), and current improvements. It also evaluates the current SM solutions offered by various firms and covers the regulations and growth aims of SG in different jurisdictions.
- N. T. Mbungu et al. [16]The research investigates the best planning and administration for power grids, with an emphasis on supply consistency and smart grid to minimise expenses, solve energy unpredictability, cut emissions, and satisfy growing energy needs.
- Hasmat Malik et al. [17] For smart load forecasting in today's electrical systems, a fuzzy-Q-learning-based FRL technique has been suggested, ensuring precise and steady energy production over long horizons with excellent prediction accuracy.
- Essallah et al. [18] The present investigation examines four LTLF approaches based on Tunisian electrical usage information, evaluating the accuracy of each as well as their pros and cons as a result of irregular and variable power demands.
- U. Singh et al. [19] For accurate forecasts, the work seeks to forecast short-term loads for as long as seven days in advance utilising Naive Bayes, and Deep Learning algorithms [20] The article demonstrates the progress of neural network-based predictions in electrical technology. by showing uses such as problem evaluation, status tracking, and scheduling.

According to research previous models exhibit substantial MSE, and RMSE errors. Deep learning approaches like as LSTM, and regression methods SARIMA were developed for STL predictions.

III. CONCEPT OF FORECAST

A time series (TS) analysis is a collection of information organised in sequence. Make a TS data set by converting from the collected dataset. Forecasting is used to create precise forecasts based on past trends.It is made up of three components: the trend, seasonality, and an error.

$$Fts = Mts + Sts + Ets \qquad (1)$$

There are several prediction processes, the auto-regression and moving average components make up the ARMA. In the ARMA model, from the equation 2, a fixed and error value included to AR and MA component.

$$Y_t = \beta_2 + \omega_1 \varepsilon_{t-1} + \omega_2 \varepsilon_{t-2} + \ldots + \omega_q \varepsilon_{t-q} + \varepsilon_t \qquad (2)$$

The SARIMA technique, like ARIMA, has extra AR and MA components, with periodic modifications to account for additional lags such as hourly.

$$y_t = c + \sum_{n=1}^{p} \alpha_n y_{t-n} + \sum_{n=1}^{q} \theta_n \epsilon_{t-n} + \sum_{n=1}^{P} \phi_n y_{t-sn} + \sum_{n=1}^{Q} \eta_n \epsilon_{t-sn} + \epsilon_t \qquad (3)$$

The LSTM network is a ML model that has had widespread application in time series forecasting challenges. To avoid the long-term reliance problem, the LSTM uses a memory cell that maintains selected data from past time steps, as opposed to regular RNNs, whose applicability is typically restricted to short-term memory tasks.

LSTM networks excel in the neural network family because of their excellent storage capacity for lengthy time. They have input, forget, output, and cell candidate gates, with the output gate receiving data, the input gate providing data, and the forget gate selecting retention.

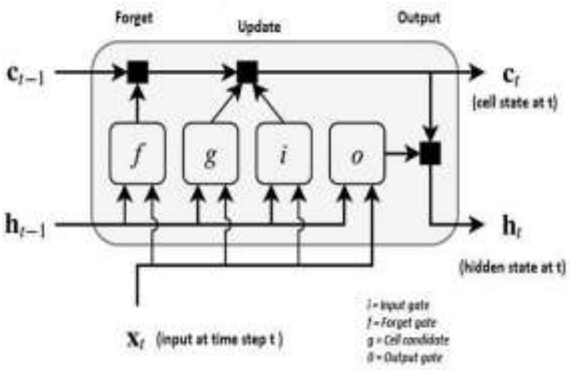

Fig.1 Long Short-Term Memory Cell [1]

i_t=σ(Wixt+UiHt-1+ViCt-1+bi) (4)

f_t = σ(Wfxt + UfHt−1 + VfCt−1 + bf) (5)

C_t = ft ⊙ Ct−1 + it ⊙ tanh(Wcxc + UcHt−1 + bc) (6)

$O = \sigma(Wo\,xt + UoHt{-}1 + VoCt{-}1 + bo)$ (7)

Ht = Ot ⊙ tanhCt (8)

The LSTM algorithm shown in Fig2 https://in.mathworks.com/help/deeplearning/ug/time-series- forecasting-using-deep-learning.html?s_tid=srchtitle_time%20series%20forecasting_ 1

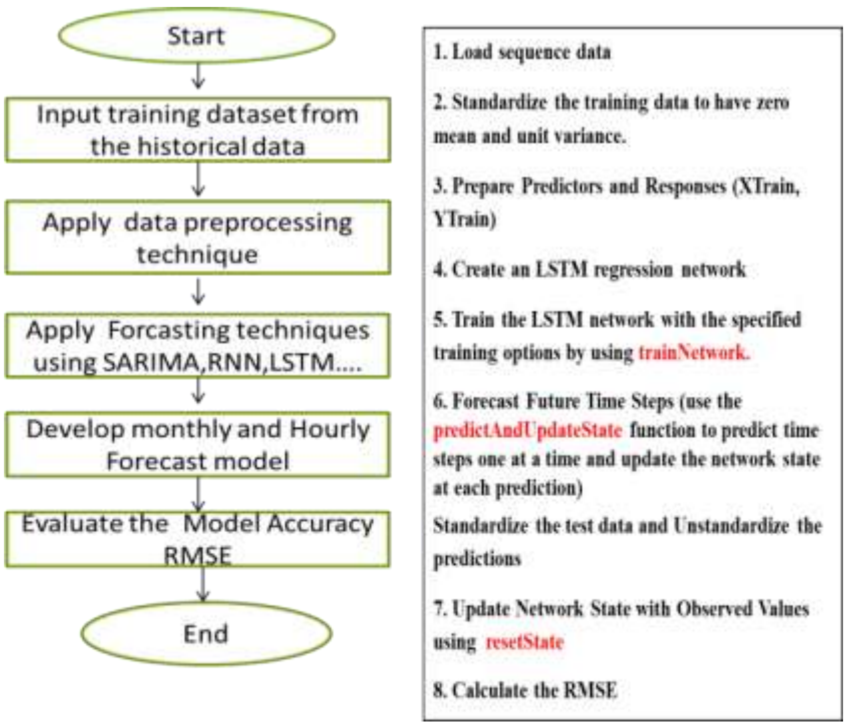

Fig.2 LSTM flow chart

I. RESULTS

The data collected from KS load curves are loaded to MATLAB program and process it using LSTM training model,it has 360 hourly samples, in that ninety percent data i.e 342 hourly samples used for training the model and rest ten percentdata (18 samples) used for testing the model, fig 3 shows the training process. Construct predictive models and estimate intoupcoming steps, evaluate the trained algorithm's precision andRMSE value, and estimate projected load demand.

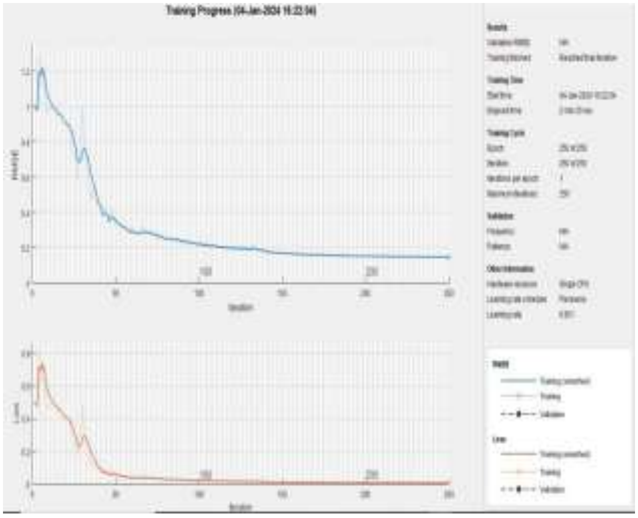

Fig.3 Training Progress

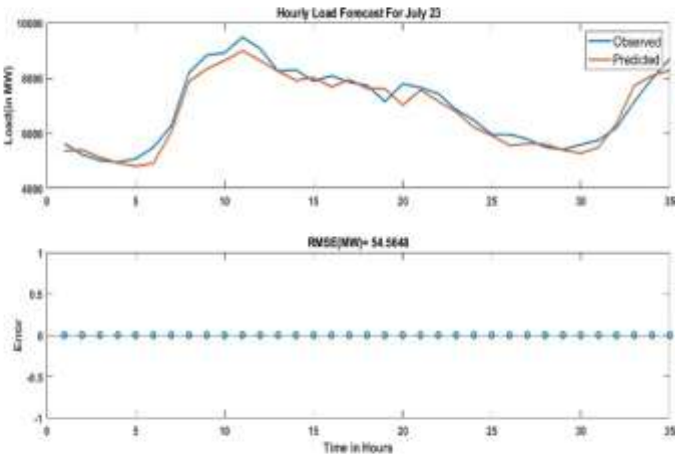

Fig. 4 Estimated per hour demand for July 23

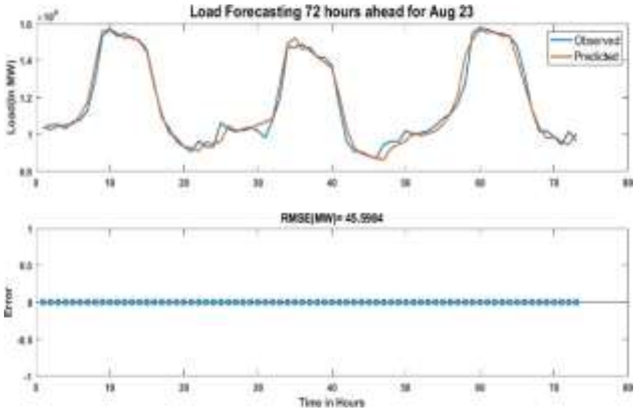

Fig. 5 Estimated per hour demand for Aug 23

The mean value for the July 23 is 8161MW, RMS Error is 54.56 MW shown in Fig4. The mean is 10165 MW and RMSE is 711.368 MW and after updating the training model it is 45.5984MW for Aug 23 depicted in fig5. The variation in predicted value is 86.75%. As a result, this strategy assists companies in planning the production of electricity based on load demands, which improves the power quality and reliabilityof the grid.

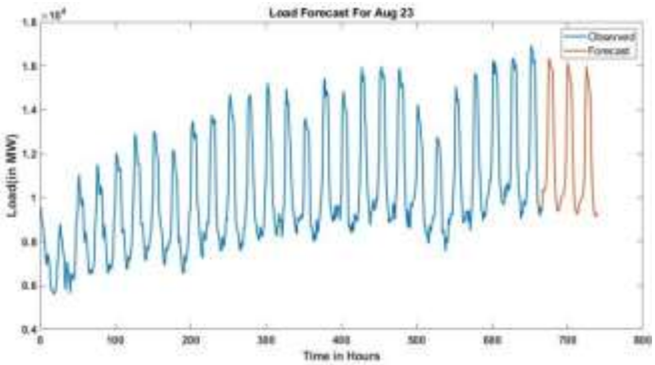

Fig. 6 Estimated per hour demand

Figure 6 depicts the estimated power demand for 72 hours ahead.

TABLE I RESULTS

Forecast Model	**SARIMA Ref. D. P. Ananthu [2]**	**LSTM For July 23**	**LSTM For Aug 23**
Mean (MW)	7796	8161	10165
MSE	159894.42	2976.79	2079.21
RMSE (MW)	399.86	54.56	45.59

II. CONCLUSION

Developed different methods for forecasting short-term electrical load. The KS load curves are utilised for data analysis, the analysis comprises 360 samples, 95% of which were utilized for developing the model and the rest, or 5%, for investigation, and the projected energy demands for the next 24 hours and 72 hours ahead for July and Aug 2023 respectively. The MSE and RMSE of the trained model were evaluated and observed that the error value is substantially low and the prediction accuracy was 86.75%. So that these methods are best suitable in grid planning and to improve reliability.

ACKNOWLEDGMENT

Thanks to R & D EEE, GNDEC Bidar and KPCL, daily load curves used in this research are obtained from KPCL Dept.

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Mathematical Optimizing Solar Energy Utilization: Novel PCM-Integrated Solar Water Heating Systems

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Abstract— An innovative solution to enhance solar energy utilization for continuous hot water supply in modern architectural settings. Overcoming limitations of conventional solar collectors, the proposed design integrates a solar tank featuring phase change material (PCM), optimizing both size reduction and increased heat capacity. This facilitates solar collectors to operate efficiently at lower temperatures, enhancing overall system performance. The system comprises a solar water heater and a PCM-based heat storage unit, ensuring uninterrupted hot water availability during nighttime and adverse weather conditions. Employing small paraffin-filled cylinders within solar collectors maximizes solar energy absorption and storage. A comprehensive comparative analysis against conventional sensible heat storage systems demonstrates the superior efficiency of the PCM-based solution. This research addresses the challenges of solar energy intermittency and spatial constraints, offering a promising avenue for advancing sustainable and efficient solar energy utilization in residential applications. Keywords: Thermal Energy, Solar water heater, Phase change material (PCM), Weather dependency.
Keywords— Thermal Energy, Solar water heater, Phase change material (PCM), Weather dependency

I. INTRODUCTION

In an era where global energy demands escalate alongside the exponential growth of population, the vitality of accessible and sustainable energy sources cannot be overstated. India, in particular, has experienced a remarkable surge in energy demand, growing steadily over the past three decades due to its rapid economic expansion. This burgeoning need for energy has instigated a critical necessity to explore alternative and renewable sources.

Among the array of renewable options, solar energy emerges as a prominent candidate. Recognized for its simplicity, cleanliness, and inexhaustible nature, solar power has garnered substantial attention. However, its intermittent nature necessitates effective storage solutions for optimal utilization. Addressing this need, Phase Change Materials (PCMs) stand out as a viable technique for storing thermal energy through latent heat.

PCM, predominantly inorganic compounds like hydrated salts, possesses the unique ability to absorb or release significant heat energy during state changes, sustaining its latent heat across numerous cycles without altering its properties. In the context of solar water heating, PCM plays a pivotal role in storing energy by melting at consistent temperatures, ensuring efficient utilization during usage cycles. The selection of an appropriate PCM hinges on several critical factors, notably its melting point, latent heat capacity, and safety considerations. Balancing these aspects with application-specific temperature requirements is paramount, especially in domains like residential, commercial, and industrial sectors, each with distinct thermal demands.

While inorganic compounds boast high latent heat capacities, they are susceptible to undercooling, potentially hindering effective phase changes. Conversely, organic compounds, excluding paraffin, tend to be expensive or pose toxicity concerns. Paraffin, despite its flammability, emerges as a pragmatic choice due to its favourable physical and chemical properties, affordability, and compatibility within water-based systems.

Furthermore, commercially available specific temperature PCMs, particularly various paraffin types, provide versatile options for diverse applications. In essence, this paper explores the multifaceted landscape of PCM utilization, highlighting their pivotal role in enhancing the efficacy of solar energy utilization, particularly in the context of water heating applications.

TABLE I
PHYSICAL PROPERTIES OF PARAFFIN 5838

Melting point	58-62 degrees Celsius.
Latent heat of Fusion	Typically around 200 J/g.
Viscosity	1.9 mm^2/s
Density	0.9 to 0.94 g/cm^3.
Specific heat capacity-solid Specific heat capacity-liquid	Approximately 2.0-2.5 J/g°C.
Thermal Conductivity	Ranges from 0.2 to 0.3 W/m°C.

II. LITERATURE REVIEW

The integration of phase change materials (PCMs) within solar water heating systems has been a subject of extensive research over the years [1]. Studies on PCM utilization within thermal energy storage units have explored various methodologies to intensify heat transfer, showcasing promising advancements [2]. Evaluations of solar collector designs featuring integrated latent heat thermal energy storage have underscored the potential for enhancing system efficiency [3].

A comprehensive review of thermal energy storage utilizing phase change materials emphasizes their versatile applications and their role in enhancing energy sustainability [4]. Investigations into the thermal performance of water-phase change material solar collectors have highlighted their efficacy in harnessing solar energy [5]. Review articles have extensively covered the materials, heat transfer analyses, and practical applications related to thermal energy storage with phase change [6].

Research on integrated solar collector/storage units employing phase change materials at a specific temperature of 65°C has elucidated their thermal behavior and operational efficiencies [7]. Additionally, experimental studies on prototypes equipped with latent heat storage have provided valuable insights into system performance [8, 9].

The cumulative body of research in this domain converges on the potential and efficacy of phase change materials in augmenting solar water heating systems, emphasizing their pivotal role in advancing sustainable energy solutions.

III. METHODOLOGY AND EXPERIMENTAL SETUP

Figure 1 illustrates the configuration of the experimental setup utilized in this study. The Thermal Energy Storage (TES) tank, possessing a capacity of 48 liters, was designed to meet the hot water demands of a standard family comprising four individuals. The tank incorporates two plenum chambers located at its top and bottom, complemented by a flow distributor at the tank's apex to ensure a homogeneous flow distribution. To meet the daily requirement of approximately 60 liters of heated water for household use, the energy is stored within the TES tank as a composite of sensible and latent heat of Phase Change Material (PCM), alongside the sensible heat of water. For the sake of this study, it is assumed that two-thirds of the total energy is stored within the PCM, with the remaining third retained as sensible heat within the water. For comparative purposes, an identical TES tank without PCM shells is employed in the PCM-less system variant.

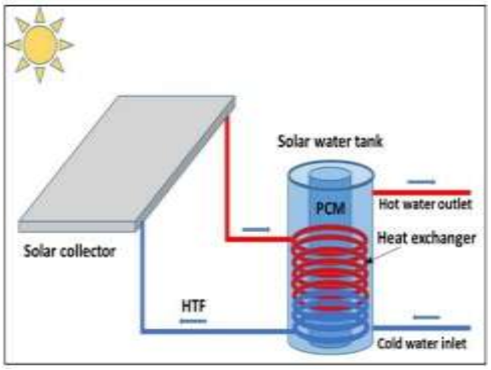

Figure 1. The diagram of the SWH–PCM system

IV. RESULTS AND DISCUSSION

The comparison between systems with and without Phase Change Material (PCM) revealed distinct thermal energy storage mechanisms. In the PCM-absent system, the water alone acquires and stores solar energy, while in the PCM- equipped system, both water and PCM absorb and retain energy, resulting in PCM melting above its specified melting point.

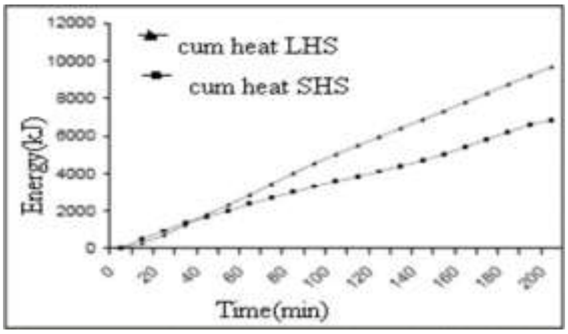

Fig. 2.Comparison of Cumulative Heat in Both the System

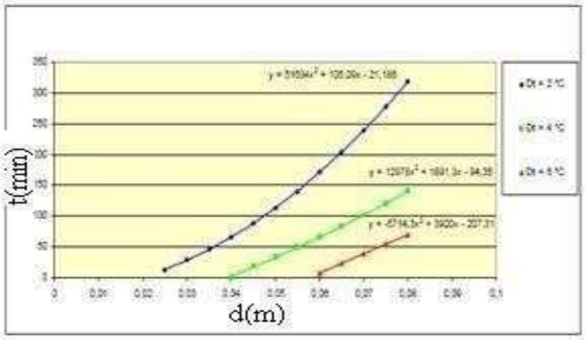

Fig. 3.Solidifying Time in Function of Time and Temperature Difference

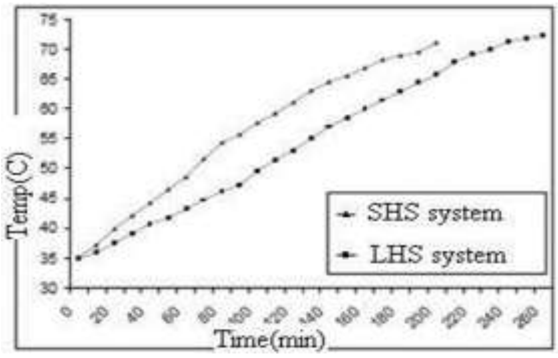

Fig. 4.Temperature Histories of Both Systems during charging

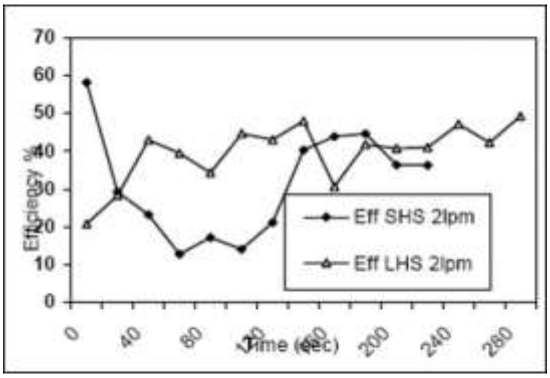

Fig. 5.Comparison of System Efficiency

a) Comparison of Heat Energy Storage

The comparison between systems utilizing and not utilizing Phase Change Material (PCM) demonstrates significant variations in heat storage efficiency. The system incorporating PCM surpasses the PCM-lacking system of identical size and tank volume. Calculations reveal a heat storage of 0.234 kJ/cc for the PCM system and 0.144 kJ/cc for the PCM-less system, indicating a substantial decrease in necessary storage volumes for equivalent heat storage in the PCM-equipped system.

b) Solidification Time of PCM

Understanding the solidification time of PCM is crucial for ensuring sustained hot water availability in the absence of solar energy. Experimental findings report a solidification time of 172 minutes with a 2°C temperature difference between the phase change temperature and the outer wall of a tube with a diameter of 60mm and 1mm wall thickness. A reduced solidification time of 66 minutes was noted with a similar temperature difference in a tube with a 40mm diameter and 1mm wall thickness.

c) Tube Diameter and PCM Solidification

The impact of tube diameter on PCM solidification time is evident; smaller diameters necessitate more tubes for the same PCM quantity. While smaller diameters facilitate quicker specific heat exchange and solidification, they decrease the tank's overall heat capacity due to increased tube material volume.

d) Charging Dynamics and System Efficiency

During charging, the PCM-equipped system redistributes solar energy to both water and PCM, contrasting the PCM-less system, which solely relies on water for energy absorption. Notably, the PCM-less system reaches a maximum temperature of 70°C 40 minutes earlier than the PCM system, with an average charging time 30-60 minutes faster.

e) System Efficiency Comparison

System efficiency analysis indicates that the PCM-less system exhibits fluctuating efficiency levels over time, whereas the PCM-equipped system maintains consistent efficiency across phase transition temperatures, displaying higher and more consistent efficiency levels. Consequently, the system employing PCM demonstrates enhanced efficiency in solar thermal storage applications.

V. CONCLUSION

This study delved into the thermal behavior of systems incorporating Phase Change Material (PCM) under varied operating conditions. The investigation encompassed charging times, energy storage capacities, PCM solidification duration, and system efficiencies, facilitating a comprehensive comparison between both systems.

The findings underscore the economic and spatial advantages of PCM-based tanks over conventional counterparts of equal heat capacity. Notably, PCM tanks exhibit lower manufacturing costs and reduced spatial demands, offering a more cost-effective and space-efficient solution for thermal energy storage. Furthermore, PCM tanks demonstrate the remarkable advantage of maintaining a consistent temperature profile during heat accumulation. This attribute, governed by the specific PCM type, enables flexible temperature settings conducive to higher solar collector efficiency, particularly in colder external environments. Conclusively, systems integrating PCM emerge as a highly viable option for solar heat energy storage. Their distinct advantages, including cost-effectiveness, space efficiency, and temperature control benefits, position them as promising alternatives to prevailing domestic solar water heating technologies reliant solely on sensible heat storage. Embracing PCM-based systems signifies a tangible stride toward more efficient and sustainable solar thermal energy utilization in domestic settings.

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Soldier’s Uniform used for Temperature Control and Health Monitoring System based on IoT

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Abstract- The solar-powered E-Uniform offers advanced protection to soldiers operating in challenging weather conditions. Its internal circuitry is fueled by solar panels, generating electricity stored in a rechargeable lead acid battery with a 12V DC output. Additionally, a traditional battery charging mechanism ensures continuous operation. The Arduino microcontroller serves as the central control unit, overseeing all functions. An ADC 0808 interfaces with a voltage sampler to monitor battery voltage, displayed on a 16X2 LCD screen. The uniform operates in two modes: summer and winter, with the H-Bridge IC controlling the body heater/cooler accordingly, providing comfort in extreme temperatures. A metal sensor alerts the soldier to potential threats with a buzzer signal. Through IoT connectivity, the soldier's health status is monitored and updated in real-time on a central server, ensuring constant oversight. This innovative uniform equips soldiers to operate effectively in diverse environments, enhancing their capability and safety.

Keywords: E-Uniform, IoT, lead acid rechargeable battery.

I. INTRODUCTION

The military's personnel are its most valuable resource, essential for national defense regardless of branch—Army, Air Force, Navy, or Marines. They dutifully fulfill their responsibilities, even in adverse weather conditions, which can pose significant challenges to their well-being. Extreme temperatures, whether scorching heat or freezing cold, can jeopardize their health and effectiveness. This project aims to develop an E-Uniform offering enhanced protection for soldiers operating in such conditions. The uniform features two modes— summer and winter—controlled by relays to activate the body heater/cooler, ensuring optimal comfort for soldiers in any environment.

Integrating solar-powered e-uniforms could represent a significant advancement in military attire. These uniforms would incorporate solar panels into the fabric, generating electricity to power various functions such as heating or cooling systems, lighting, and communication devices. This environmentally friendly approach reduces reliance on conventional battery- powered equipment, alleviating the burden on soldiers and promoting sustainability. The inclusion of cooling elements in the e-uniforms helps regulate body temperature and prevent heat- related illnesses, while heating components ensure comfort and prevent cold-related injuries. Addressing challenges like maintaining body temperature and communication in harsh environments, solar-powered e-uniforms offer a promising solution to enhance soldier comfort and performance in combat scenarios.

By harnessing solar energy in military apparel, these innovative uniforms offer a practical and effective solution to the challenges faced by troops operating in extreme conditions. They have the potential to significantly improve soldier performance, comfort, and safety, providing a sustainable and environmentally responsible alternative to traditional battery-powered equipment.

II. LITERATURE SURVEY

Dipali H. Kale's solar-based E-Uniform for soldiers offers enhanced protection for soldiers operating in challenging weather conditions. Solar panels power the internal circuitry of the E-uniform, with energy stored in a 12V DC lead-acid rechargeable battery. Additionally, traditional battery charging mechanisms can be used to power the circuits. The ATmega16a microcontroller serves as the central control unit, managing all functions of the uniform. The project features two operational modes: summer and winter, adjusting the body temperature via the heater/cooler to ensure soldier comfort in various environmental conditions.

Rahul Khairamode's E-jacket for soldiers aims to provide protection against extreme weather conditions experienced throughout the year, including high temperatures and cold snaps, which pose health risks such as heatstroke or dehydration. By integrating solar panels and a lead acid rechargeable battery, the E-jacket offers mobility and enhanced protection. The jacket is equipped with a GPS module for location tracking. Dr. S. Ramesh's climate-adjustable E-military suit addresses the challenges posed by unpredictable climatic changes by incorporating air-conditioning technology. The suit utilizes the Peltier effect to regulate body temperature, providing comfort and protection in extreme conditions. It also includes sensors to monitor atmospheric conditions and health parameters, displaying the data on an LCD screen.

III BLOCK DIAGRAM DESCRIPTION

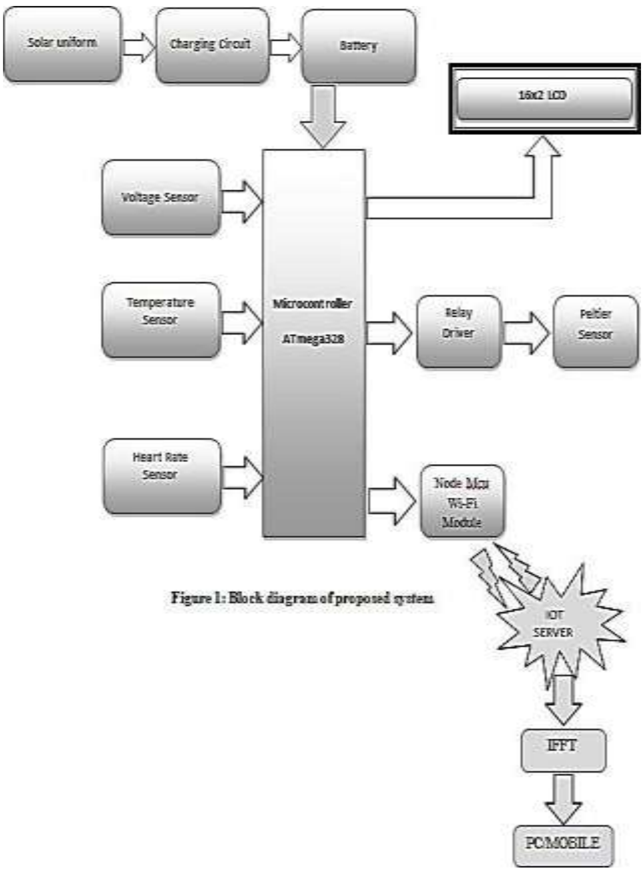

Fig 1: Block diagram

Functional Unit description:

In the figure 1 we shown the hardware requirements & Technical approach in the way to design the system. The system consist of mainly parts like Microcontroller (ATmega328), Sensors, IOT , LCD display, which are described briefly below.

Microcontroller ATmega328

The Arduino UNO is an open-source prototyping platform based on the ATmega328 microcontroller. The on-board microcontroller features six analogue inputs, fourteen digital input/output (I/O) pins, a reset button, a power jack, and an ICSP header. It operates on a 16MHz crystal oscillator and has all the parts needed to support the microcontroller.

Heart beat Sensor

The TCRT1000 reflecting optical sensor is used in the updated model for photoplethysmography. Because the TCRT100's infrared light emitter diode and detector are mounted side by side in a leaded package, it blocks ambient light from the surrounding area, which could otherwise impair sensor performance. This streamlines the sensor construction process within the project. Furthermore, I developed a printed circuit board featuring a signal conditioning unit and the sensor itself, ensuring accurate synchronization with the heartbeat. To further process the data and retrieve the heart rate in beats per minute (BPM), the output pulse can be directed to an ADC channel or a digital input pin of a microcontroller.

LM35 Temperature Sensor

The LM35 family includes precision integrated circuit temperature sensors. These sensors provide an output voltage directly proportional to the temperature in Celsius. Unlike linear temperature sensors calibrated in degrees Kelvin, the LM35 offers the advantage of not requiring a significant constant voltage deduction to obtain a Centigrade measurement. It boasts typical accuracy of ±1⁄4°C at room temperature and ±3⁄4°C across the entire temperature range of -55 to +150°C, eliminating the need for external calibration or trimming. The low cost of the LM35 is attributed to wafer-level trimming and calibration. Its accurate intrinsic calibration and linear output simplify interfacing with control or readout circuitry.

Internet of Things (IOT)

Utilizing existing network infrastructure, the Internet of Things (IoT) enables remote detection or control of various objects. This integration bridges the real world with computer-based systems, reducing the necessity for human intervention and promoting economic, precise, and efficient outcomes. IoT technology operates within the broader scope of cyber-physical systems, encompassing the integration of sensors and actuators with other technologies. The exponential growth of IoT offers banks opportunities to revolutionize payment methods beyond mobile devices, credit cards, and point-of-sale terminals. Connected devices may eventually surpass smartphones in transaction handling, shaping the financial sector's landscape, particularly with Visa and MasterCard leading infrastructure development. Each object, equipped with an embedded computing system, possesses a unique identity and seamlessly communicates with existing internet infrastructure. Moreover, there's a growing desire for human interaction with non-living objects online, such as clothing, furniture, appliances, and office supplies. While current interaction tools mainly cater to living beings, the IoT facilitates comfortable communication with inanimate objects. The Internet of Things represents the convergence of various technologies, including embedded systems, ubiquitous computing, ambient intelligence, sensors, actuators, and communication technologies.

IoT Server:

IoT server will triggered by the IFTTT server i. e it send the ON OF commands packets to the Node Mcu

ESP8266.

Fig 2 : IoT server

- Adafruit IO serves as a platform aimed at enhancing the value of data. Our primary objective revolves around simplifying usage and minimizing programming requirements for basic data connectivity.
- IO provides client libraries that encapsulate our MQTT and REST APIs, leveraging Node.js and Ruby on Rails as its foundation.
- Adafruit IO is currently in its beta phase. To participate in the beta, visit io.adafruit.com and register.

- The Internet of Things (IoT) refers to a network of physical objects, including buildings and vehicles, equipped with sensors, actuators, software, electronics, and network connectivity. These objects interact and gather data, facilitating remote sensing and control reservoir. through the existing network infrastructure. The 2013 definition of IoT by the Global Standards Initiative on Internet of Things (IoT-GSI) described it as "the infrastructure of the information society." Through IoT, objects can be monitored and managed remotely, fostering closer integration between computer-based systems and the physical world, thereby enhancing efficiency.

Solar Panel

Fig 3.: Solar panel

In essence, solar energy originates from the sun's direct production and collection, typically on Earth. Through a thermonuclear process, the sun converts approximately 650,000,000 tons of hydrogen into helium every second, generating both heat and electromagnetic radiation. This ongoing process is sustained by the sun's internal heat. Electromagnetic radiation, comprising ultraviolet, infrared, and visible light, radiates in all directions.

Despite the vast amount of radiation generated, only a tiny fraction reaches Earth. Most of today's energy sources derive indirectly from the radiation that does penetrate the Earth's atmosphere, with nuclear fission, fusion, and geothermal energy serving as exceptions. The sun serves as the ultimate source of energy for all life forms, including fossil fuels, which originate from former plants and animals reliant on solar energy for survival. Solar radiation directly contributes a significant portion of the planet's energy needs, with additional energy sources derived indirectly. We'll delve into the advantages and disadvantages of this approach, as well as its feasibility, and explore modern applications of solar energy.

Battery

A battery serves as a reservoir for storing electricity to be utilized later. It generates voltage through a chemical reaction that occurs when dissimilar materials, such as positive and negative plates, interact with the electrolyte—a mixture of sulfuric acid and water. Typically, a standard lead-acid battery provides around 2 volts per cell, totaling 12 volts overall.

Once a circuit is established between the battery's positive and negative terminals, electricity begins to flow from it. This flow is triggered when a device requiring electricity is connected to the battery. Additionally, the battery serves as a supplemental power source, supplying extra current when the demand exceeds what the alternator can provide, effectively functioning as an electrical gather data, facilitating remote sensing and control reservoir.

LCD (16X2) Display

A liquid crystal display (LCD) is a sleek, thin electronic visual interface that leverages the light-modulating capabilities of liquid crystals. Unlike traditional displays, LCDs do not emit light themselves but instead manipulate incoming light to produce images. Their versatility finds application in various fields, including computer monitors, televisions, aircraft instrument panels, signage, and more. Additionally, LCDs are ubiquitous in consumer electronics such as smartphones, calculators, clocks, watches, video players, and gaming consoles.

In many instances, LCDs have supplanted older cathode ray tube (CRT) screens due to several advantages. They are known for being gentler on the eyes, more reliable, cost-effective, lightweight, portable, and compact. LCDs offer a broader range of screen sizes compared to CRT and plasma displays, and they do not suffer from image burn-in issues typically associated with phosphor-based screens. Furthermore, LCDs provide safer disposal options and are more energy-efficient than CRT displays, making them environmentally preferable. Their low power consumption also makes them suitable for battery- operated electronic devices.

Functionally, an LCD is an electronically controlled optical apparatus capable of producing color or monochrome images by arranging liquid crystal-filled pixels in front of a backlight or reflector.

Fig 4: LCD Display

Relay

A relay serves as an electromagnetic bridge between two circuits, providing electrical isolation while enabling one circuit to control the other. These versatile devices are commonly employed to interface a low-voltage electronic circuit with a higher-voltage electrical circuit, allowing for the control of devices like electric fans or lightbulbs using a small sensor circuit. Comprising two essential parts, the input and output, a relay switch operates when a small voltage applied to the input coil generates a magnetic field, known as the operating voltage. Relays come in various operating voltage configurations, such as 6V, 9V, 12V, and 24V, to suit different applications. The output section consists of contactors, which mechanically connect or disconnect. A typical relay includes three contactors: common (COM), normally closed (NC), and normally open (NO). In its resting state, COM is connected to NC. However, when the operating voltage is applied, the relay coil activates, causing COM to switch to the NO contact. Relays are available in different configurations, including DPDT (Double Pole Double Throw), SPDT (Single Pole Double Throw), and SPST (Single Pole Single Throw), varying in the number of switch contacts they offer. By employing the appropriate combination of contactors, it's possible to control the electrical circuit, turning it on or off as needed. Understanding the internal mechanisms of a relay switch is essential for effectively utilizing this component.

III.CONCLUSION

The project "Soldiers uniform used for temperature control and health monitoring system based on IoT" aims to address the challenges faced by soldiers operating in extreme weather conditions by integrating innovative technology into their uniforms. By implementing this concept in practical applications, we can significantly enhance the resilience and effectiveness of military personnel in adverse climates.

The utilization of solar technology in the uniform's design adds a layer of robustness and self-repair capability, making it ideal for mobile deployments where soldiers may face varying environmental conditions. Solar energy offers a renewable and sustainable power source, reducing the reliance on traditional battery-powered systems and ensuring continuous operation even in remote locations. Furthermore, the incorporation of IoT-based health monitoring systems enables real-time tracking of soldiers' vital signs and environmental conditions, providing valuable insights into their well-being and performance. By leveraging IoTconnectivity, commanders and medical personnel can remotely monitor soldiers' health status and intervene promptly in case of any emergencies, thereby ensuring their safety and optimizing mission outcomes.

Overall, this project holds significant promise in enhancing the operational capabilities of soldiers by providing them with advanced temperature control and health monitoring capabilities, ultimately enabling them to carry out their duties effectively evenin the harshest of climates.

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Design and Development of Solar Hybrid Bicycle

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Abstract: The primary goal of this proposal is to design and build an e-Bicycle using solar as an energy source. A solar panel is a big, flat rectangle that is usually between the size of a door and a radiator. It is composed of numerous tiny solar energy collectors known as solar cells that are shielded from the elements by a layer of glass. Typically octagonal in shape and blue black in hue, the cells are roughly the size of an adult's palm. Similar to battery cells, solar panel cells are made to produce energy; however, unlike battery cells, which do this by using chemicals, solar panel cells do this by absorbing sunlight.. Electric motorcycles and Bicycles are two- or three-wheeled plug-in electric cars that run on electricity. One or more electric motors are powered by the electricity that is kept on board in a rechargeable battery. Unlike motorcycles, electric bicycles have a step-through frame. All electric bikes and motorbikes can be recharged by plugging them into regular wall outlets; this process typically takes eight hours, or overnight. Bicycles and motorbikes with the same weight and size but different power sources are approximately comparable in performance. The E-Bicycle model requires a hub motor, throttle accelerator, gate for brakes and batteries along with solar panel- based charging circuit model. The battery is also charged by the system using solar energy. We are using a solar panel, a rechargeable battery with a long lifespan and large charge storage capacity, a reverse polarity preventer/corrector, an AC ripple neutralizer, and a unidirectional current controller.

Keywords: Solar panel, Hub motor, PV cells, Gate switch, Battery charger, E-bicycle, brake set

I. INTRODUCTION

B. Bachche Ajit and N. S. Hanapure conducted a study on fuel prices and noted a continuous daily increase in gas prices [1]. This rise in prices, coupled with escalating car pollution in urban areas and heavily trafficked regions, has prompted the search for alternative energy sources for vehicles. However, the affordability of expensive cars remains a challenge for many, particularly the economically disadvantaged. In response, efforts are underway to assist financially struggling individuals while addressing environmental pollution issues.

One solution proposed is the integration of solar-assisted bicycles equipped with DC hub motors. These motors, located in either the front or rear axle housing, are powered by batteries charged via solar radiation. The solar panels mounted on the bicycle carriage charge the battery when the bike is not in use. This setup aims to replace traditional gasoline engines, gearboxes, and fuel tanks found in conventional two-wheelers, or the chain sprocket mechanism commonly used by the public. Pedal-assisted solar hybrid bikes are modifications of traditional bicycles designed to enhance speed and rider comfort. Testing involved a 250W, 24V hub motor [2]. Additionally, Henry M. Gannon's study focused on multi- wheeled vehicles, excluding bicycles [3]. Their recommended setup includes a solar charging system, an electrical generator, and a standard bicycle equipped with a multi-speed gearbox. This preferred configuration allows for both pedaling and motor power, with the flexibility to use either or both as needed. The electrical system comprises a DC hub motor, lead acid batteries, a hand lever for throttle control, and a battery switching circuit. Furthermore, research was conducted on regenerative braking systems, which harness braking energy to charge the battery. When the brakes are applied, hydraulic cylinders compress fluid, releasing energy upon brake release for battery charging.

II. BLOCK DIAGRAM

In this chapter the block diagram of the project and design aspect of independent modules are considered. Block diagram is shown in fig: 1

1. Hub Motor

A wheel hub motor, also known as a wheel motor, wheel hub drive, or in-wheel motor, is an electric motor integrated directly into a wheel hub, providing direct propulsion. This innovative design eliminates the need for additional components like drive chains, sprockets, or brackets, enhancing efficiency and reliability.

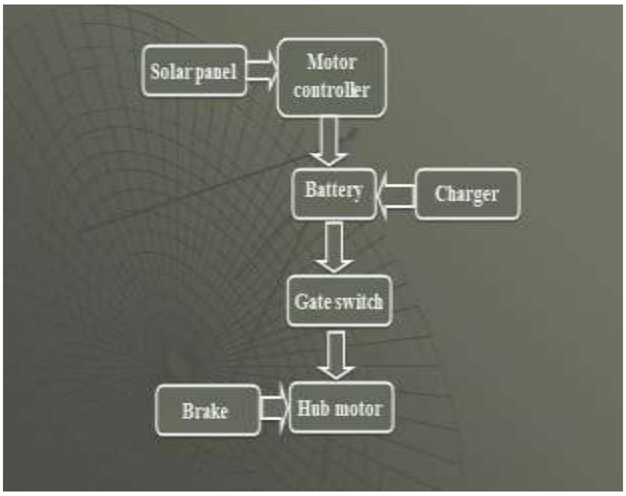

FIG 1: Block diagram

In a typical wheel hub motor, permanent magnets are positioned within the stator, which is housed inside the rotor. When powered by batteries, the motor generates alternating current (AC), causing the hub to rotate, while the stator remains fixed to the axle. This configuration offers several advantages, including high efficiency, significant torque production at low speeds, and durability.

One of the key features of brushless DC machines, like wheel hub motors, is their ability to control speed over a wide and consistent power range. This controllability ensures optimal performance across various operating conditions, contributing to the motor's efficiency and versatility. Overall, wheel hub motors represent a robust and efficient solution for electric propulsion, offering reliability and performance in various applications.

2. Solar Panel/Cell:

A device that uses the photovoltaic effect to turn solar energy into electricity is called a solar cell or photovoltaic cell. When the source is unknown, the phrase "photovoltaic cell" is used, although the word "solar cell" is occasionally reserved for systems meant particularly to collect energy from sunshine. Solar panels, solar modules, and photovoltaic arrays are constructed from cell assemblies. The science and technology of solar cell applications for solar energy is known as photo voltaic.

3. Working

Solar power systems utilize photovoltaic cells to directly convert the radiant energy from sunlight into electrical energy. These cells are semiconductor devices that transform sunlight into electricity. Photovoltaic cells employing crystalline semiconductors like silicon offer high performance and reliability. They consist of silicon-based crystal wafers that generate a voltage across opposite surfaces when light strikes one of them, typically equipped with a current-collecting grid. When photons of light interact with these cells, they transfer their energy to the valence electrons of the semiconductor material, causing them to break free from their atomic bonds and transition to a higher energy state known as the conduction band, enabling them to move freely throughout the semiconductor.

4. Solar Panel Setup

When using batteries, installing a charge controller is an additional component that is required. Batteries last a lot longer if they aren't overcharged or drastically low on power. That's what a charge controller does. When the batteries are fully charged, the charge controller cuts off the current from the PV modules. Similarly, many charge batteries after they have been used to a certain, predetermined level that is determined by monitoring battery voltage. The controllers are unable to remove any more current from the batteries until they have been recharged. It is necessary to employ a charge controller for extended battery life. Apart from energy storage, the electricity generated by your solar panels and, should you choose to utilize them, taken from your batteries isn't the same as what your utility company supplies or what your home's electrical appliances use[6]. To convert solar electricity from direct current to alternating current, an inverter is needed. Most large inverters allow you to configure automatic controls to regulate how your system operates. A tiny percentage of PV modules, also known as AC modules, have an inverter built in, which eliminates the need for a large central inverter and allays wiring worries.

5. Poly Crystalline Modules

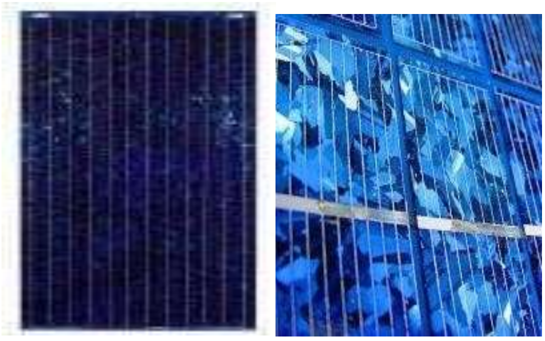

Fig 2 :Polycrystalline module

Polycrystalline (multi-crystalline) modules are made up of multiple distinct crystals that have been fused together to form a single cell—thus the term "multi" As a result of the cheaper cost of producing the cells, they have long been the most widely used type of solar module. Mono crystalline have become increasingly popular in the residential market as their cost has decreased recently.

This metal flake effect', or visible crystal grain, is a result of the formation of these many crystals, as the figure (left) illustrates. Although they are less expensive to build than mono panels, their efficiency is lower (varying from 0.5% to 2%, depending on the manufacturer). This is due to the possibility of electron trapping at the crystal grain boundaries, which lowers efficiency.

6. Motor Controller

A motor controller, sometimes referred to as the vehicle's brain, is a crucial component of the solar hybrid bicycle. It regulates the power delivered to the hub motor, lights, and, if necessary, the horn. The motor controller is responsible for converting the battery's DC voltage into an alternating voltage that may be varied in frequency and amplitude to operate the hub motor at various speeds. Essentially, it is made up of a tiny microprocessor and MOSFET transistors that can identify issues with the throttle, motor hall sensors, and other components. It can also guard against under voltage and excessive current.

In essence, a motor controller or charge regulator functions as a voltage and current regulator to prevent batteries from overcharging. Its primary role is to manage the voltage and current flow from solar panels to the battery, ensuring optimal charging conditions. Typically, batteries require approximately 14 to 14.5 volts to reach full charge.

Fig 3: Hub Motor Controller

7. Battery

Lead acid batteries are widely used in everyday life and are the most common type of battery used in various devices. Despite having a lower energy density compared to lithium-ion batteries, lead acid batteries are considered safe to use when proper precautions are taken. This makes them a preferred choice for applications such as solar hybrid bicycles due to their affordability, widespread availability, and resistance to explosions. The current supplied by a battery, measured in amperes (amps), indicates the rate of energy flow, with higher current ratings resulting in slower battery depletion.

The current rating is typically specified in terms of ampere- hours (Ah). This project focuses on the charging and discharging processes of high voltage batteries. Therefore, a battery with higher energy density, longer runtime, and lower weight relative to its high output voltage is required. Among the various types of batteries available, lead acid batteries are deemed most suitable for use in solar hybrid bicycles.

Fig 4 : Battery pack

Fig 5: Throttle

8. Throttle

The bicycle's maximum speed is 25 km/h, but this speed can be adjusted between 0 and 25 km/h depending on road conditions and traffic. To accommodate these variations, a throttle is integrated into the bicycle, allowing riders to increase or decrease speed as needed. Positioned on the right- side handlebar, the throttle is linked to a motor controller. The throttle comprises three distinct wires: black, red, and green. Typically, the red and black wires supply the necessary voltage, with a standard requirement of 4 volts for the accelerator, while the green wires facilitate acceleration.

9. Gate Switch

The gate switch serves as a primary switch that regulates the flow of direct current from the battery to the motor, operating manually. By pressing the button, a controlled current is permitted to pass between the Input and Output contacts of the Power switch, facilitating the pre-charging of capacitors within the controller and balancing the voltage on both sides of the power switch contacts. This pre-charging process ensures that the power switch can be activated without any arcing across the contacts, as they are already at the same voltage level.

In the OFF position, the input and output terminals remain disconnected within the switch. Conversely, in the ON position, all four contacts are effectively linked together through the two pairs of switched contacts housed within the switch, along with the parallel loop wiring connections on its exterior.

III. METHODOLOGY

• Initially, the DC Gear motor was attached to the rear wheel via a chain drive, which was secured onto the seat stay using nuts and bolts fixed on iron strips welded to the seat stay.
• The fabrication process was conducted with careful consideration given to the maximum load capacity that the motor could handle.
• Edge grinding was performed to ensure a smoother surface finish on both the freewheel and the iron strips.
• Welding was employed to connect the freewheel to the shaft of the DC motor.
• Subsequently, all the fabricated components were assembled together.
• The controller drive is powered by batteries, which are mounted on the handlebars.
• The controller drive is supplied power from the batteries and transmits signals/output to the HUB Motor.

III. WORKING

Initially, solar panels are mounted on the bicycle handlebars to capture sunlight and convert it into electrical energy. This energy is then stored in a rechargeable battery through a charge controller, with an additional option for direct wall charging using an adapter. Both sources of energy are directed through a unidirectional electronic circuit board and stored in the battery for later use. Activation of the hub motor is achieved by using a gate switch, while propulsion on the road is controlled by the accelerator throttle. Additionally, braking is applied to the motor through a braking arrangement located in the front wheel.

A solar bicycle operates by utilizing battery power to drive its hub motor, which propels the bicycle forward. The battery is charged using solar energy, converted into voltage through photovoltaic cells. These cells, integral to solar bicycles, facilitate the conversion of solar energy into voltage required for battery charging. Lead acid and lithium-ion batteries are commonly employed in solar bicycles, each with its own advantages and disadvantages. Lead acid batteries, although heavier and shorter-lived, boast a higher current capacity. Conversely, lithium-ion batteries are lighter but offer a longer lifespan. In essence, the fundamental concept of a solar-powered bicycle revolves around utilizing stored energy from a battery, charged either through solar panels or other means, to drive the motor, functioning as the vehicle's engine, and propel the vehicle forward.

IV. PERFORMANCE ANALYSIS

Hub Motor Calculation

Motor Specification:

Volt(V)=48 v, Power (P)=1000 w

Power Equation

Power (P) = Current (I) × Voltage (V) Hence,
$I = P \div V = 1000 \div 48 = 20.83$ Amp.
Speed of Motor In RPM

$$N = K \div (d \times 0.001885) = 35 \div (25.4 \times 0.001885) = 731 RPM$$

Where, N = Speed In RPM, K = Speed In kmphd
= Wheel Diameter in cm
• Wheel Diameter (d) is 10 inch (Given)

1 inch = 2.54 cm, So, d = 10 inch = 25.4 cm

• Speed In kmph (K) is 35 kmph (Given)

Torque of the motor (T)

$$T = (P \times 60) \div (2 \times \pi \times N) = (1000 \times 60) \div (2 \times 3.14 \times 731) = 13.06 Nm$$

Torque of the wheel hub motor, T = 13.06 Nm

Vehicle dynamics, including as rolling resistance, gradient resistance, aerodynamic drag, etc., must be taken into account when determining a vehicle's power rating. The process for choosing a motor rating for an electric scooter weighing 170 kggross is taken into consideration as an example.

The force required for driving a vehicle is calculated as: $F_{total} = F_{rolling} + F_{gradient} + F_{aerodynamic\ drag}$

Where, F_{total}=Total force

Battery Calculation

From motor calculation we get, Wattage=1000w, Voltage =48v,So, watt.hr = 1000w ×1hr =1000w.hr
Out of the full battery 80% should in use and 20% should remaining. So, battery watt.hr =1000w.hr ×1.20 =1200w.hrHence, Current (Ah)in battery=1200w.hr ÷48v=25Ah

- Selection of battery charger
- Suppose we have to charge a battery in 5hr. So ourrequired wattage is 1200w.hr.
  According to above condition, Wattage of charger =1200w.hr÷ 5 hr=240w

Hence, current rating of charger =240w÷48v= 5A
As per the above calculation to charge 48v,25Ah battery in5 hours, we require 48v,5A charger.

- Battery specification`

Voltage Rating = 48v, Current Rating =25 Ah
So, Wattage of battery = Voltage Rating × Current Rating = 48 ×25 =1200wh(watt.hr.)

V. RESULT AND TESTING

The "Design and Development of Solar Hybrid Bicycle" proposal aims to create a bicycle powered by renewable energy, specifically solar power. A successful ridingtest has been conducted, achieving a speed of 15 km/h. The bicycle completed a total round trip of 30 km on a single charge, with backup support from both solar panels and a dynamo.

VI. CONCLUSION

Today's fast growing gasoline vehicle usage contributes to increased air pollution. Because of its many benefits—such as the fact that an electric scooter is an environmentally beneficial product—using EVs is essential to controlling this. A solar-powered bicycle is a modified versionof an existing bicycle. It works well on cement, asphalt, or mudroads in cities and rural areas to cater to the need of economically week citizens. It is available for free usage for the whole year. This bicycle's ability to save millions of foreign currency, by not using pricey fossil fuels is its most significantfeature. Since it produces no emissions, it is both environmentally friendly and pollution-free. Furthermore, it is silent and can be refilled in an emergency or during overcast weather using an AC adaptor. At about Rs. 0.70 per kilometer,the running cost is very low. In the event that the solar system malfunctions, it can be powered manually by pedaling. Because it is simpler to assemble and disassemble, it requires less upkeep. From the standpoint of a future energy system, it is critical to find new means of energy production and transportation, and solar-powered E-bike pools might be oneof them. e-bikes are far more energy-efficient than a car, bus, or other big transportation vehicle.

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Semi-automated Spacer Fitting Mechanism forHotline Maintenance

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Abstract: In recent days, electrical sector has grownup apace and additionally voltage levels at that transmission to be done has additionally accumulated from 33KV to 1200KV. This has diode to the matter of doing the upkeep work as a result of the work should be performed on live line. it's undesirable to disconnect significant masses for maintenance work from grid because it might cause immense loss to the buyer similarly on the ability firms. Currently this work is finished by humans by hand with Hot stick technique and blank hand technique however these strategies conjointly has disadvantage. to beat this, we tend to developed a Spacer fitting mechanism to eliminate the requirement of human hand in Spacer fitting operation. With this mechanism the spacer fitting operation becomes quicker and easier. With the assistance of IR (Infra- Red) sensing element and Arduino Uno microcontroller board with ATMEGA328P controller, the position of conductor is perceived and command is shipped to perform fitting of spacer. The position of arms is adjusted by DC motors to perform the operation properly

Keywords: ATMEGA328P (Microcontroller), Arduino Uno (Board), IR sensor (Infra-Red), Hotline.

I. INTRODUCTION

In engineering, maintenance work has got to be performed whereas line is energized. the primary techniques for live-line operating were developed within the early years of the twentieth century, with growth in industrial sector from 19thcentury; it junction rectifier to drawback of maintenance work as a result of it had been troublesome to perform work while not interrupting provide to the patron. within the Sixties, strategies were developed within the laboratory to modify field staff to come back into direct contact with high voltage lines. Such strategies will be applied to modify safe work on the best transmission voltage

1.1 Meaning of Hotline Maintenance "Performing the upkeep work whereas the road is energized is termed as hotline maintenance" the work involves the fitting of spacer, replacement of insulators, scrutiny of transmission lines and improvement of insulators. These works area unit principally performed by hand with the assistance of 2 strategies that 2 strategies area unit as given below:

1) Hot stick technique
2) Bare Hand Technique

1.1.1 Hot stick Technique

In this methodology the employee carries a hot stick (Hot stick could be a insulated with a high voltage rating) in his hand and perform the upkeep work by keeping his body at ground potential and utterly isolated from line potential.

1.1.2 Bare Hand Technique

In this technique employee wears a Faradays suit (which is totally electrically conductive) furthermore as insulated gloves and shoes. He then reaches nearer to conductor by insulated ladder or insulated floor of eggbeater. The employee holds a charge current stick-on conductor and attracts the potential from conductor into his body. supported principle that whenever 2 same charges are placed along, they suffer neither attraction nor repulsion. thus, employee suffers no shock from high voltage line and might perform the work safely.

II. METHODOLOGY

By introducing automaton into power sector, the risks concerned is also decreased, however the automaton ought to fulfill the subsequent requirements:

- It ought to cut back involvement of human hand.
- It mustn't build contact between ground potential and line potential.
- Robot ought to be straightforward to control. Robot ought to give most safety to operator. It mustn't cause any hurt to line.
- Spacers fitting operation ought to be sleek

2.1 Block Diagram of Spacer Fitting Mechanism

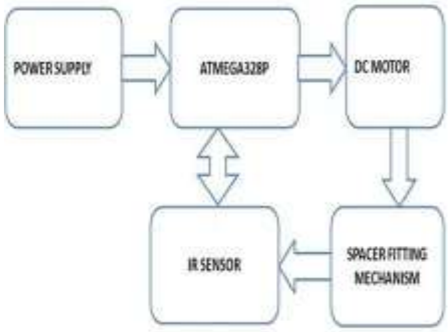
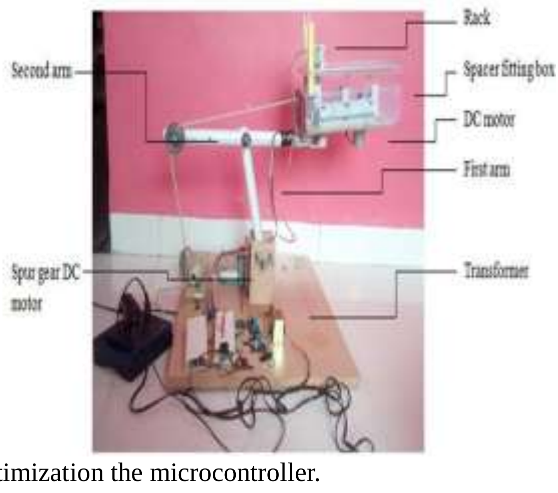


Figure 2.1: Block Diagram of Spacer Fitting Mechanism

Above figure shows the diagram for hotline maintenance by automaton within which the12V DC power offer is feed to microcontroller, microcontroller generates PWM pulses that cause the rotation of dc motor above all degrees. thanks to rotation of DC motor automaton arms can move (as the motors are literally fitted in robot-arms to cause movement). there'll be a tool arrangement at the tip of arm for doing maintenance work. dominant unit controls the automaton arm movement by giving commands to the microcontroller. Sensing unit can find the position of robot-arm. The torsion rating for dc motor is typically 14Kg/m2 to 16Kg/m2 this torsion rating is spare for automaton arm movement, point feedback additionally plays a very important role in movement of robot-arm because it improves the steadiness of operation. The motor driver IC is employed to drive the motors employing a 5v signal supply and might additionally run the motors in each reverse and forward directions. This IC may also offer the 12V to the dc motors although the controller voltage is of 5V. The speed of the motors in each forward and

III. IMPLEMENTATION



reverse direction is controlled victimization the microcontroller.

Figure 3.1: Side View of Project Setup

Three different movements have been employed in this system. They can be titled like:

1. Waist Movement
2. First Arm Movement
3. Second Arm Movement

1. Waist Movement

The waist of the robotic arm is controlled by the machine- controlled box. A string is hooked up to the spacer fitting box and tied to the shaft of motor articulated at the bottom of setup and middle of the string is hooked up to the machine at the middle. By movement of motor the waist conjointly moves.

2. First Arm Movement

Another DC motor is as well as a worm reducer, that contains a reduction quantitative relation of 100:1. The worm reducer can transmit the facility to the shaft. This shaft is connected to the primary (lower) arm. thus, if the shaft rotates then the primary arm can rotate consequently.

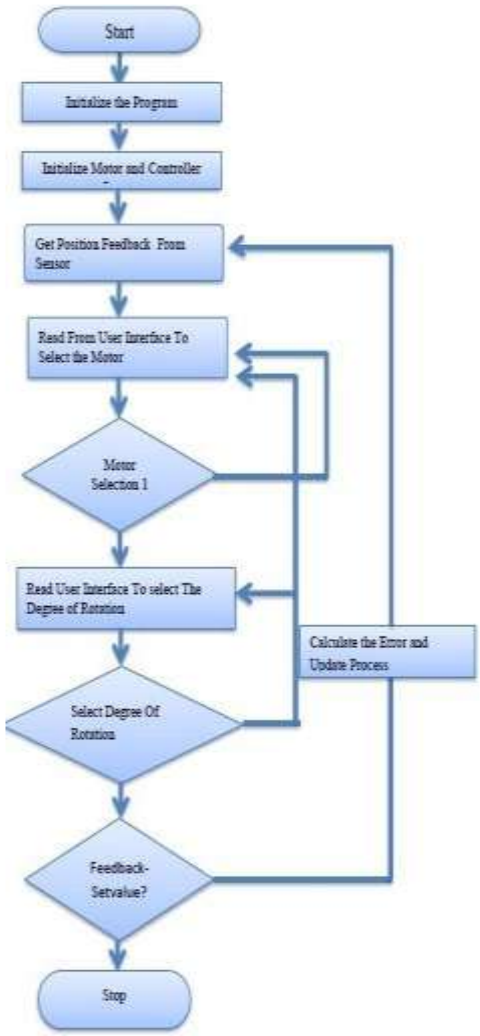


Figure 4.1: Flow Chart for Conductor Detection Program Spacer

3. Second Arm Movement

Second arm holds each the machine on one facet and spacer fitting box on the opposite facet. A string is hooked up to the box at one finish and to the motor shaft on the opposite finish through machine. once the motor purposed for second arm movement is turned „ON‟, string gets wounded on motor shaft which ends up in propulsion of spacer fitting box inflicting upward and downward movement of spacer fitting box.

4. Flowchart for conductor detection program

In case of high voltage cable, the spacer fitting is very important because the conductors square measure command along moreover as they're protected against the high winds. There square measure many varieties of spacers. they're principally classified in keeping with variety to conductors they hold, the virtually comes all told shapes and sizes in keeping with the necessity of cable. The transient classification of those is also given as follows:

1. Two conductor spacers
2. Three conductor spacers
3. Multiple conductor spacers

1. Two conductor spacers

Figure 4.2: Two Conductor Spacer

Spacer, who is employed to carry 2 conductors along, may be a 2-conductor spacer. sometimes this spacer is used in high voltage line higher than 33kv. it's conjointly referred to as as twin spacer.

Two conductor spacer is as shown in on top of image, within which it's 2 components joined along by bolt and nut arrangement. Its length is twelve.5cm. This spacer is fitted to cable by employee with hands. In Bharat most of thetransmission lines area unit fitted with 2 conductor spacers.

For our spacer fitting mechanism, we tend to createdspacers by ourselves that square measure created from fiber material and like spacer shown in on top of figure it's conjointly joined along by bolt and nut.

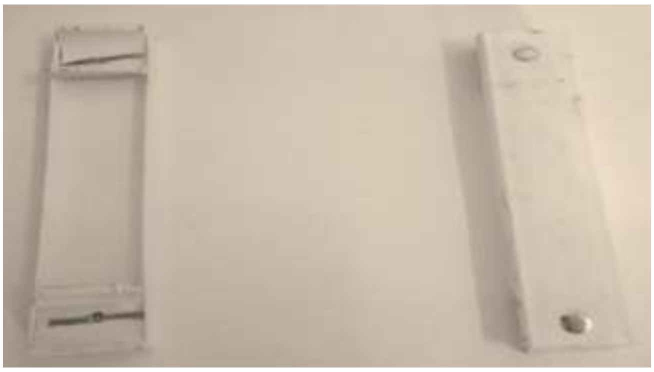


Figure 4.2: Two Conductor Spacer

Two conductor spacer is as shown in on top of image, within which it's 2 components joined along by bolt and nut arrangement. Its length is twelve.5cm. This spacer is fitted to cable by employee with hands. In Bharat most of the transmission lines area unit fitted with 2 conductor spacers.

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Operation of Spacer Fitting Mechanism

Arduino UNO boards are specialized in robotic applications, therefore may be employed in nearly robotic applications it's special ports for driving up to four DC motors. 2 ports for driving Servomotors and extra five sensors may be connected to the board. it's further thirteen ports for connecting input/output devices. during this project we tend to used it forconductor position detection and screw modification mechanism (Spacer fitting Mechanism).

The operation of the Spacer fitting mechanism is as follows:

1. The spacers are fed into the spacer fitting box.
2. One part of spacer is set on upper part of box and other part of spacer on the lower part of spacer fitting box.
3. The setup is moved close to the transmission line.
4. The spacer fitting box is opened.
5. The opened box is inserted into the transmission line.
6. The sensor set for conductor detection detects the conductor and gives signal to the ATMEGA328P (which means conductors are in position)
7. The spacer fitting box is closed and motor placed at the bottom of the box stars rotating which holds a Nut.
8. Due to this the spacer gets tightened as boththe Nut and bolt gets tightened due to rotation of Nut.
9. After successful operation of spacer fitting.

IV. RESULTS & CONCLUSION

The above work deals with high voltages applications hence it must be insulated properly. The insulation rating for the given spacer fitting setup is determined as follows.

$$V_{rated} = K * V_{transmission}$$

Where,

Vrated- Rated voltage for insulation of given setup.

Vtransmission- Voltage of the transmission line.

K- (2 or 2.5) number constant relying upon the atmosphericphenomenon.

V. CONCLUSION

In India most of the high voltage lines are fitted with 2 conductor spacers therefore this mechanism is appropriate for pretty much all such style of high voltage lines. it's finished from the work that the area fitting operation may be performed safely by eliminating human hand and putting artificial mechanism to perform the task. It conjointly reduces the value of operation because it reduces variety of employees required for the operation. Operation is simple and need less time for coaching.

Advantages

The spacer fitting mechanism has following benefits overstandard technique of spacer fitting by human hand;

- Inspection and repaired easily.
- Reduces the risk of loss.
- Reduces the number of workers.
- Precise monitoring and performance.

- Spacer fitting.
- Takes less time for spacer fitting than current method of spacer fitting.
- Provides complete isolation between line potential and ground potential as well as operator.
- Easy to operate.

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Analytical Approaches for Analysis of Sub- Synchronous Resonance (SSR) In PMSG based Wind Farm under Weak Grid: A Review

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Abstract- The integration of renewable energy sources, specifically wind farms utilizing Permanent Magnet Synchronous Generators (PMSGs), presents unique challenges when operating in regions with limited grid infrastructure. One of the critical issues that can arise is Sub-Synchronous Resonance (SSR), which can impact the stability and performance of the wind farm. This research paper offers a comprehensive exploration of analytical approaches aimed at addressing SSR in PMSG-based wind farms operating under weak grid conditions. The study commences by developing a detailed dynamic model that captures the complex resonance between the PMSG-based wind farm and the weak grid. Modal analysis is then utilized to identify the key modes that contribute to SSR, with a particular focus on evaluating the involvement of different system components in these modes. The paper also investigates strategies to enhance system damping, such as the implementation of damping controllers and power system stabilizers. Furthermore, the study delves into fault ride- through capabilities and dynamic reactive power control strategies to ensure the wind farm's resilience during transient events. Advanced control algorithms, including adaptive and intelligent control, are explored for their potential to improve the overall system response. Additionally, the design of robust control strategies to handle uncertainties in wind speed and grid conditions is discussed. To validate the proposed analytical approaches, simulation studies are conducted, highlighting their effectiveness in mitigating SSR, and enhancing the integration of wind farms with weak grids. The findings emphasize the importance of collaboration with system operators and adherence to grid codes to ensure the stable and reliable operation of PMSG-based wind farms in challenging grid environments.

Index Terms—Wind farm, Permanent magnetic synchronous generator, Sub-synchronous resonance.

I. INTRODUCTION

Wind power has made significant progress in recent years as a clean and sustainable energy source. The development of variable speed wind turbine generators (WTGs), such as the doubly-fed induction generator (DFIG), has played a crucial role in this advancement. [1], [2].

Direct-drive permanent magnetic synchronous generators (PMSGs) [3], [4], are extensively utilized because of their exceptional control capabilities. When connected to the grid through fully controlled voltage source converters (VSCs), direct-drive PMSGs exhibit remarkable on-grid operating performance [5],[6]. This includes high operational efficiency, seamless integration with the grid across a wide range of speeds, and excellent fault-ride-through ability. As a result, they are increasingly being adopted in newly-established windfarms.

Concern for both academia and industry [7]-[9]. This problem arises from the interaction between the control system of Doubly Fed Induction Generators (DFIG) and fixed series compensation (FSC), resulting in the disconnection of multiple WTGs and damage to their crowbar circuits [9], [10]. Similar incidents of SSR have been observed in wind farms [8], [11]. This particular type of SSR is also referred to as sub- synchronous control interaction (SSCI) [12] or sub-synchronous interaction (SSI) [13] due to the active involvement of WTG control in the development of unstable sub-synchronous power oscillations. It is worth noting that previously reported SSR/SSI events have predominantly occurred in induction-generator-based WTGs, particularly type 3 or DFIGs [14], when they are connected to series-compensated transmissions [15].

The question of whether type-4 WTGs or direct-drive PMSGs would also be affected by unstable SSI remains unanswered. Numerous studies have been conducted on the interaction between AC networks and general VSCs [16]-[18]. For example, reference [16] highlights that constant power loads connected to tightly regulated converters exhibit negative impedance characteristics, which can lead to system instability. Reveals [17] that the coupling between phase-lock loops (PLLs) of neighboring converters can increase the system's susceptibility to oscillations. The research presented in [18] demonstrates the presence of series/parallel resonant circuits in grid-connected VSC systems. However, the instability caused by negative impedance, PLL coupling, or resonant circuits primarily pertains to high-frequency oscillations rather than sub-synchronous interaction.

There were limited studies specifically addressing the influence of PMSG on SSI. For example, one reference [19] stated that PMSGs can contribute to positive damping in SSI mode. Another study concluded [20] that PMSGs do not exhibit any apparent vulnerability to SSI, and in fact, theymay even be beneficial for SSI immunity. However, [21]-[22], a different study declared that there is a potential risk of SSI due to the negative damping caused by PMSGs. It is important to note that these previous investigations were conducted using computer models rather than real-world observations in an actual power system. Furthermore, no information is provided regarding the decisive factors and dominant characteristics of SSI associated with PMSGs.

Despite the lack of a definitive conclusion regarding the potential for SSI caused by direct-drive PMSGs, practical instances of real oscillatory events have already occurred. The wide-area measurement system (WAMS) has repeatedly detected sustained power oscillations at sub-synchronous frequency since June 2014, as the installed capacity of wind generation continues to rapidly increase. These oscillations originate from direct-drive PMSG based wind farms and extend to the external power grids. In some cases, the amplitude of the oscillatory power surpasses that of the fundamental power. In a severe incident, these oscillations even induce intense torsional vibration in nearby turbo generators, leading to the trip of all generators in a powerplant due to its torsional protection system. Investigations into the system reveal the absence of series compensation in the vicinity. Furthermore, the sub-synchronous power oscillation differs from previously reported cases induced by constant power loads, PLL coupling, or resonant circuits. It represents a novel form of sub-synchronous interaction between type-4 WTGs and their connected weak AC networks. Consequently, the existing research falls short in explaining its fundamental mechanism. Further efforts are required to comprehend its key characteristics and dominant influential factors. This study examines the operational principles and distinctive features of the newly emerging SSI, which is caused by the interplay between PMSG-based wind farms and vulnerable AC networks.

The purpose of this paper is to review and analyze the diverse analytical approaches proposed in the literature to mitigate Sub-synchronous Resonance in PMSG-based wind farms. However, aim to provide a structured overview of different methodologies, including their theoretical basic, merits and demerits, and comparative analyses.

In the paper is organized as follows. Following the Section I with discus about Introduction, Section II presents Modelling of PMSG Wind Farm, Section III presents analysis methods for SSR and Section IV presents comparison of different analysis methods for SSR damping in PMSG based wind farm. Section V concludes this paper.

II. MODELING OF PMSG WIND FARM

Wind power is often generated in remote areas, far from where the electricity is needed. As a result, the electricity generated by wind farms needs to be transmitted over long distances to reach the main power grid. These remote wind farms are typically connected to weak AC systems with low short circuit ratios and small local loads [23]. To account for these practical conditions, a simplified system model, as shown in Figure 1, is used for this study. The model includes a large wind farm (identified as A), a local transmission (B), a long-distance transmission (C), and an equivalent representation of the main grid (D). Additionally, there maybe a turbo generator (E) connected to the main grid.

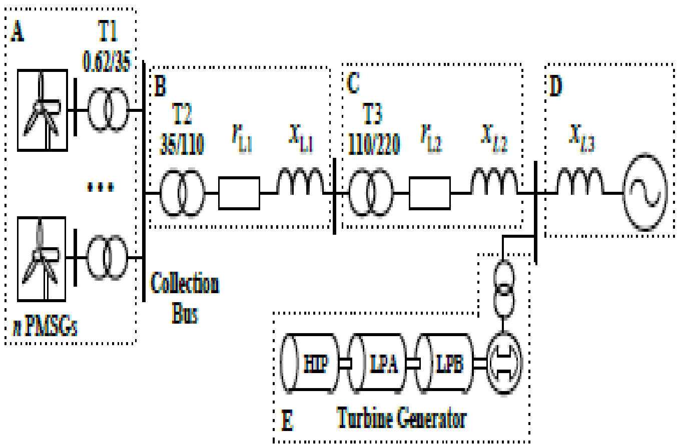

Fig: 1 System model with multiple PMSGs connected to a weak AC grid

The wind farm is expected to consist of identical type-4 WTGs. This means that all WTGs have the same capacity, structure, parameters, operating status, and are connected to the same bus. This assumption is reasonable and beneficial for simplifying the analysis without sacrificing its generality, as wind farms typically use the same type of WTG and operate under similar conditions. The local transmission system includes a step-up transformer T2 and a 110 kV line with an impedance of rL1+jxL1. Through another step-up transformer T3, the local 110 kV grid is connected to a long-distance 220 kV line with an impedance of rL2+jxL2. It is likely that a coal-fueled turbine generator is located near the main grid. The electricity generated by both the wind farmand the thermal power plant is then transferred to the main grid, which is represented by an ideal voltage source with a reactance of xL3.
The provided diagram in Figure 2 illustrates the setup of a standard 1.5 MW direct-drive PMSG. This configuration is specifically designed by the manufacturer of the wind turbine generator (WTG) utilized in the aforementioned wind farm. The components of this setup include a wind turbine, a permanent magnet synchronous generator (PMSG), a machine-side converter (MSC) consisting of a diode rectifier and a boost DC/DC converter, a DC link, a grid-side converter(GSC) utilizing pulse width modulation (PWM) voltage source conversion, and an LC filter.
The control characteristics of the grid-connected direct-drive permanent magnet synchronous generator (PMSG) are primarily determined by the control features of its grid-side converter (GSC), as depicted in Figure 3 and detailed in Table II. The GSC controller employs a vector control strategy in the dq reference frame. The outer-loop controls are responsible for regulating the DC voltage and reactive power, while the inner-loop controls handle the d- and q-axis currents.Proportional-integral (PI) controllers are utilized in these control loops.

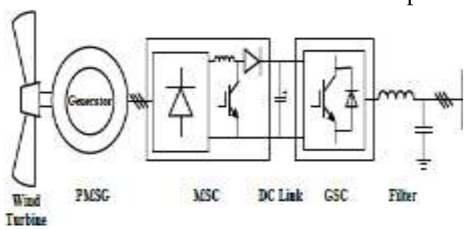

Fig: 2 Configuration of a 1.5 MW direct-drive PMSG

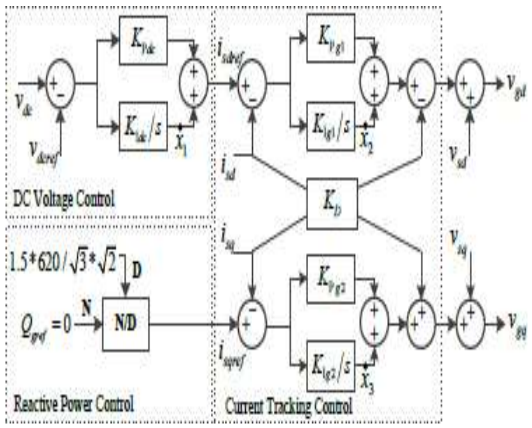

Fig. 3 Control diagram of the GSC

Symbols In Control Blocks of the GSC

Symbols	Meaning
i_{sd}, i_{sq}	*d*- and *q*- axis component of GSC output current
v_{sd}, v_{sq}	*d*- and *q*- axis component of GSC output voltage
i_{sdref}, i_{sqref}	Reference values for i_{sd}, i_{sq}
v_{gd}, v_{gq}	Reference values for v_{sd}, v_{sq}
v_{dc}, v_{dcref}	DC voltage and its reference value
Q_{gref}	Reference value of GSC output reactive power
$K_{Pdc}/K_{Pg1}/K_{Pg2}$	Proportional gains

$K_{Idc}/K_{Ig1}/K_{Ig2}$	Integral gains
K_D	Decoupling gain

III. DIFFERENT METHODS OF ANALYSIS OF SUB- SYNCHRONOUS RESONANCE (SSR) IN PMSG BASED WIND FARM UNDER WEAK GRID

I. Impedance Based Stability Analysis

The following section introduces a fresh stability criterion for SSI, which relies on the impedance model (IM) in the dq reference frame. Additionally, it demonstrates the coherence between the current IM-based analysis and eigenvalue analysis.

A. The dq Reference Frame Based IMs of PMSG andAC Grid

According to the documentation provided in [21]-[22], the state equation for a particular Permanent Magnet Synchronous Generator (PMSG) within the system can be alternatively represented as equation (1). Assuming that the control vector for the terminal current is dq = [isd ; isq], and the output vector for the terminal voltage is vsdq = [vsd ; vsq],the subsequent expression can be derived.

$$\begin{cases} \Delta \dot{x} = A\Delta x + B\Delta isdq \\ \Delta\, vsdq = C\,\Delta x + D\,\Delta\, isdq \end{cases} \quad (1)$$

By utilizing Laplace transform and performing certain manipulations on equation (3), we can derive the correlation between the terminal current and voltage of a PMSG, specifically referred to as its IM.

$$Z_{PMSG}(s) = C\,(sI - A)^{-1}\,B + D \quad (2)$$

The 2×2 impedance matrix, denoted as ZPMSG (s) = [ZPdd(s) ZPdq(s); ZPqd(s) ZPqq(s)], represents a polynomial expression of Laplace operators in each of its elements.

Likewise, the IM for AC grid illustrated in Figure 1 (comprising of T1, B, C, and D) can be acquired within the dq reference frame [24].

$$Z_{Line}(s) = \begin{bmatrix} r_\Sigma + sX_\Sigma & -\omega_0 x_\Sigma \\ \omega_0 x_\Sigma & r_\Sigma + sX_\Sigma \end{bmatrix} \quad (3)$$

Where $Z_{Line}(s)$ is a 2×2 impedance matrix;

$r_\Sigma = r_{L1}+r_{L2}$;

$X_\Sigma = x_{L1}+x_{L2}+x_{T2}+x_{T1}/n$; $\omega_0=1$ pu.

Ultimately, the entire system's IM can be represented by.

$$Z_T(s) = Z_{PMSG}(s) \,/\, n + Z_{Line} \quad (4)$$

Where $Z_T(s)$ is a 2×2 impedance matrix.

The reduction in SCR has a minor impact on the negative resistance of ZPMSG(s), but it significantly alters the impedance of ZLine(s). Both eigenvalue analyses and time- domain simulations have demonstrated that reducing the SCR to a low value would lead to unstable SSI. Hence, the unstable SSI is caused by the dynamic interaction between the PMSGs with negative-resistance effect and the vulnerable AC system.

B. Impedance based approach Criterion

The representation of the IM of a PMSG cannot be done using complex vectors [11] due to the mirror frequency coupling [25] caused by the unequal structure in the d- and q- axis as shown in Fig. 3. Consequently, the stability of SSR needs to be evaluated by considering the impedance matrices of (2) and (3), which can be accomplished using either the generalized Nyquist criterion [24] or the norm-based criterion [16]. However, these criteria can only provide qualitative outcomes, indicating whether the system is stable or unstable, rather than quantitative ones. Furthermore, the detailed explanation for the instability of the system is not provided. In order to address these concerns, an alternative stability criterion is proposed, which is based on the impedance- frequency characteristics of the determinant of the impedance matrix. If a disturbance voltage source V(s) of the mentioned SSI mode is introduced into the AC grid, such as at the step- up transformer T2, a corresponding current of the same mode can be generated and represented by the following expression:

$$I(s) = V(s)\, Z^{-1} \quad (5)$$

$Z^{T-1(s)}$, namely the zeroes of the determinant of ZT(s) [32]. The determinant can be obtained by

$$D(s) = \det(Z_T) = Z_{Tdd}\, Z_{Tdd} - Z_{Tdq}\, Z_{Tqd} \quad (6)$$

D(s) represents the determinant of ZT(s), which is an expression in the form of a polynomial of s. ZTdd, ZTdq, ZTqd, and ZTqq are four components within ZT(s).

The fact that the SSI mode in question is one of the decisive zeros should be emphasized. The concerned zero can be calculated using either an analytical or numerical approach. In this section, we have chosen to utilize the proposed aggregated RLC circuit model method [11].

The small-signal models used in both IM based analysis and eigenvalue analysis are the same, as mentioned above. Consequently, the eigenvalues obtained from equation (1) are equal to the zeroes of the determinant of the impedance matrix ZT(s). In other words, any changes in the operating conditions of the target system would impact the IMs of PMSGs and AC grid, thereby influencing the zeroes of the IM determinant or its eigenvalues for the entire system.

II. Eigen Value based Analysis

Eigenvalue analysis is a widely employed analytical technique that relies on a mathematical model of the system being studied, utilizing a collection of linear ordinary differential equations.

The differential equations can be expressed in the standard form as follows:

$$\dot{x} = Ax + Bu \quad (7)$$

The eigenvalues can be defined as the solution to the equation: Det [λU – A] = (8)

The eigenvalue vector of the differential equation, denoted by λ, serves as a clear indicator of the frequencies and damping of oscillation modes. This allows for an easy understanding of the relationship between various system parameters, including the series compensation level, PI parameters of the current controller, wind speed, and number of wind turbine generators, and the characteristics of oscillation. By observing the movement of eigenvalues [26, 27], valuable insights into the oscillatory modes can be obtained. In order to study sub-synchronous interactions, D.H.R. Suriyaarachchi et al. propose a two-step procedure. In step 9, a frequency scanning method is employed, while step 10 involves a detailed small signal eigenvalue analysis. These steps provide crucial information about the oscillatory modes [28]. Ref. [29] utilizes participation factor analysis to confirm that the characteristics of the modes are influenced by various PMSG parameters, such as the GSC controller, PLLs, LCL filter, and controller parameters of VSC-HVDC. However, it is important to note that the eigenvalue analysis approach necessitates a comprehensive representation of both the mechanical and electrical systems. Consequently, higher order models, beyond the 2nd or 4th order models, are required. Unfortunately, the model parameters for these higher order models are not readily available [30].

III. Modal Analysis

During operation, the system parameters of the generator, such as inductance and resistance, control system parameters, and operating conditions like machine speed and load power, undergo variations. These changes have an impact on the system eigenvalues. To avoid repetitive calculations of the eigenvalues, it is necessary to conduct a sensitivity analysis in order to estimate the tendency of eigenvalue changes. This section focuses on a thorough modal analysis that encompasses participation factor and eigenvalue sensitivity.

The eigenvalues obtained from the state matrix can be either real or complex. Complex eigenvalues can be represented as conjugate pairs, as shown below.

$$\lambda_i = -\sigma_i \pm j\beta_i \quad (9)$$

The damping ratio and oscillation frequency corresponding to mode λi can be defined as

$$\xi_i = \frac{\sigma_i}{\sqrt{{\sigma_i}^2 + {\beta_i}^2}}, \quad f_{\text{osci}} = \frac{|\beta_i|}{2\pi}. \quad (10)$$

Participation factor analysis assists in determining the impact of each state variable on a specific mode. It quantifies the relative involvement of the kth state variable in the ith mode. The computation of participation factors can be derived from the eigenvector matrices using the following procedure:

$$p_{ki} = \frac{|w_{ki}||v_{ik}|}{\sum_{k=1}^{n} |w_{ki}||v_{ik}|} \quad (11)$$

where w_{ki} and v_{ik} are the k_{th} elements in the left and right eigenvector corresponding to the i_{th} eigenvalue. In general, the participation degree of the k_{th} variable in the i_{th} mode is measured by p_{ki}. As discussed in [32], p_{ki} can also be regarded as the sensitivity of λ_i with respect to the k_{th} diagonal element of state matrix [31].

The calculation of eigenvalue sensitivity allows us to quantify the speed and direction of mode movement caused by changes in system parameters. To determine the eigenvalue sensitivity of a mode (λ_i) in relation to an uncertain parameter μ, the following procedure can be followed:

$$\frac{\partial \lambda_i}{\partial \mu} = \frac{w_i^T (\partial A/\partial \mu) v_i}{w_i^T v_i} \quad (12)$$

where w_i and vi are the left and right eigen vectors corresponding to the eigenvalue λ_i, respectively.

IV. COMPARATIVE ANALYSIS

Analyzing Sub- Synchronous resonance (SSR) in power systems involves various methods, each with its own merits and demerits. Here's an overview of some common analysis methods along with their advantages and disadvantages:

Table No: 01 Merits & Demerits of Different Analysis Methods

Sr. No.	Analysis method	Merits	Demerits
1	Impedance- Based Model Analysis	- It provides a comprehensive understanding of the interactions between different components in a power system, including generators, transformers, and controllers. - It allows for a detailed assessment of system stability under various operating conditions. - The approach helps in identifying weaknesses in the power system that might be prone to SSR. - Impedance- based analysis is valuable for evaluating the impact of different controllers on sub-synchronous modes.	- The accuracy of impedance-based analysis is sensitive to variations in model parameters. - Developing accurate impedance models can be complex, particularly in large and interconnected power systems. - Impedance based analysis is inherently based on linear system assumptions. - Impedance-based analysis may have limitations in capturing interactions at very high or very low frequencies.
2	Eigen value Analysis	- It provides a global perspective on system stability. - Eigenvalue analysis provides information about the mode shapes associated with different eigenvalues. - Engineers can perform sensitivity analysis by varying system parameters and observing changes in eigenvalues. - Eigenvalue analysis can be used to reduce the complexity of the system model. -Eigenvalue analysis can serve as an early warning system for potential stability issues.	- Eigenvalue-based analysis relies on the assumption of a linear system. - The accuracy of eigenvalue-based analysis is sensitive to the accuracy of the system model. - It may not be effective in capturing interactions at very high or very low frequencies. - It might not fully capture the impact of power system stabilizers and other controllers on system stability. Interpreting eigenvalue analysis results can be complex, especially in large interconnected systems.
3	Modal Analysis	- It provides detailed information about the mode shapes associated with different natural frequencies. - it helps identify critical modes that can lead to SSCI. - it allows for the examination of the dynamic response of the system to disturbances. - It results can be used for model validation and verification.	- it is based on the assumption of a linear system. - The accuracy of modal analysis is sensitive to the accuracy of the system model. -It can become complex and computationally intensive, particularly in large interconnected power systems. - It assumes that the system is linear and time-invariant.

V.CONCLUSION

A novel form of sub-synchronous resonance has been identified in large-scale direct-drive PMSG based wind farms. In order to examine this matter, a simplified yet representative model has been devised to simulate multiple PMSGs connected to a feeble AC network. The interaction between the wind farms and feeble AC networks can lead to an under- damped SSI mode. In specific scenarios, particularly when the short circuit ratio (SCR) is exceedingly small, the SSI can become unstable and result in sustained sub-synchronous power oscillation in wind turbine generators (WTGs) as well as the entire grid system. The frequency and stability of this SSI mode are contingent upon various factors, with the SCR (determined by the grid strength and WTG online capacity) and the control strategies and parameters of WTG converters exerting the most significant influence. The power oscillation is primarily induced by the negative-resistance effect at the SSI frequency, which arises from the resonance between direct-drive PMSGs and feeble AC grids. To tackle the unstable SSI, an additional sub-synchronous damping control loop has been implemented in the PMSG controllers. Moreover, several other potential countermeasures are recommended for further investigation.

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Implementation of Arduino based Smart Management System for Household and Corporate Application

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Abstract: Despite the vital role water plays in various activities, it's essential to recognize that only 2.5 percent of the world's freshwater is usable. Given the limited availability of this precious resource, it becomes imperative for us to be conscientious stewards, acknowledging the scarcity of reliable sources of usable water and taking proactive measures to sustain its vitality. Apart from the prevalent water wastage evident in our homes, municipal buildings, and large industries, there is also a noteworthy occurrence of energy wastage. Acknowledging the depletion of natural resources usedin power generation, it's essential to recognize the dwindling availability of these resources on our planet. Given the pivotal role electricity plays in our lives, it becomes incumbent upon us to fulfill our fundamental responsibility by actively conserving and reducing its usage. With the help of this system it is possible for us to avoid the waste of water and electricity with smart mechanism using aurdino.

Keywords-GSM, Arduino Uno (Board), IR sensor (Infra-Red), theATmega328P microcontroller, PWM,DIY

I. INTRODUCTION

Electricity stands as the indispensable lifeblood for allindividuals, playing a pivotal role in various aspects of our lives. Yet, occasional energy loss occurs due to human negligence, underscoring the urgency for conservation efforts to ensure its sustainable use. Following the collection of water in a ground tank or pipeline, the water sensor in the proposed design is utilized to ascertain the water level. If the detected information is updated on an Android application, a user can view the water level on a smartphone. The motor is controlled based on the volume of water in the tank. The current world is centered around "smart" technology. As technology advances, the process will grow increasingly intelligent and automated. Resources are frequently optimized by intelligent irrigationsystems to guarantee that everything gets what it requires without wasting any. Given the severity of the water and energy crises, an increasing amount of attention has been directed into irrigation techniques that consume less of both The block diagram illustrates the integration of essential components such as Arduino, a GSM module system, relay module, water sensors, water pump, and connecting Wi-Fi converter. Water sensors are strategically placed at the input and outlet points. When water enters the pipe, the sensor sendsa signal to the Arduino. Another sensor near the outlet receives a signal from the Arduino, allowing it to monitor the water level in the tank. In the absence of water, the Arduino signals the relay, activating the motor to commence waterpumping. Once the tank is full, the Arduino receives a signal and instructs the relay to turn off the motor. Simultaneously, the GSM module notifies the user about the impending arrival and tank-filling process. The Arduino, facilitated by the Integrated Development Environment (IDE) software, loads a program onto the Arduino Uno board. This program reads input values and orchestrates the system's operation**.** This system employs two water sensors, with the first one positioned at the inlet of the pipe and the second at the tank. The sensors determine if the tank has reached its capacity. When water reaches the upper side of the tank where the sensor is located, it senses the water level and signals the Arduino. Upon confirming that the tank is full, the Arduino commands the relay module to halt the motor. Subsequently, the GSM module sends a notification to the user indicating that the tank is now filled. The entire system operates seamlessly, characterized by automation and effective control.

II. BLOCK DIAGRAM AND METHODOLOGY

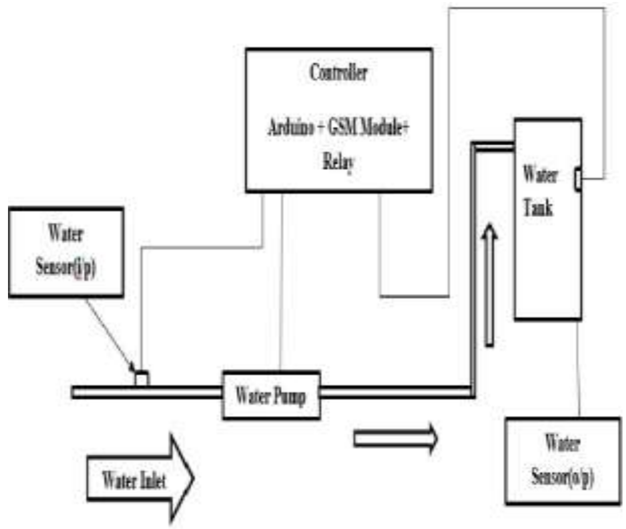

Fig.1: Block Diagram of System

III. FLOWCHART

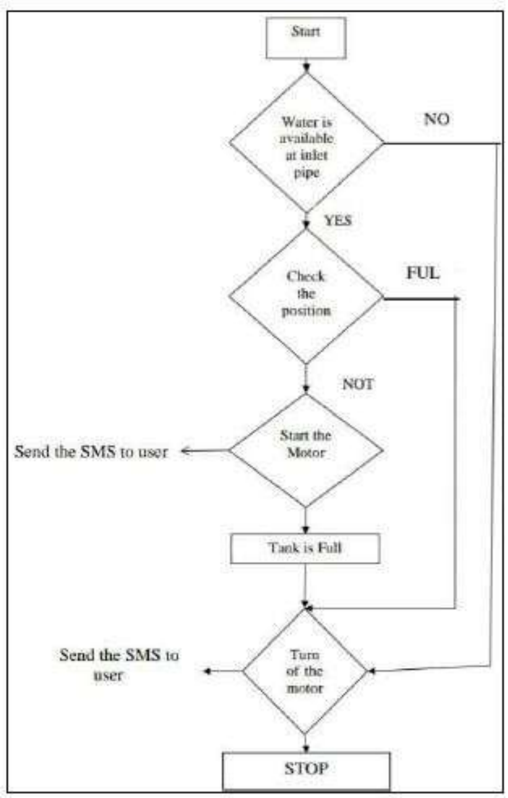

Fig.2: Flowchart

The system operates autonomously and adheres to regulated procedures. There's no requirement for someone to be physically present at the tank site to ascertain water availability. An advantageous aspect of this design is that users are relieved of theresponsibility to manually activate the motor as water enters the inlet. The system intuitively activates the motor when specific conditions are met, such as the presence of water in the pipeline and an unfilled tank. Conversely, the motor remains inactive when the tank is already full, ensuring a consistently relaxed operational state.In a different case, the water inlet sensor will cause the motor to be in the idle position if the tank is empty yet there is no water in the intake pipeline. Arduino communicates that there is no water in the inlet pipe and advises the relay tostay in its optimal state.

I. CIRCUIT DIAGRAM

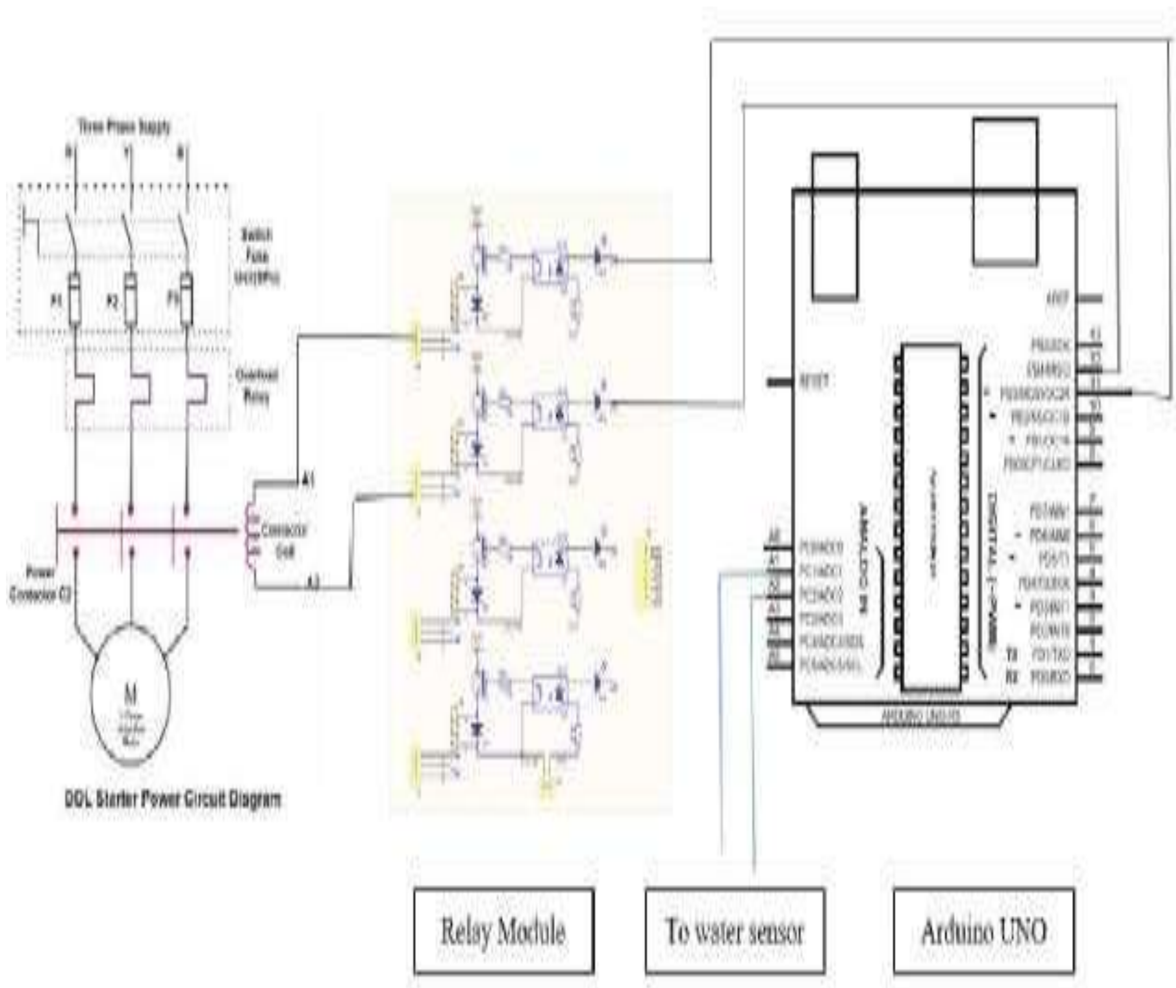

Fig.3: Circuit Diagram

The DOL starter with pump is connected to the relay module with the help of contactor coil. Relay module is interfaced with Aurdino UNO for proper functioning of the system. At the same time water sensors are also interfaced with the Aurdnio UNO in order to detect the water level present in the tank.

II. IMPLEMENTATION OF SYSTEM

Fig.4: Real time implementation of system

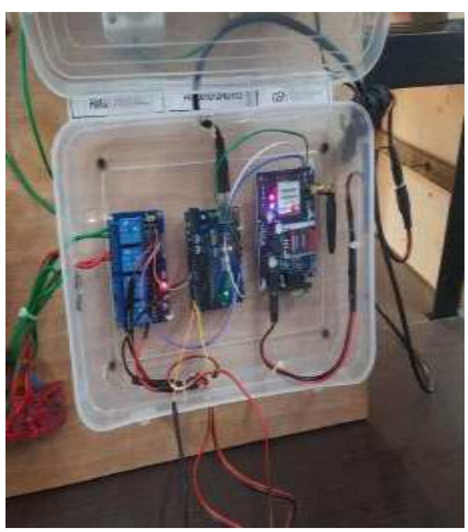

Fig.5: Relay module and controller

Arduino Uno is an open-source microcontroller board based on theATmega328P microcontroller. It is one of the most popular boards in the Arduino family and is widely used in DIY projects and prototyping. The board has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection. The primary part of the module, the relay functions as an electrically operated switch. It normally consists of a series of contacts and an electromagnet, or coil. The coil creates a magnetic field that attracts and releases the contacts when current flows through it, opening and closing the circuit. Make that the voltage and current specifications of the relay module are appropriate for your application before using it. Additionally, ensure that the low-power and high-power circuits are appropriately isolated and take all essential safety measures to guard against electrical risks. Relay modules can have one or By utilising this technology, we will cut down on water waste more channels, each of which represents the number of relays the and save money on electricity module contains. While multi-channel modules can have two, four, eight, or more relays, single-channel modules only have one. Because each channel functions separately, you can control numerous circuits at once. With the input portion of relay modules, you can use a low-power signal from a microcontroller or other digital device to control the relay. To separate the control signal from the high-power circuit, the input portion frequently has a transistor or optocoupler.

Fig.6: Result (Motor Turned ON & OFF)

The water sensor detects the presence of water in the water pipe line at that precise instant and sends a signal to the Arduino, which relays the signal to the relay module. The water pump activates automatically when the tank is empty and notifies the system user via the GSM system that "water pump is turn ON." The Arduino receives a signal from the water sensor when the tank is full, detects the water level, and automatically turns off the water pump. It then alerts the user via GSM that the water pump is off.

III. RESULT

The water sensor detects the presence of water in the water pipe line at that precise instant and sends a signal to the Arduino, which relays the signal to the relay module. The water pump activates automatically when the tank is empty and notifies the system user via the GSM system that "water pump is turn ON."
The Arduino receives a signal from the water sensor when the tank is full, detects the water level, and automatically turns off the water pump. It then alerts the user via GSM that the water pump is off.

IV. CONCLUSION AND FUTURE SCOPE

This model will run automatically because of how easily it can be used. Commercial, industrial, and agricultural applications can all make use of this model. The nation's water and wastewater management infrastructure, encompassing pipe systems, facilities, and equipment, faces inherent shortcomings that contribute to environmental harm and the wastage of millions of gallons of water annually. Traditional practices such as labor-intensive meter readings and a lack of insight into distribution, collection, and consumption patterns lead to time-consuming, expensive, and reactiveservices. To mitigate these losses and address pressing issues related to drought, flooding, and water quality, the water industry is embracing cutting-edge sensors and communication solutions tailored for "smart water management." This shift is primarily motivated by more stringent government compliance standards, the evolution of smart cities, and the imperative for water conservation, particularly in agriculture and other high- water consumption sectors.

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Quasi-Z-Source Solar Inverter fed BLDC Drive System

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Abstract— The Quasi-Z-Source inverter is a key component of this project, offering several advantages over traditional inverters, including inherent buck-boost capabilities and improved reliability. The integration of solar panels into the system enhances the sustainability and reduces dependency on conventional power sources. This project focuses on the design, simulation, and analysis of a solar inverter system employing the Quasi-Z-Source (qZS) topology to power a Brushless DC (BLDC) drive. The qZS inverter's unique characteristics, including its ability to handle varying input voltages and inherent boost capability, make it an ideal for renewable energy applications. The quasi z-source network has applications in the field of renewable energy as it acts as a power conditioning circuit. This four switch quasi z source structure decreases the switching losses, total harmonic distortion and cost in comparison with traditional six switch structures. Simulation of the proposed model was done in MATLAB/SIMULINK

Keywords Quasi z-source inverter, MATLAB simulation.

I. INTRODUCTION

The quasi-Z source inverter is a modified version of the Z source inverter, offering enhanced voltage boost capabilities and improved reliability. A Quasi-Z-Source inverter fed Brushless DC (BLDC) drive system is an advanced technology that efficiently converts DC power from sources like solar panels or batteries into AC power for precise and reliable control of BLDC motors. There are many challenges when a BLDC motor is driven using renewable energy sources such as solar and wind power. The intermittent supply provided by the renewable energy sources needs to be modified to a DC with superior output quality for BLDC motor drive applications. For obtaining balanced three phase output voltages, the existence of a ripple free DC supply is necessary. Also bulky and heavy capacitors must be avoided as they lead to slower response and increase in cost. A Quasi- Z-Source Inverter (qZSI) is a type of power inverter used in renewable energy systems and motor drives. It incorporates a unique impedance network, the Z-source network, which provides certain advantages over traditional inverters.

The Z-source network allows the inverter to handle a wider range of input voltage variations and enables buck-boost functionality, improving the overall flexibility of the system. Unlike conventional inverters, a qZSI can boost the input voltage when needed, enhancing its performance in various operating conditions. A Quasi-Z-Source Inverter (qZSI) is a type of power inverter used in renewable energy systems and motor drives. It incorporates a unique impedance network, the Z-source network, which provides certain advantages over traditional inverters. The Z-source network allows the inverter to handle a wider range of input voltage variations and enables buck-boost functionality, improving the overall flexibility of the system. Unlike conventional inverters, a qZSI can boost the input voltage.

The qZSI finds applications in photovoltaic systems, wind energy systems, and electric vehicle drives, where its flexibility and ability to handle varying input conditions make it a compelling choice for power conversion. A Quasi-Z- Source Inverter (qZSI) is a specialized type of power inverter designed for renewable energy systems and motor drives. Its distinctive feature is the implementation of a unique impedance network known as the Z-source network. The Z- source network enables the inverter to tolerate a wider range of input voltage variations. This is particularly beneficial in renewable energy applications where the input voltage from sources like photovoltaic panels or wind turbines can be variable. Developing a mathematical model of the qZSI, incorporating the Z-source network and the switching elements. Define the equations governing the behaviour of the inverter, taking into account shoot-through states and control strategies. Parameter Selection Specify the parameters of your qZSI model, including values for the Z-source network components, modulation index, and other relevant parameters. These values are often determined based on the specific requirements of your application. Implementing Control Strategies Incorporate control strategies to manage the shoot- through states and overall operation of the inverter. Common control methods include pulse width modulation (PWM) techniques and shoot-through control [1].

II. PROPOSED SYSTEM

This is the block diagram of solar inverter based on quasi-z-source fed for BLDC drive. It contains solar panel, battery, quasi-z- source inverter and a BLDC drive. First, the solar panel captures sunlight from the sun and converts it into DC power. This power is then stored in the battery. The Quasi-Z-Source inverter takes the DC power from the battery and converts it into AC power. Finally, the AC power is supplied to the BLDC drive. This sequence ensures that the solar energy is efficiently utilized to power the BLDC drive.

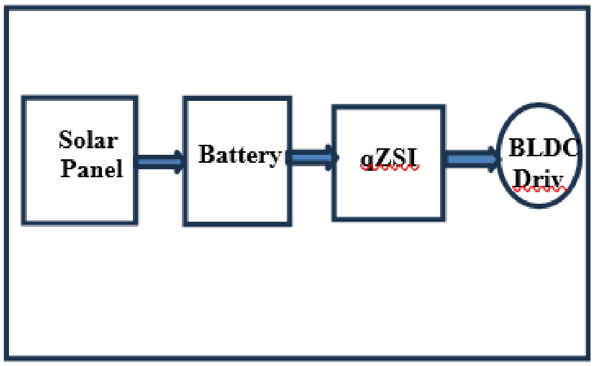

Fig. 1 Shows proposed system block diagram

Proposed Quasi-Z-Source Inverter

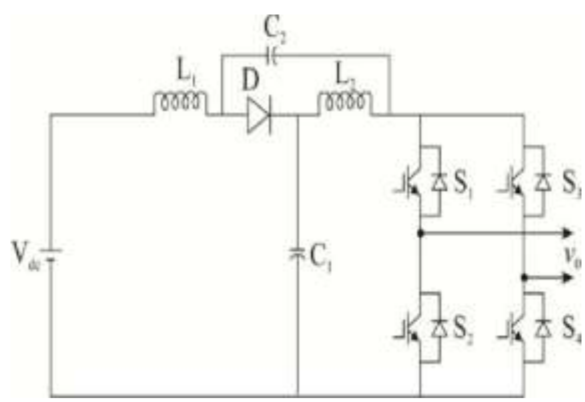

Fig 2. Quasi-Z-Source Inverter

The quasi-Z-Source inverter is shown in fig.2. The quasi-Z source inverter is the modified version of z source inverter. The Quasi-Z-Source inverter, renowned for its ability to handle wide voltage ranges and inherent boosting capabilities, aligns seamlessly with solar applications. Through MATLAB, we aim to explore and optimize the control strategies, modulation techniques, and power conversion algorithms tailored to harness solar energy efficiently for BLDC propulsion systems. This will delve into the implementation details, simulation methodologies, and performance assessments of the Solar Inverter based on the Quasi-Z-Source topology, offering insights into its feasibility, efficacy, and potential advancements in renewable energy-driven BLDC applications. Integrating a Quasi-Z-Source inverter, which allows for greater flexibility and improved performance compared to traditional inverters. Creating a system that effectively harnesses solar energy and converts it into usable power for the BLDC drive. Developing control algorithms and mechanisms to ensure the smooth operation and control of the BLDC drive.

Quasi-Z-Source inverter plays a crucial role in converting the DC power from the battery into AC power. It uses a unique topology that allows for improved efficiency and flexibility in power conversion. The Quasi-Z-Source network controls the voltage and current to meet the requirements of the BLDC motor, ensuring smooth and efficient operation of the motor. This helps in maximizing the overall efficiency and performance of the system.

The Quasi-Z-Source inverter, renowned for its ability to handle wide voltage ranges and inherent boosting capabilities, aligns seamlessly with solar applications. Through MATLAB, we aim to explore and optimize the control strategies, modulation techniques, and power conversion algorithms tailored to harness solar energy efficiently for BLDC propulsion systems [2].

III. SIMULATION AND RESULTS

Use MATLAB/Simulink to build the simulation model. Create blocks representing the components of the qZSI, including the Z-source network, switches, and control algorithms. Defining Input Conditions Specify the input conditions for your simulation, such as the input voltage from renewable sources (e.g., photovoltaic panels or wind turbines). This step is crucial to evaluate the inverter's performance under varying input conditions. Running the Simulation Execute the simulation and observe the behaviour of the qZSI. Analyse key performance metrics, including output voltage, current, and efficiency.

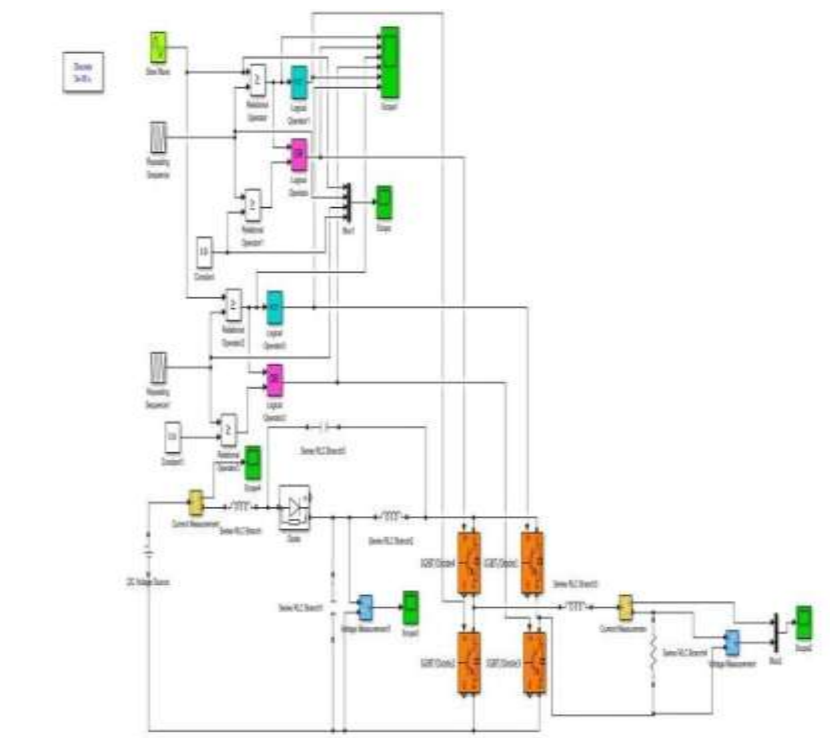

Fig.3 Proposed Simulation Model of Quasi-Z-Source inverter.

Simulation and Modelling:

MATLAB provides a comprehensive platform for simulating and Modelling: complex systems, making it ideal for designing and analyse power electronics systems like a Quasi-Z-Source inverter for BLDC drives.

Performance Analysis:

We can use MATLAB to analyse the performance of the solar inverter and BLDC drive under various operating conditions, helping you make informed design decisions. Parameter Optimization: MATLAB can assist in optimizing component values and parameters to achieve desired performance and efficiency.

Real-Time Testing:

MATLAB also supports real-time testing and implementation, which is essential for hardware-in-the-loop (HIL) testing of the inverter and drive system [3].

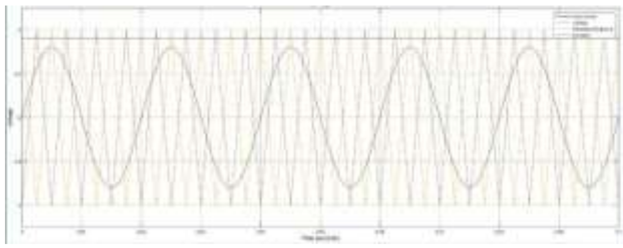

Fig.4 Input Scope voltage Result

Fig.5 Scope 1 output (Logical Operators)

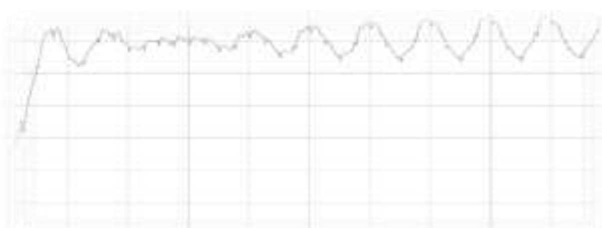

Fig.6 Scope 3 output (Logical Operators)

The below graph (fig .7) shows the final scope output of quasi z source inverter.

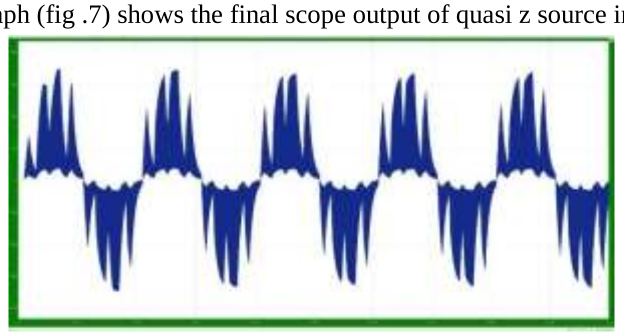

Fig.7 Quasi-Z-Source inverter output voltage

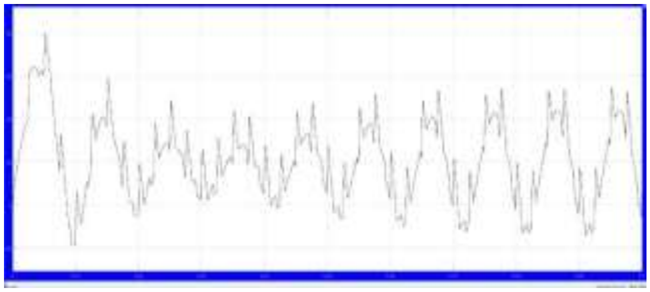

Fig.8 Scope 4 (Relational operator)

IV. CONCLUSION

In this Simulink-based project, we embarked on a comprehensive exploration of the Quasi-Z-Source topology Through complex simulations and modeling within the Simulink environment, we sought to evaluate the feasibility and performance of this innovative system. Simulations revealed the inherent advantages of the Quasi-Z-Source topology in handling wide input voltage ranges, providing robustness against fluctuations in solar power output [4].

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Smart Doormat with IoT-Enabled Visitor Detection

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Abstract— Suggested system fulfils the home security system's door mat notification function. This system can be easily changed to provide numerous functional systems, such as safety control, fire detection, and industrial automation. The suggested technique detects the visitor outside the door.
By snapping a visitor's photo, the owner will receive an email immediately. Authentication is the most important component of any security system. An Android phone is the main device used in the proposed system for email visitor notifications and authentication. The proposed approach allows the owner to view the visitor's past year history by storing images of them both offline and online. With 3% of errors, this system has a 97% accuracy rate. It could occur due to a network problem. As a result, the entire system is robust and has a promising future for a range of uses.

Keywords— Cloud computing, email, IoT, and smart doormats.

I. INTRODUCTION

Without opening the door, it is challenging to discern who is outside. When we are working in the kitchen or completing important office chores, it takes a lot of time to open the door or watch the person outside the door. In addition, if we are travelling outside of the state or nation, we must allow servants or known people enter the residence. With this technology, you can immediately identify who is at your door and decide whether to let them in or not by simply pressing a single button. Today's culture places a high value on home security, which makes using a system that provides sufficient protection all day and night imperative. Many security systems available on the market are not cloud-connected, despite their abundance [1]. Handheld devices access and save data on this cloud server. Our proposed design calls for data to be saved on one device in the cloud and retrieved on another. Hence, compared to other technologies, this one is quick and simple to use. In addition, the system is converted to a CCTV and utilized for home monitoring.

II. METHODOLOGY

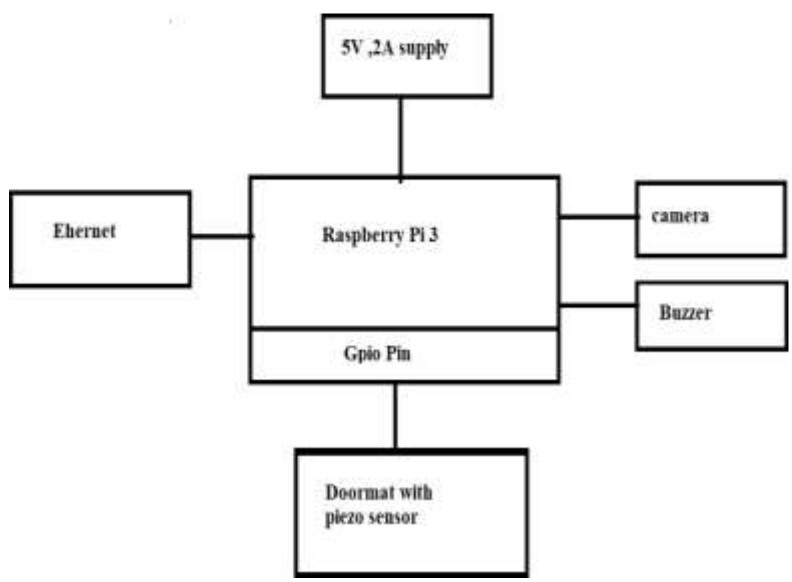

Fig.1 System block diagram

A Raspberry Pi, a camera, an Ethernet connection, a piezoelectric sensor, an ultrasonic sensor, and a camera make up the recommended system's many parts. The adapter can offer the 5V power source that Raspberry Pi needs. It also has a special 5-megapixel, 8-megapixel camera. The camera port on the Raspberry Pi is directly connected to this camera. In order to give the user instructions in the form of pictures, a Raspberry Pi was fitted with a CCTV camera. An Ethernet cable must be connected to the Raspberry Pi's Ethernet shield in order to access the internet. We placed an ultrasonic sensor 100 cm away in order to detect. Furthermore, a piezoelectric sensor was utilised to supply data to the door mat. The Raspberry Pi has 40 GPIO pins that can be used to connect different kinds of sensors. The Raspberry Pi's gpio pins are connected to the electric buzzer.

2.2 Hardware prototype:

- **Raspberry Pi**

The proposed system incorporates the Raspberry Pi 3 as a crucial element. With its 4 USB ports, users can easily connect a mouse, keyboard, and pen drive, while the Ethernet-compliant connection enables the use of an Ethernet cable. The Raspberry Pi 3's 40 GPIO pins provide flexibility for attaching various sensors such as ultrasonic, air, temperature, and moisture sensors. Additionally, the Raspberry Pi includes dedicated slots for attaching the Pi camera and touch screen display.

Fig.2: Raspberry Pi

To set up the system, an 8 GB memory card is essential for installing the operating system and storing software. The versatile Raspberry Pi serves as a capable music player, equipped with a 3.5 mm audio connector for seamless connection to headphones and home theatre systems. Facilitating its power needs, the Raspberry Pi incorporates a dedicated power slot compatible with a 5V, 2A charger, and a separate power circuit can be designed as well. Moreover, the device is equipped with an HDMI connector, allowing easy connectivity to external desktops or projector .[3]

- **Pi Camera:**

The Raspberry Pi is equipped with a dedicated camera slot that directly interfaces with the Pi camera. Users can choose between 5 MP and 8 MP camera options, with the system opting for the 5 MP variant. Utilizing a Pi camera on the Raspberry Pi offers a simplified experience compared to using a web camera, thanks to its inherent command integration. Before utilizing the camera, it is essential to enable it in the Raspberry Pi configuration. Positioned above the door at the center, the camera serves a pivotal role in the system. The Pi camera, specifically designed for use with the Raspberry Pi, is a compact and versatile imaging solution that enhances the capabilities of the system.[2] It seamlessly integrates with the camera slot on the Raspberry Pi, providing users with a streamlined and efficient way to capture images and videos for various applications.

Fig.3: Pi Camera

• **Piezoelectric Sensor:**

A piezoelectric sensor is a type of sensor that utilizes the piezoelectric effect to measure changes in pressure, acceleration, temperature, or force by converting them into an electrical charge. The piezoelectric effect is the ability of certain materials, such as crystals and ceramics, to generate anelectric charge in response to mechanical stress.

Working Principle: Piezoelectric sensors operate based on the principle that when mechanical stress is applied to a piezoelectric material, it causes a displacement of charge within the material, resulting in the generation of an electric voltage. This voltage is proportional to the applied force or pressure, allowing for precise measurement.

Applications: Piezoelectric sensors find applications in various fields. They are commonly used in industrial settings for pressure and force measurements, in accelerometers for detecting vibrations and accelerations, and in medical devices for monitoring physiological parameters such as heart rate and blood pressure.

Sensitivity and Accuracy: One of the advantages of piezoelectric sensors is their high sensitivity. They can detect small changes in pressure or force, making them suitable for applications that require precise measurements. Additionally, they have a quick response time, providing real-time data.

Compact and Lightweight: Piezoelectric sensors are often compact and lightweight, making them suitable for applications where space and weight constraints are crucial, such as in aerospace or automotive industries.

Durability: These sensors are known for their durability and reliability. They can withstand harsh environmental conditions and are less susceptible to wear and tear compared to some other sensor types.

Energy Harvesting: In addition to sensing, piezoelectric materials can also be used for energy harvesting. The mechanical vibrations or movements in the environment can be converted into electrical energy, offering a potential source of power for low-power electronic devices.[4]

Integration with IoT and Electronics: Piezoelectric sensors can be easily integrated into electronic systems and Internet of Things (IoT) devices, providing valuable data for monitoring and control applications.

In various engineering and scientific applications, the versatility and effectiveness of piezoelectric sensors make them an essential component for capturing and translating mechanical phenomena into measurable electrical signals.

Fig.4: Piezoelectric Sensor

In this setup, we utilize piezoelectric sensors that transform the piezoelectric effect into electrical impulses, enabling the monitoring of acceleration, force, and pressure. These sensors trigger alerts through a buzzer activation. Consequently, the need for a conventional doorbell is eliminated when guests arrive, as the doormat itself becomes an intelligent sensing device capable of recognizing guests and issuing alerts on their behalf.

The embedded Piezo sensor within the mat consistently monitors changes in pressure induced by objects or individuals standing or sitting on it. This transformative technology turns the doormat into a dynamic and weight-sensitive layer of smart foam. This smart foam can be strategically placed under a doormat or virtually anywhere else in your home where reactions to pressure changes are desired.

Beyond its role as a doormat, this technology introduces a versatile and adaptable solution. The weight-sensitive layer of smart foam extends its applicability to various scenarios within your household. Whether positioned under furniture, carpets, or other surfaces, it provides an intelligent means of detecting and responding to changes in pressure. This not only enhances convenience but also offers a potential layer of security, alerting occupants to the presence of individuals or objects in specific areas.

In summary, the integration of piezoelectric sensors within the doormat transforms it into a sophisticated, weight-sensitive layer of smart foam. This innovation surpasses the conventional role of a doormat by enabling intelligent and automated responses to changes in pressure, making it a valuable addition to your home for both convenience and security [5].

III. FLOW CHART OF THE SYSTEM:

The system follows a structured flow procedure where each step occurs sequentially. It begins with the initial person detection using a piezoelectric sensor. If a visitor is identified, the system activates a buzzer and captures an image. Subsequently, an email containing the captured image is sent to the owner. Additionally, the piezoelectric sensor is utilized to trigger a buzzer in case theft is detected. This ensures a systematic and orderly response to both visitor recognition and theft alerts within the system.

By leveraging the Internet of Things (IoT) and the Raspberry Pi 3 module, we construct a smart doormat equipped with a visitor sensor. This enables automatic detection of visits. Furthermore, data is received through a piezoelectric sensor, and email notifications are sent to our mobile devices. This ensures that we can promptly detect theft and take protective measures, regardless of whether we are at home or not. Additionally, there is the capability to maintain visitor records in picture format as an available option.

The implementation of the Smart Doormat with IoT-Enabled Visitor Detection has yielded promising results. Leveraging the capabilities of the Internet of Things (IoT) and the Raspberry Pi 3 module, the system demonstrates effective and automatic detection of visitors as they approach.

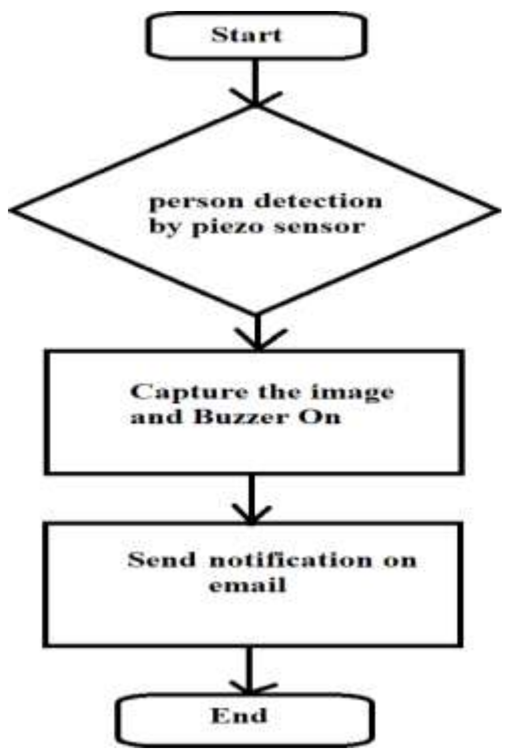

Fig.5: Flowchart of system

IV. RESULTS

Key outcomes of the project include:

Automated Visitor Detection: The smart doormat successfully identifies and detects visitors through the integration of IoT technology and the Raspberry Pi 3 module. This automated process enhances convenience for occupants.

Real-time Data Acquisition: The piezoelectric sensor facilitates real-time data acquisition, enabling the system to promptly respond to changes in pressure caused by individuals standing on the doormat. This ensures timely and accurate visitor detection.

Immediate Alerts: In the presence of a detected visitor, the system triggers a buzzer, providing an audible alert. Simultaneously, an image is captured and sent via email notifications to the owner's mobile devices, allowing for immediate awareness of visitors even when away from home.

Theft Detection Capability: The integrated piezoelectric sensor serves a dual purpose by also detecting theft. In such instances, the system activates the buzzer, delivering an alert to notify occupants of unauthorized activity.

Remote Monitoring: The email notifications enable remote monitoring, allowing homeowners to stay informed about visitor activity and potential security concerns whether they are at home or not.

Visitor Records: The system offers the option to maintain visitor records in picture format. This feature enhances security by providing a visual log of individuals who have approached the premises.

• Image captured by the Raspberry pi camera.

Fig 6: Actual captured image

•Front side of project model:

Fig.7: Front view of model

• Top view of Project Model:

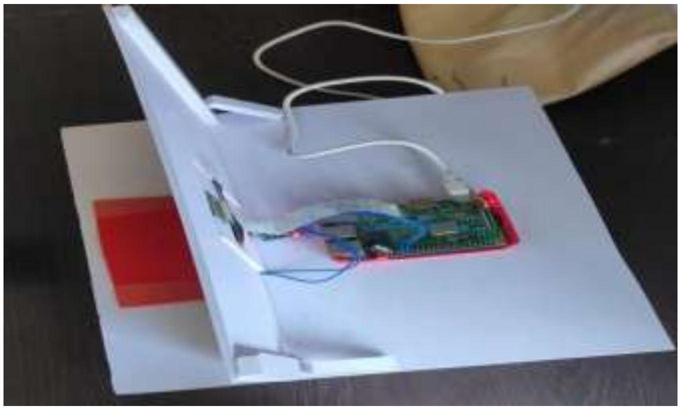

Fig. 8: Top view of model

V. APPLICATION:

- Enhancing home security through surveillance measures.
- Implementing an automatic door open and close system for added convenience.
- Strengthening locker security with advanced face recognition technology.
- Automating gates with a built-in visitor count feature and notification functionality.
- Improving safety by integrating fire detection systems with automatic notifications to the fire brigade.

VI. CONCLUSION:

In conclusion, the implementation of the Smart Doormat with IoT-Enabled Visitor Detection project has resulted in a successful and innovative solution for enhancing home security and automation. By leveraging Internet of Things (IoT) technology and the Raspberry Pi 3 module, the doormat demonstrates a seamless and automated process of detecting visitors.

The key achievements and conclusions of this project are as follows:

Efficient Visitor Detection: The integration of piezoelectric sensors enables the doormat to efficiently detect the presence of visitors. This automated process eliminates the need for traditional doorbells and enhances the overall accessibility and responsiveness of the home security system.

Real-time Alerts: The system promptly triggers a buzzer and captures an image when a visitor is detected. Simultaneously, email notifications are sent to the owner's mobile devices, ensuring immediate awareness and enabling quick response, whether the homeowner is at home or away.

Dual Functionality for Theft Detection: The utilization of piezoelectric sensors not only facilitates visitor detection but also serves as an effective mechanism for detecting potential theft. The system's ability to sound the alarm in such situations provides an additional layer of security.

Remote Monitoring and Control: The project enhances the concept of smart homes by allowing homeowners to remotely monitor visitor activity. The integration of IoT technology enables seamless communication and control, contributing to an advanced and connected living environment.

Overall, the Smart Doormat with IoT-Enabled Visitor Detection project successfully combines technological innovation with practical security applications. The system's ability to automate and enhance visitor detection contributes to the evolving landscape of smart home solutions, providing homeowners with a reliable and intelligent approach to home security and surveillance.

A Smart Doormat with IoT-enabled visitor detection has several exciting future scopes Here are some potential areas of growth and development:

Enhanced Security Features: Integration with home security systems: The doormat could be connected to other security devices like cameras, alarms, or smart locks to enhance overall home security.

Facial recognition: Incorporating facial recognition technology could provide an added layer of security by identifying known visitors and alerting homeowners to potential threats.

Data Analytics for Insights: Visitor patterns and trends: Analyzing data collected over time can provide insights into visitor patterns, helping homeowners understand their daily routines or identify irregularities. Integration with other IoT devices: Connecting the doormat to other smart devices within the home can provide a comprehensive view of the environment, allowing for more informed decisions and automation.

Integration with Virtual Assistants: Voice-enabled interactions: Integration with virtual assistants like Amazon Alexa or Google Assistant could enable users to control and monitor the doormat using voice commands.

Automated notifications: Virtual assistants can send alerts or notifications to homeowners when a visitor is detected, even providing information about the visitor if available.

Customization and Personalization: User profiles: Allowing users to create profiles for different family members or regular visitors can help in personalizing the doormat's responses or notifications based on individual preferences.

Customizable settings: Providing users with the ability to customize sensitivity levels, notification preferences, or other settings can enhance the user experience.

Integration with Smart Home Ecosystems: Seamless connectivity: Ensuring compatibility with popular smart home ecosystems like Apple Home Kit, Google Home, or Samsung Smart Things can broaden the doormat's usability.

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Simulation and Analysis of Thyristor-Based Industrial Battery Charge Controller using MATLAB

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Abstract— In recent developments, various rectifier circuit configurations, including multi-pulse arrangements, have been employed to convert regular electrical power from AC to DC, effectively minimizing ripple content in the output. The applications of these rectifiers in diverse industrial settings, such as electroplating, heating, magnet power supply, traction and battery charging have necessitated tailored specifications. Notably, for single-phase systems, DC power is derived from a thyristor-controlled rectifier, while AC power is harnessed through a bridge rectifier consisting of diodes and a thyristor for precise control. In this paper, we have designed a single and three-phase pulses thyristor-controlled rectifier is comprehensively detailed, encompassing both purely resistive and resistive-inductive load scenarios. To validate and analyse the designs, circuit simulation tools have been conducted, with the subsequent presentation of simulation results.

Keywords—Thyristor, Triggering pulse, Semi-controlled rectifier, Various loads, MATLAB simulation.

I. INTRODUCTION

Battery chargers play a vital role in powering diverse devices such as laptops, electric vehicles, mobile phones, electronic gadgets and electronic tools, etc [13]. Ensuring robust and efficient battery performance hinges on the dependability of the charger. Chargers are often distinguished by their charging speed. In low-voltage applications like battery charging, automotive, and aircraft systems, DC power finds common use [5]. Previously, the generation of DC power was achieved through power electronic semiconductor switches. These semiconductor switches can be categorized based on their controllability:

I. Uncontrollable - Diodes
II. Controllable – Thyristors

Silicon diodes are frequently employed in rectifiers, yet they lack control over the output voltage [5]. In applications demanding controllability, such as battery chargers, thyristors are preferred over diodes. Unlike diodes, thyristors necessitate a triggering signal at the gate for conduction when forward- biased. The firing angle (α) of the thyristor dictates the control over the rectifier, where α=0 results in behaviour akin to an uncontrolled diode rectifier [3]. This paper delves into a single- phase full-wave controlled bridge rectifier, examining its behaviour under diverse loads, including resistive (R) and resistive-inductive (R, L) loads. Through phase control achieved by triggering pulses to the thyristor gate, the average load voltage can be managed and adjusted. MATLAB simulations are carried out at different triggering angles and different loads [4].

There are two methods mostly used for voltage control.

a. PWM Controlled Method [7]
b. Thyristor Firing Angle Control Method [2]

a. PWM Controlled Method

Pulse Width Modulation (PWM) is a common method in power electronics, especially for controlling the output voltage in DC/AC inverters. Essentially, PWM adjusts the width of output pulses to regulate the average output voltage. This allows a fixed DC input to generate a variable-frequency sinusoidal waveform with adjustable amplitude. Inverters using PWM provide precise control over voltage and current, crucial in applications like motor drives, renewable energy systems and uninterruptible power supplies (UPS)[6]. This fine control helps achieve optimal performance PWM also allows managing harmonic distortions in the output waveform, improving power quality and reducing system losses. Compared to basic square-wave modulation, PWM provides better control over voltage, frequency, and harmonics enhancing overall efficiency and performance in various applications [7].

When using PWM in power electronics systems, there are some downsides. It has the effect of raising the switching frequency and stress on power devices, leading to a reduced lifespan, increased switching losses, and higher emissions of electromagnetic interference (EMI). Moreover, you need an advanced controller and driver circuit to create and apply the PWM signals to the power device, which can drive up costs and add complexity to the converter. Lastly, it can bring about negative effects on the connected devices, including voltage spikes, current ripples, noise, and vibrations. This is particularly true for sensitive or nonlinear loads such as motors, batteries, or LEDs [7].

These are the disadvantages of PWM controlled methods which overcomes by using thyristor firing angle control.

b. Thyristor Firing Angle Control Method

Thyristor firing angle control serves as a crucial method for precisely regulating voltage in AC power systems by manipulating the firing angle of thyristors within the circuit. This technique involves adjusting the timing of thyristor conduction during each AC cycle, allowing for effective voltage control across the load [2]. Semiconductor devices known as thyristors function as switches in electrical circuits, conducting current only upon receiving a trigger signal and remaining conducting until the current falls below a specific threshold. The firing angle, representing the delay in triggering thyristors, is a pivotal parameter. By controlling this angle, the point at which thyristors begin conduction, the effective voltage across the load can be dynamically altered [10].

Phase angle control a key aspect, entails adjusting the firing angle to regulate the power delivered to the load. Delays in the firing angle result in reduced power delivery, thereby lowering the average voltage across the load. This method boasts advantages in its simplicity and effectiveness for voltage regulation in AC circuits, often finding application in systems requiring smooth and continuous power control, such as heating systems [11]. Common applications of this control method include industries relying on precise power control for resistive loads, exemplified by heaters [12].

To address challenges like voltage spikes during turn-off, snubber circuits are frequently incorporated to reduce stress on the thyristors. Some advanced systems integrate feedback mechanisms to dynamically adjust the firing angle based on actual output voltage, ensuring enhanced regulation and stability [2]. Synchronization with the AC waveform is critical for accurate control, emphasizing the need for precise timing of thyristor firing to minimize waveform distortion [3]. In the broader context, thyristor firing angle control is an integral part of sophisticated control systems, often featuring sensors, feedback loops, and microprocessor-based controllers to meet specific application requirements.

These are the following methods used for control thyristor firing angle [2].

1. Phase Angle Control
2. Integral Cycle Control
3. Single-Pulse Control
4. Two- Pulse Control
5. Three-Pulse Control
6. Multicycle Control
7. Slip Power Recovery System
8. Current Source Inverter Control

1. Phase Angle Control

In phase angle control, the manipulation of the firing angle is employed to regulate the segment of the AC waveform during which the thyristor conducts. This technique is commonly applied in scenarios involving resistive loads.

Regulating power entails manipulating the flow of the AC voltage signal through a conducting thyristor. The triggering card receives a control signal, dictating the allowed portion of the signal to pass while blocking the remainder. Adjusting this signal level enables the regulation of the average voltage across the load, prompting the load to draw current proportionally. In simpler terms, it resembles adjusting a faucet to govern the flow of water – in this context, it's about managing electricity for the desired power level [6].

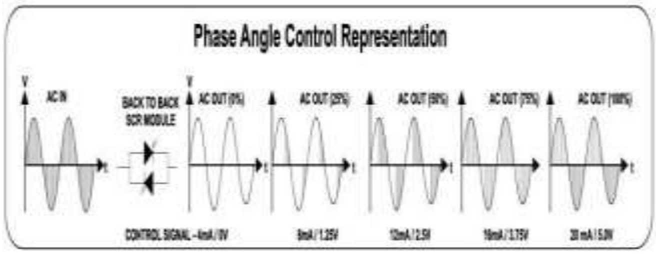

Fig.1 Phase angle control representation

Phase Angle Control stands out as a precision method, offering meticulous management of the power supplied to a load. Analogous to a dimmer switch for electricity, it enables the selective use of current, ensuring only the essential amount is deployed. This not only facilitates accurate control but also contributes to energy conservation, utilizing only what is truly necessary. The analogy of adjusting the volume on a device further illustrates the nuanced ability to fine-tune power consumption, enhancing overall efficiency [16].

2. Integral Cycle Control

Integral cycle control enhances power regulation by extending the conduction angle beyond a single half-cycle, enabling a smoother control of power. This method is well-suited for resistive and moderately inductive loads. Integral Cycle Control provides an efficient method for power converters to transform AC power into another form of AC power directly, eliminating unnecessary energy wastage. Think of it as a shortcut that captures the optimal part of the AC wave, resembling a smooth wave in its operation.

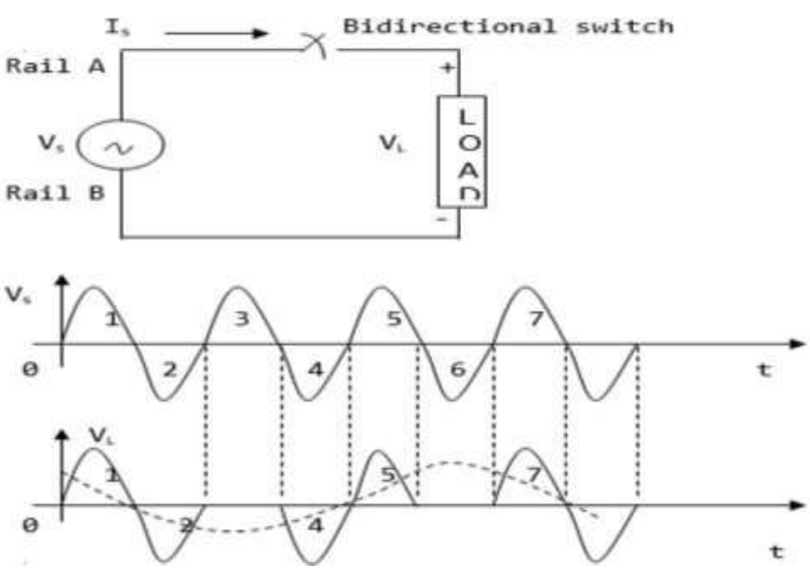

Fig.2 Integral cycle control representation

These controllers strategically turn on or off precisely when the voltage hits zero, ensuring a streamlined process without unnecessary steps. In essence, it's like having a switch that instantly modifies the power, enhancing overall energy efficiency [8].

II. SIMULATION MODEL & EXPERIMENTAL RESULT

The simulation tool proves instrumental in crafting designs for both single-phase rectifiers. The first configuration involves an R-load with a 4-ohm resistance, while the second introduces an R-L load featuring a 4-ohm resistance and a 2 milli-henry inductance. Through meticulous simulations, it becomes evident that the anticipated outcomes are successfully achieved. Specifically focusing on the simulation circuit tailored for the R-L load, the configured parameters within the simulation software contribute to a comprehensive analysis of its performance is shown in fig 1[1].

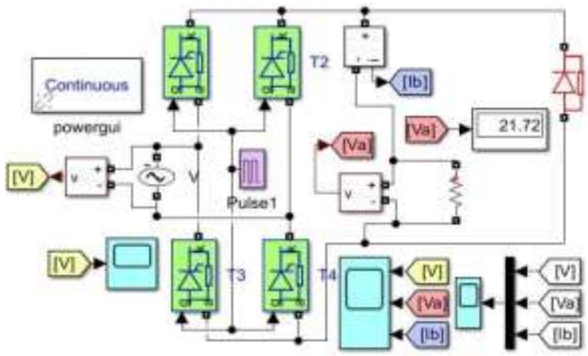

Fig 1. Simulation Model for Single Phase RL Load.

The R-load circuit's output is acquired by varying the excitation voltage at the input side for different firing angles (alpha), as outlined in the corresponding table 1[1].

Table 1. Output voltages for Single phase R-Load for different triggering angles.

Firing Angle	Output Voltage
0	11.92
15	11.92
30	18.5
45	20.86
60	21.72

The above table1 values shows that the output voltages for different firing angle for single-phase R load.

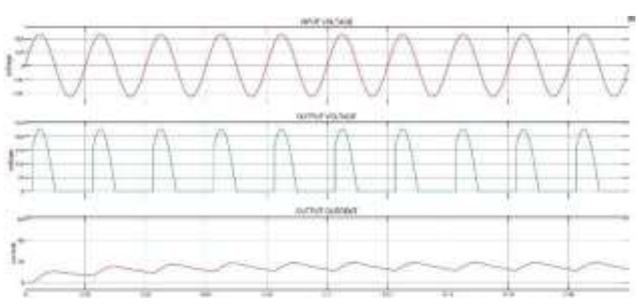

Fig 2. Simulation waveforms for R-Load at alpha=30

The above Fig 2 shows that the waveform for single-phase R load at triggering angle α=30.Above figure shows the waveforms for voltage and current.

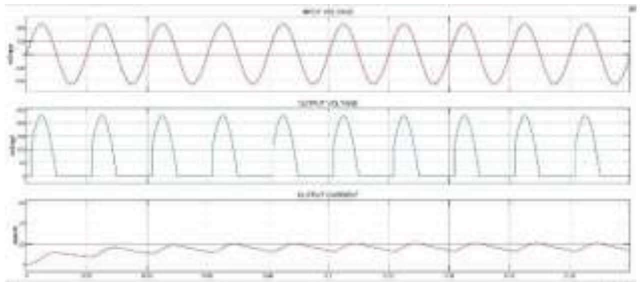

Fig.3 Simulation waveforms for RL-Load at alpha=30

Table 2. Output Voltage of Single-Phase RL-Load for Different triggering angle

Firing angle	Output voltage
0	11.92
15	11.95
30	20.12
45	21.45
60	21.73

A simulation tool is employed for the design of a three-phase rectifier. Two circuits were simulated: one for an R-load with a resistance of 4 ohms and another for an R-L load featuring a 4 ohm resistance and a 2 milli-henry inductance. The simulation results indicate the achievement of the intended outcomes [1].

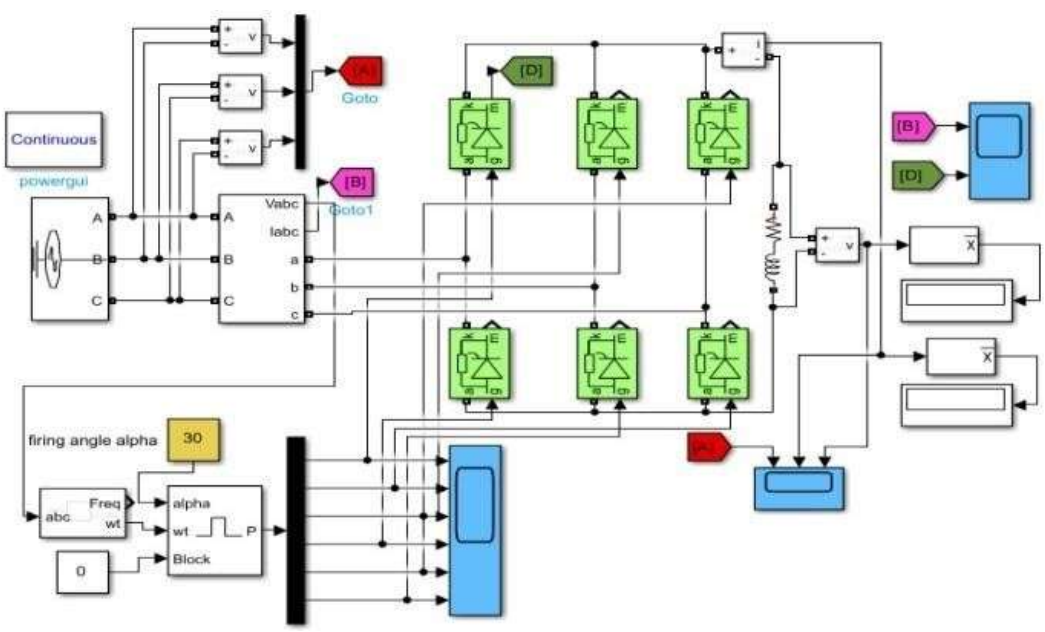

Fig 3. Simulation circuit model for Three-Phase R-load

In a resistive load, the current and voltage are in phase. Adjusting the firing angle of thyristor in a circuit controlling a resistive load affects the portion of the AC waveform allowed to pass through, thereby regulating the power supplied to the resistive load. By Controlling the firing angle, we can effectively regulate the average voltage applied to the resistive load [2].

Table 3. Output voltage for Three phase R-Load for different triggering angles.

Firing Angle	Output Voltage
0	77.6 V
30	81.4
45	98.3
60	107.8
90	122.9

The above table values shows that the output voltages for different firing angle for three-phase R load.

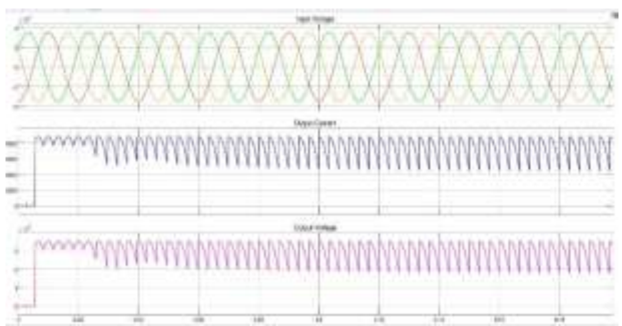

Fig 4. Simulation waveforms for three phase R-Load at alpha=30

Increasing the firing angle, represented as 'a,' in a three-phase fully controlled rectifier results in a heightened time delay. causing greater fluctuations in the output waveforms. This pulsation is undesirable when striving for a stable DC output.

To mitigate this concern, various combinations of passive filters can be implemented at the output to reduce the observed DC voltage and current ripple.

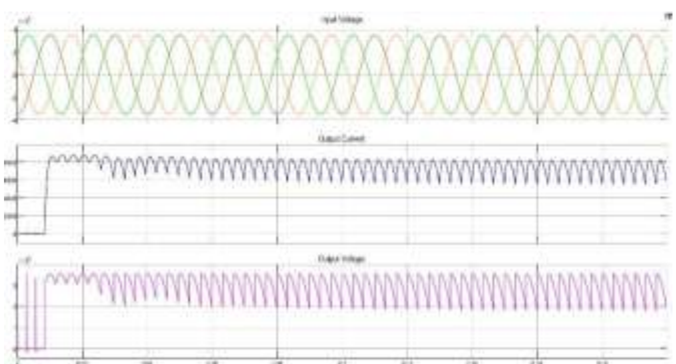

Fig 5. Simulation waveforms for three phase RL-Load at alpha=30

Setting the firing angle (α) to 30 degrees in a 3-phase fully controlled rectifier with an R-L load leads to increased pulsations in the output waveforms rather than achieving a ripple-free state. This pulsating behaviour stems from the extended time delay linked to higher firing angles, which is undesirable for maintaining a constant DC output. To mitigate this issue, it becomes essential to incorporate various passive filter combinations at the output end. This helps diminish the observed ripple or pulsating nature, ensuring a stable DC voltage. [1].

Table 4. Output voltage for Three phase RL-Load for different triggering angles.

Firing Angle	Output Voltage
0	77
30	80
45	98.7
60	107
90	125

The above table values shows that the output voltages for different firing angle for three-phase RL load. Conclusively, the implementation of firing angle control within a resistive-inductive (RL) load scenario emerges as a versatile and efficient method for power regulation. This approach, which involves adjusting thyristor firing angles, allows for precise management of both voltage and current in systems featuring inductive components. The manipulation of firing angles provides adaptability in delivering power to RL loads. Nevertheless, it is crucial to be aware of potential issues, such as harmonics, and customize the firing angles based on the distinct characteristics of the RL load to enhance overall performance.

III. CONCLUSION

The industrial battery charger project employs a sophisticated system that utilizes a thyristor-controlled rectifier for obtaining DC power from an AC power supply. The bridge rectifier, comprising diodes and a thyristor, facilitates precise control over the AC power. This setup ensures efficient charging of batteries through controlled thyristor firing angles. The design and simulation results presented for the single- phase and three-phase, fully controlled thyristor converter in industrial battery chargers demonstrate effective control over current, voltage and power handling capabilities. The parametric values provide crucial insights into transformer and thyristor performance. While ripple content in output waveforms is inevitable and increases with thyristor firing angle, the simulation highlights the importance of implementing output filters to minimize ripple.

Moreover, the shift towards digital control techniques is recommended to overcome flexibility and noise interference issues associated with analog control. The comparison indicates that digital systems draw considerably less power than their analog counterparts. Therefore, for the successful implementation of an industrial battery charger using thyristor firing angle control, adopting a digital control topology is strongly recommended for enhanced efficiency and performance.

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Fault Investigation in High Voltage Transmission Line

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Abstract— An essential component of a power system are the transmission lines. Transmission lines are vulnerable to larger- scale failures and have a high-power transmission capacity. Transmission lines can have a variety of defects for this reason, transmission line protection requires protection relays. The fault currents may be harmful to electrical equipment, so protection system's goal is to cut off the unhealthy section from the healthy section. Distance relays are one type of protective relay that are mostly utilised in transmission lines. The voltage and current are required by distance relays to calculate impedance. Usually, distance protection relays are used to safeguard transmission cables. Distance relay used in transmission line are also known as high-speed relay. The proposed model has been validated through various tests, including line-to-line (L-L), two-line-to-ground (L-L-G), one line-to-ground (L-G), and three-level (L-L-L) fault. The SimPower System was utilised to model and simulate transmission lines, faults and distance relays. By using MATLAB software simulation results and distance relays for the investigation of transmission line protection for single, double and three phase faults at various transmission line locations. MATLAB/SIMULINK software can be used to overcome the challenges associated with comprehending the operation of a distance relay.

Keywords— Fault Types, High Voltage Transmission Line, Fault Analysis, Power System Protection, Distance Protection Scheme, MATLAB Simulation.

I. INTRODUCTION

The three primary parts of a power system's structure are distribution, transmission, and generating.

Generating: The process of producing electricity from a variety of sources, including nuclear, fossil fuels, hydropower, wind, solar, and more, is known as power generating. Electricity is produced by power plants or renewable energy installations and is subsequently distributed throughout the grid.

Transmission: From power plants to distribution substations, electricity must be transported across great distances via the transmission system. Electricity is transmitted through high voltage transmission lines, often called power lines or transmission lines. In order to minimise power losses during transmission, these cables run at high voltages.

Distribution: The power is stepped down to lower voltages for safe delivery to customers once it reaches the distribution substations. Distribution lines, also known as feeder lines, distribute the electricity to homes, businesses, and other end- users. Transformers are used to further lower the voltage to a level suitable for consumer use.

Power systems consist of these three primary parts in addition to a number of control and protection measures that guarantee the system's dependable and secure operation. These mechanisms include protective relays, circuit breakers, and monitoring systems. Investigating faults in high voltage transmission lines using MATLAB simulation involves modelling the transmission system, introducing faults, and analyzing their waveforms of current and voltage. The simulation allows testing various fault scenarios, assessing protective measures, and optimizing the system's reliability.

II. OBJECTIVE

The primary aim of fault investigation on transmission lines with high voltage is to quickly identify and address any issues or abnormalities that disrupt power transmission system efficiency, dependability, and safety by monitoring the flow of electricity. This involves identifying faults like L-G, L-L, L-L- L and L-L-L-G faults.

III. FAULT TYPES

There are various forms of faults in electrical and power systems, each having unique properties and consequences. The most typical kinds of errors consist of :

1. Line – Ground Fault (L-G)

This is the most common type of fault in high voltage transmission lines. Line-to-ground faults on high voltage transmission lines is a common electrical problem that happens when one of the conductors usually one of the phase accidentally touched the ground or an object that is grounded. This fault can result from a variety of factors, including insulation degradation, physical damage to the conductor, or a breach in the protective shielding.

When a line-to-ground fault occurs, it can have significant implications for the electrical system. The fault causes a sudden increase in current flow through the affected conductor and can lead to an unbalanced condition in a three-phase system. This, in turn, can result in voltage imbalances and voltage sags in the system. Furthermore, the fault may cause thermal stress and mechanical damage to the affected conductor and associated equipment.

2. Line – Line Fault (L-L)

An electrical failure that occurs when two conductors of a three-phase system come into direct contact with one another is known as a line-to-line faults in high voltage transmission lines. There are several potential causes of this defect, such as malfunctioning equipment, insulation breakdown, or external factors like falling trees or debris. Line-to-line faults are a serious concern in high voltage transmission systems because they can result in substantial short-circuit currents and significant damage to equipment.

When a line-to-line fault occurs, it typically leads to a sudden increase in current, causing excessive heating, electromagnetic forces, and voltage instability in the affected phases. This can result in a cascading effect, affecting the overall stability and operation of the power grid.

3. Line – Line – Line Fault (L-L-L)

Three-phase faults, or line-to-line-to-line faults, are one of the largest and least common electrical problems that can occur on major power lines. A short circuit is the result of all three phases of a three-phase electrical system coming into direct contact with one another. An extensive and possibly disastrous three-phase fault can have serious repercussions.

During this fault, the voltage levels can rise to extremely high levels, creating an intense electrical current surge. This can lead to the rapid overheating and damage of transmission line components, including conductors, insulators, and other equipment. The resulting high current can also affect transformers and generators connected to the transmission line, potentially causing widespread power outages.

4. Line – Line – Line – Ground Fault (L-L-L-G)

In a high-voltage transmission lines, a "three line-to-ground" fault is a complicated electrical fault condition that occurs when three conductors (typically associated with a three-phase power system) simultaneously develop a short circuit to the ground. This type of fault is relatively rare but can have significant consequences for the power system.

In such a fault, electrical energy from all three phases is exposed to the ground or to a conductive structure, resulting in a substantial current surge. This fault can be caused by various factors, including insulator failure, conductor damage, or equipment malfunction. When it occurs, it can lead to immediate and severe consequences, including electrical arcing, equipment damage, and potential power outages.

IV. FAULT ANALYSIS

Analyzing transmission line faults on transmission lines with high voltage is crucial for ensuring the reliability, safety, and optimal performance of the electrical grid. Here is some steps involved in the analysis of transmission line faults:

1. Fault Detection

As part of the analysis process, fault detection comes first. Modern power systems use protective relays and monitoring systems to detect abnormal conditions in transmission lines.

Protective relays continuously monitor voltage, current, and other parameters. When a fault is detected, the relay initiates protective actions to isolate the fault and minimize damage.

2. Fault Localization

Finding the fault's position along the transmission line comes next when a fault has been identified. Accurate fault localization is critical for minimizing downtime and ensuring efficient repairs.

Techniques for fault localization include time-domain reflectometry, which measures the time it takes for a signal to reflect off the fault location, and impedance-based methods.

3. Fault Classification

Faults can be classified as symmetrical (three-phase) or unsymmetrical (single-phase or double-phase). Classifying the fault type helps in selecting appropriate protective actions.
It is crucial for mitigation to know if the fault is a single phase-to-ground, line-to-line, or another kind.

4. Analysis

Detailed fault analysis involves understanding the magnitude and duration of fault currents, fault impedance, and the type of fault (L-G, L-L, etc.).
With the help of Computer-based simulation analyse the voltage and current waveform, and assess the impact on the power system.

VI. EFFECT OF FAULTS

High voltage transmission line faults can have various effects on the power system, including electrical, operational, and safety consequences. These effects can range from momentary disturbances to prolonged outages, and they can impact both the transmission system and downstream distribution systems.
Here are some effects of faults in high voltage transmission lines:

1. Voltage and Current Disturbances
   Faults cause sudden changes in current and voltage levels. Voltage sags (dips) and surges can occur, affecting the quality of power supplied to consumers.

2. Overcurrent and Overload Conditions
   Faults often result in overcurrent conditions, which can damage equipment and pose safety risks. Overloads can stress transformers, conductors, and other components.

3. Power Interruptions
   Depending on the fault type and the effectiveness of protective devices, faults can lead to temporary or prolonged power interruptions in the affected area, affecting businesses, industries, and households.

4. Equipment Damage
   Faults, especially short circuits, can cause mechanical and thermal stresses on equipment, leading to damage or failure of circuit breakers, transformers, and other components.

5. Economic Losses
   Extended power interruptions and equipment damage due to faults can result in significant economic losses for industries and businesses.

6. Operational Challenges
   Transmission line faults can create operational challenges for power utilities, requiring them to deploy maintenance crews, reroute power flows, and coordinate restoration efforts.

VIII. SIMULATION MODEL AND RESULT

1. L-G Fault (Single Phase Fault)

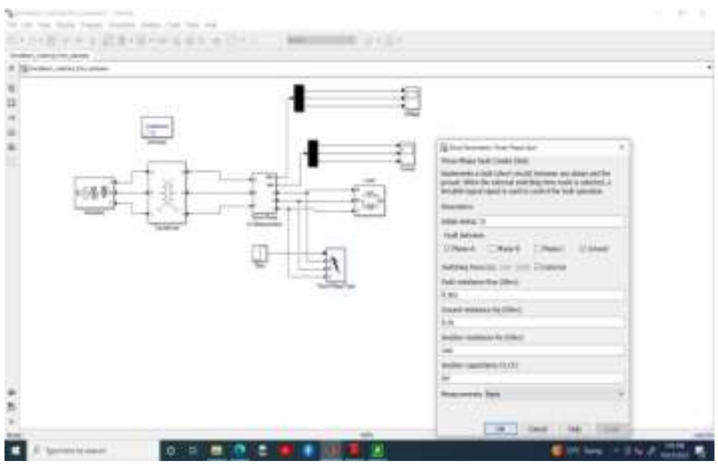

Fig.1 Simulation Model L-G Fault

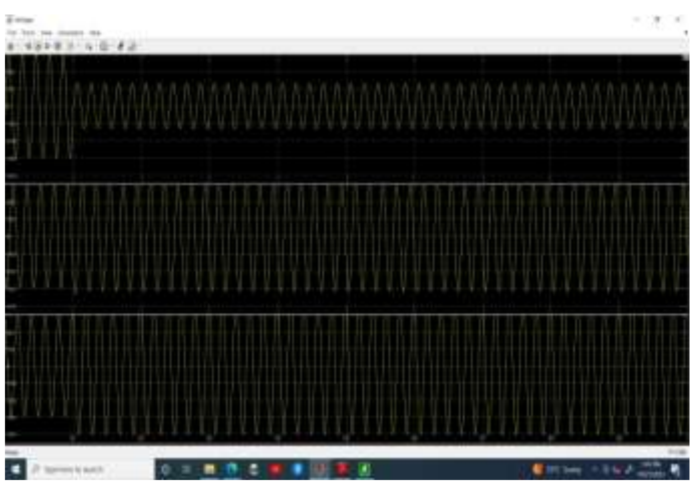

Fig.2 Output Waveform of Voltage (L-G Fault)

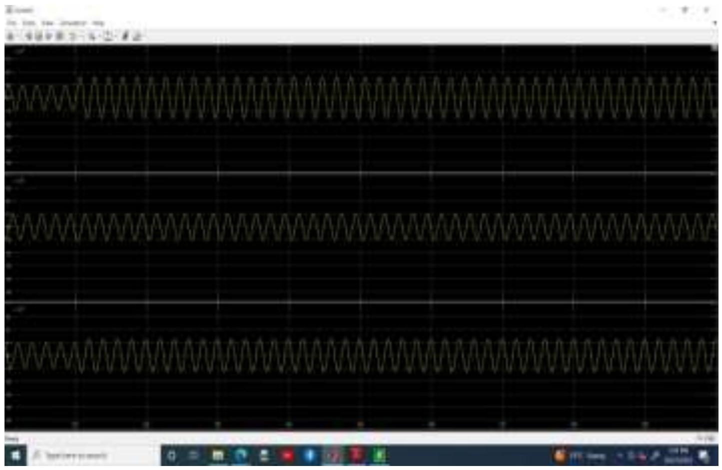

Fig.3 Output Waveform of Current (L-G Fault)

2. L-L Fault (Double Line Fault)

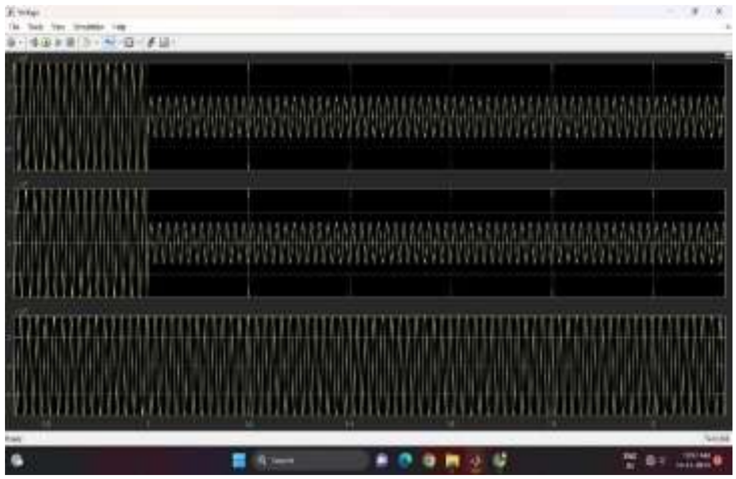

Fig.4 Output Waveform of Voltage (L-L Fault)

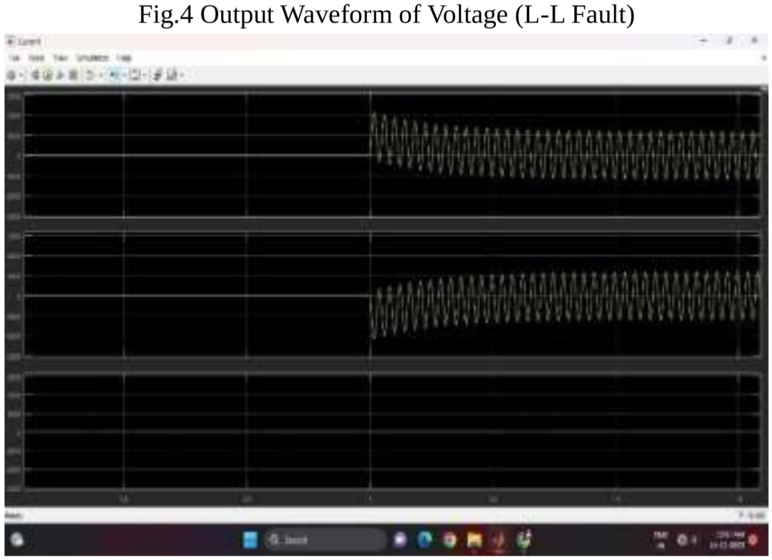

Fig.5 Output Waveform of Current (L-L Fault)

3. L-L-L Fault (Three Phase Fault)

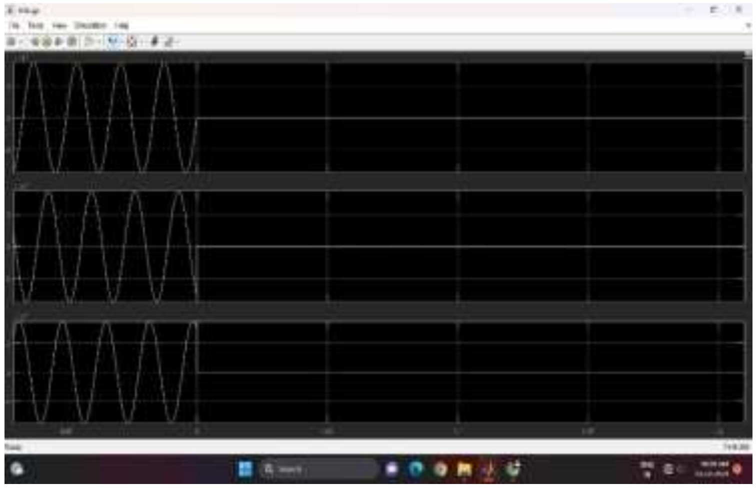

Fig.6 Output Waveform of Voltage (L-L-L Fault)

Fig.7 Output Waveform of Current (L-L-L Fault)

4. L-L-L-G Fault (Three Phase to Ground Fault)

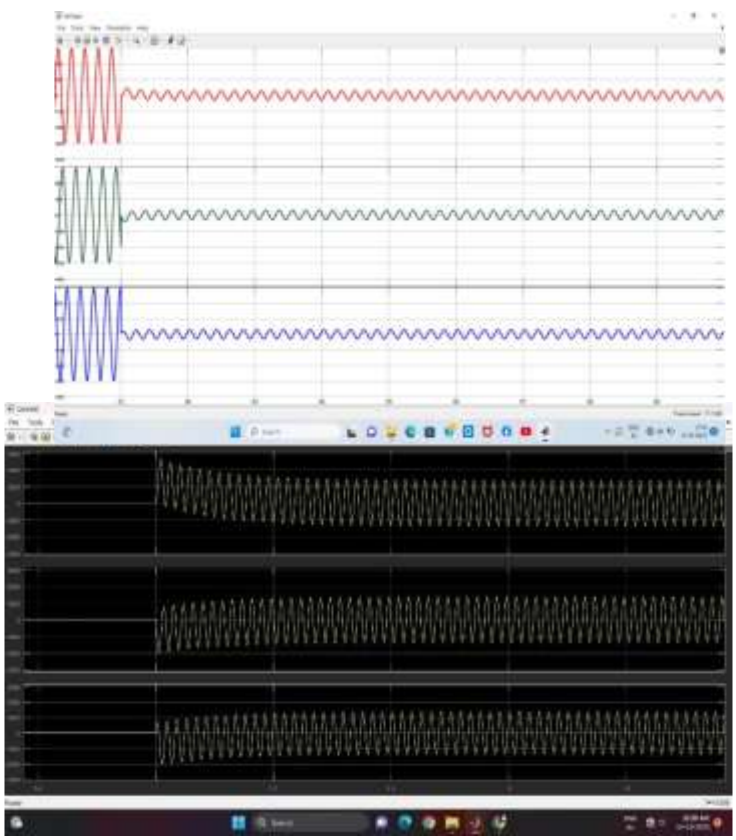

Fig.8 Output Waveform of Voltage (L-L-L-G Fault)

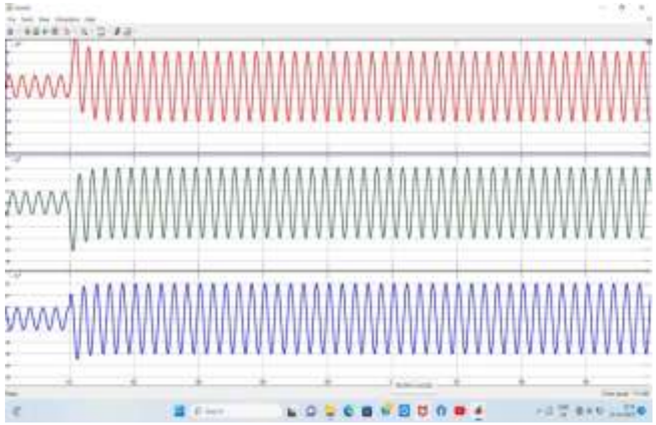

Fig.9 Output Waveform of Current (L-L-L-G Fault)

VIII. OUTCOMES

When conducting fault investigation in a high voltage transmission line using MATLAB, you can expect to achieve several outcomes, including:

1. Fault Detection and Localization

MATLAB can be used to process data from sensors and measurement devices to identify and localize faults in the transmission lines. Various algorithms and techniques can be employed for this purpose, such as Impedance-based method. Fault detection and localization refer to the process of identifying an issue with a power system occurring and determining its specific location.

2. Fault Classification

MATLAB can help you classified fault types that has occurred, such as line to line, two lines to ground, line to ground, etc. Classification is essential for implementing appropriate protection and mitigation strategies.

3. Fault Simulation

You can evaluate the effects of different fault on the performance of the transmission lines by simulating fault scenarios using MATLAB. This is important to know in order to comprehend how the system operates when there is a failure. Fault simulation refers to the process of simulating or modelling faults in a power system to understand their impact and behaviour. It involves creating computer-based models that replicate the electrical components and network of the power
system.

4. Real-time Monitoring

To continually monitor the transmission line and react to disturbances in real-time, MATLAB can be connected with real-time data acquisition devices.

Continuous and instantaneous observation of a system or process as it takes place is known as real-time monitoring. It entails the real-time collection and analysis of data, enabling the prompt identification and handling of any alterations or irregularities.

IX SCOPE

The future scope of investigating high voltage transmission line faults using MATLAB is promising and will continue to evolve as technology advances. MATLAB is a powerful tool for, which simulates, analyzes and optimizes electrical systems, making it a valuable resource for investigating faults in high- voltage transmission lines.

1. Advanced Modelling

Creating more complex and precise models to represent fault analysis, transient behaviour, and power flow in transmission lines in an effort to comprehend the system on a deeper level.

2. Smart Grid Integration

Designing MATLAB-based tools for integrating high- voltage lines into smart grids, optimizing operations, and managing renewable energy sources efficiently.

3. Fault Analysis and Mitigation

Creating enhanced algorithms and tools in MATLAB for faster and more precise fault detection, classification, and mitigation strategies.

4. HVDC Transmission

Advancing MATLAB simulations for HVDC (High Voltage Direct Current) transmission systems to improve efficiency, control, and stability.

X. CONCLUSION

In conclusion, fault investigation on transmission line with high voltage is crucial for ensuring the power distribution is reliable and stable. Waveforms of current and voltage can be used to analyse fault classification. And then fixing them fast to keep electricity flowing smoothly. By getting better at this process, we make sure power stays reliable for everyone.

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A Review of Innovations in EV Battery Charging Electrification

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Abstract—For the time being, the automobile industry is changing a lot, especially towards electric vehicles (EVs) to help the environment. As more people start using EVs, there's a bigger need for better ways to charge them. This study looks into a new idea called "Battery Charging Optimization" to make EV battery charging better in the future. The main goal is to make charging faster and more effective while running. The research checks out the newest technologies, looks into how we can connect charging systems with smart charging alternator, and figures out ways to handle changes in charging power. By looking at what experts have already written, studying real examples, and checking out actual data, this research wants to give useful insights into making EV battery charging better, especially focusing on a part called the alternator charging system. The results show that there are good things happening, real stories of successful changes, and a clear understanding of the challenges and opportunities we might face. Considering the whole world is starting to use more EVs, this study emphasizes how important it is to make charging better and more effective for a future where electric vehicles are used everywhere.

Index Terms— Electric vehicles (EVs), charging technologies Electrify, Optimize, Alternator charge, Artificial Intelligence (AI) , Battery Management System (BMS)

I. INTRODUCTION:

This change is mainly because we need transportation that's good for the environment and climate control. With more electric cars on the road, there's a big need for better ways to charge them. This study looks into a new idea called "Electrify & Optimize" as a smart way to influence how we charge EV batteries in the future. The main goal is to make charging faster and better because how well EVs work depends a lot on how well we can charge them. The study explores using the latest technologies, connecting charging to smart grids, and finding smart ways to deal with the increasing demand for EV charging. The main focus is to understand all the different aspects of making EV battery charging better, including using new tech, connecting to smart alternators, and finding ways to meet the demand for charging. By looking at what experts have already written, studying real examples, and checking out actual data, this research wants to give useful insights into making EV running battery charging better or not. The expected outcomes include insights into good things happening, examples of successful changes, and a better understanding of the challenges and opportunities ahead. Considering the whole world is starting to use more EVs, this study shows how important it is to make charging better and more efficient for a future where electric vehicles are used everywhere. Additionally, the paper briefly explores how using alternator charging systems might impact EVs, aiming to make them cover more distance with each charge. This dual focus looks at both the technology and efficiency to improve electric mobility. Through a meticulous review of existing literature, the analysis of case studies, and the examination of empirical data, this research seeks to make a substantial contribution to our understanding of the intricate dynamics involved in optimizing running EV battery charging. The expected outcomes may include insights into encouraging progress, instances of successful implementation, and a deeper understanding of the challenges and opportunities that lie ahead. Within the context of the global shift towards widespread EV adoption, this study highlights the pivotal role played by electrification and optimization in shaping the future of sustainable and effective electric vehicle charging. Additionally, the review briefly explores the potential impact of alternator charging systems on EVs, with the aim of enhancing their average distance coverage per charge. This dual focus reflects a holistic approach in addressing both technological and efficiency aspects in the pursuit of advancing the field of electric mobility.

II. BACKGROUND

The car industry is currently experiencing a notable transformation as it shifts towards electric vehicles, highlighting a growing demand for more efficient batteries. While electric vehicles offer a cleaner and sustainable form of transportation, their widespread adoption faces challenges related to battery performance and charging infrastructure. The conventional ways of charging have limitations in terms of speed, range, and overall efficiency. This has created an urgent need for inventive solutions to improve the range and overall performance of electric vehicle (EV) batteries. In response to these challenges, the research on "Charge Evolution with optimization" is committed to investigating unconventional methods that enhance the efficiency of electric vehicle batteries simultaneously with the battery charging system.

Context of the Research

The study is set within the dynamic landscape of electric mobility, where advancements in technology play a crucial role in shaping the future of transportation. The framework also acknowledges the significance of concurrent charging through an alternator, introducing a dual emphasis on enhancing battery efficiency while the vehicle is in motion. As electric vehicles gain increasing popularity, there is a growing need for solutions that not only boost the overall effectiveness of battery systems but also introduce innovative charging methods beyond the conventional stationary charging stations. The integration of alternator-based charging systems opens up an intriguing pathway for simultaneously powering the vehicle and recharging the battery, potentially addressing concerns related to both range anxiety and charging infrastructure. To sum up, the research on "Charge Evolution" is strategically positioned within the evolving electric vehicle industry with the aim of contributing to the future of transportation. It seeks to explore novel possibilities in electric vehicle battery efficiency and assess the viability of concurrently charging the battery using alternator technology.

Statement of the problem

The matter at hand revolves around the premature degradation of electric vehicle (EV) batteries, resulting in reduced performance, particularly a decrease in the distance covered per single battery charge. This decline poses a significant challenge to the overall efficiency and practicality of electric vehicles. In response to this issue, a novel approach is proposed: utilizing two batteries with independent charging facilitated by an alternator system, aiming to potentially improve overall efficiency. This prompts the need to examine and determine whether implementing such a configuration, involving dual batteries and alternator-based charging, can effectively address the performance deterioration associated with early EV.

Objectives of the study

Assessing Early EV Battery Performance: Conduct a thorough investigation to evaluate and quantify the extent of performance degradation observed in electric vehicle (EV) batteries during their initial lifecycle. Specifically, focus on determining the reduction in the average kilometres covered using a single battery over time. Evaluate the Feasibility of Dual-Battery Configuration: Scrutinize and analyse the practicality of implementing a dual-battery configuration in electric vehicles as a potential solution to counteract the observed early deterioration witnessed in single-battery scenarios. Explore the potential benefits and drawbacks of such a configuration. Analyse Alternator-Based Charging System: Systematically assess the effectiveness and efficiency of a novel charging system that utilizes an alternator for standby battery in the dual- battery configuration. This analysis will delve into its impact on various parameters, including charging speed, energy replenishment rates, and the overall health of the batteries. Measure Overall Efficiency Improvement: Utilize quantitative metrics to measure and analyses the comprehensive efficiency gains resulting from the implementation of the dual-battery configuration with separate charging through an alternator system. Place specific emphasis on evaluating improvements in the average kilometres covered by the electric vehicle. Investigate System Integration and Compatibility: Thoroughly explore the integration aspects and compatibility of the proposed dual-battery setup with existing electric vehicle systems. This investigation will ensure seamless operation and adherence to stringent safety standards within the electric vehicle ecosystem.

Examine Cost Implications

Conduct a detailed economic assessment to evaluate the financial feasibility of introducing and maintaining a dual-battery and alternator-charging system. Factors such as manufacturing costs, on-going maintenance expenses, and potential cost savings associated with extended battery life will be meticulously examined. Assess Environmental Impact: Investigate the environmental implications associated with the proposed dual-battery system, considering aspects such as resource utilization, recycling requirements, and the broader sustainability of the technology. This examination aims to provide a holistic understanding of the ecological footprint of the proposed system. Optimize Charging Strategies: Develop and optimize charging strategies tailored to the dual-battery configuration. Consider factors such as charging intervals, balancing mechanisms between the batteries, and energy distribution strategies to enhance the overall efficiency of the charging process. Provide Recommendations for Implementation: Based on empirical findings, formulate practical and actionable recommendations for the seamless implementation of the dual-battery and alternator-charging system in electric vehicles [31. These recommendations will address potential challenges and capitalize on identified opportunities to enhance overall efficiency and mitigate early EV battery decline. Contribute to Knowledge Base: Disseminate research findings to contribute novel insights and knowledge to the evolving field of electric vehicle technology. The aim is to inform and potentially inspire future advancements and innovations in EV battery systems and charging methodologies, fostering continued progress within the industry.

III. LITERATURE REVIEW

Advancements in Battery Chemistry: Studies have explored innovative battery chemistries such as solid-state batteries, lithium-sulfur batteries, and metal-air batteries, aiming to enhance energy density, lifespan, and overall performance in electric vehicles.

Smart Battery Management Systems (BMS): The literature highlights the role of intelligent Battery Management Systems in optimizing electric vehicle battery performance. Innovations in BMS focus on real-time monitoring, predictive analytics, and adaptive control algorithms to maximize battery efficiency and longevity. Fast Charging Technologies: Research has investigated fast charging technologies to address charging time concerns. Innovations include ultra-fast charging stations, advanced cooling systems, and high-power charging protocols to reduce charging durations and improve the practicality of electric vehicles.

Energy Harvesting and Regeneration: Studies explore the integration of energy harvesting technologies, such as regenerative braking and solar panels, to supplement electric vehicle battery charging. These innovations aim to improve overall efficiency and extend the driving range of electric vehicles. Thermal Management Systems The literature emphasizes advancements in thermal management systems to mitigate issues related to battery overheating and degradation. Innovations include phase change materials, liquid cooling, and thermal energy recovery mechanisms to optimize battery temperature [1], [2].

Machine Learning and Artificial Intelligence (AI): Innovations in machine learning and AI applications have been explored for predictive modelling, optimization of charging patterns, and adaptive control strategies. These intelligent systems aim to tailor the charging and discharging cycles based on user performance and external factors. Second-Life Battery Applications: Research investigates the potential of repurposing electric vehicle batteries for secondary applications after their primary use. Innovations include grid storage, stationary energy systems, and backup power solutions, contributing to sustainable battery usage. We introduce the EV Charging Profiles and Waveforms (EV-CPW) dataset, which is now accessible to the public. This dataset encompasses charging profiles and detailed transient current/voltage waveforms for 12 electric vehicles (EVs). A comprehensive power quality analysis, encompassing power factor, distortion, harmonic analysis, and load behaviour, is conducted on the 12 EVs. The results are then compared to the EV standard recommendations put forth by standards agencies. It's important to note that an off-board charger, as illustrated in Fig. 1, is employed for L3 charging. Consequently, the grid impact resulting from L3 charging is determined by the charger design. Conversely, for L2 charging, the impact is determined by the on-board charger design of the EV, which can vary based on different topologies and controllers [21]. Both Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs) are compatible with AC charging, while a smaller subset of EVs, typically only BEVs, can utilize DC charging. Level 2 charging has been more widely adopted for public charging, possibly due to its lower cost compared to Level 3 chargers. This paper specifically focuses on collecting EV charging data from AC charging, accomplished by charging EVs on Level 2 chargers [11].

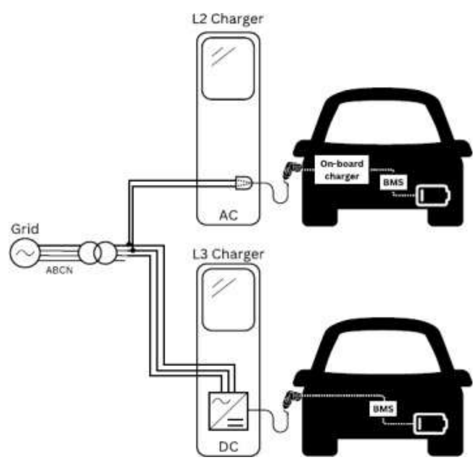

Fig. 1. Simplified diagram of L2 and L3 charger connections

Wireless Charging Technologies: Literature explores wireless charging technologies as an innovative approach to enhance user convenience and eliminate physical connectors. Advances in inductive and resonant wireless charging systems aim to optimize the charging experience for electric vehicle owners.

Material Innovations:

Material science plays a crucial role in battery optimization. Studies delve into innovations in electrode materials, electrolytes, and separators to improve energy density, charge/discharge rates, and overall battery performance in electric vehicles. Block chain and Decentralized Charging Networks: The literature discusses innovations in decentralized charging networks using block chain technology. This approach aims to optimize charging infrastructure, enable peer-to-peer energy trading, and enhance the overall efficiency of electric vehicle charging ecosystems. Dynamic Pricing Strategies: Studies explore dynamic pricing strategies for electric vehicle charging, considering factors such as grid demand, renewable energy availability, and time-of-use pricing. Innovations in pricing models aim to incentivize off-peak charging and promote grid stability. Collaborative Research and Industry Partnerships [24].

Literature highlights collaborative efforts between research institutions, industry players, and government agencies to drive innovations in electric vehicle battery optimization. These partnerships contribute to shared knowledge, resources, and accelerated advancements in the field.

The current body of literature underscores the multifaceted exploration of electric vehicle (EV) battery charging efficiency. Researchers emphasize the pivotal role of developing a resilient charging infrastructure and integrating it seamlessly with the electrical grid. This encompasses the investigation of smart charging solutions, grid management techniques, and the overarching impact of charging infrastructure on the overall efficiency of EV battery charging. Smart charging algorithms and control strategies emerge as key focal points in the literature, addressing the need for real-time monitoring, predictive analytics, and adaptive control systems. These systems take into account variables such as battery state, grid conditions, and user preferences to optimize the charging process. Energy management strategies are explored, with a specific focus on peak shaving to alleviate grid load during high-demand periods. This involves the optimization of charging schedules and distribution to enhance overall system efficiency. Moreover, the integration of renewable energy sources, such as solar and wind, into EV charging stations is extensively discussed to improve sustainability and reduce the carbon footprint associated with EV charging as shown in Fig. 2

Battery charging curve:

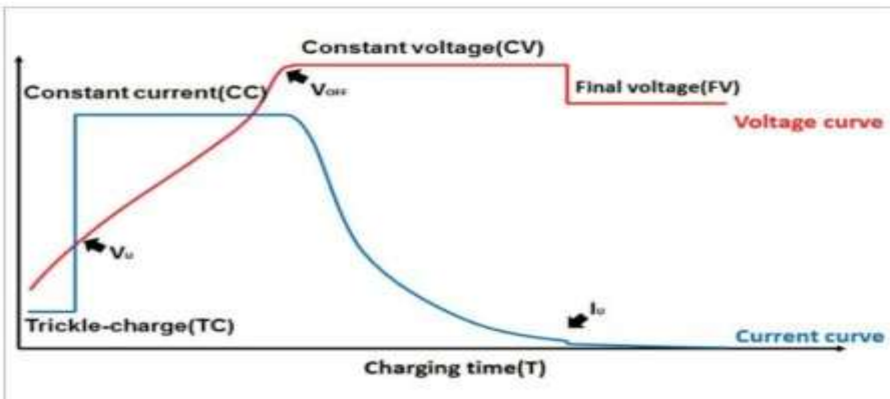

Fig. 2. Battery Charging Curve

The optimization of thermal management plays a pivotal role in discussions surrounding charging efficiency. Various studies explore advanced cooling and heating systems designed to maintain an optimal battery temperature, ensuring efficient charging while safeguarding battery health. Scrutiny of user behavior and charging patterns aims to understand their impact on charging efficiency. This encompasses investigations into user preferences, charging habits, and the potential for implementing demand response strategies to optimize charging during periods of low grid demand.

Economic feasibility studies and analyses of government policies are crucial components of existing literature. These studies delve into financial incentives, pricing models, and regulatory frameworks, all aimed at enhancing overall charging efficiency. The strategic placement of charging stations and considerations of accessibility are also vital aspects, addressing concerns related to range anxiety and promoting widespread electric vehicle (EV) adoption. The literature further explores innovations in charging cables, connectors, and materials to improve charging efficiency. On- going efforts include advancements in conductive materials, contactless charging, and enhanced power electronics. Additionally, battery swapping technologies are under examination as an alternative to traditional charging methods, seeking to reduce charging time by exchanging depleted batteries with fully charged ones. In summary, this comprehensive literature review encompasses diverse dimensions of research on the EV charging system, as illustrated in the block diagram shown in Fig. 2

Innovations in charging cables, connectors, and materials are examined to improve charging efficiency. Advancements in conductive materials, contactless charging, and improved power electronics are part of on-going efforts to enhance the overall efficiency of EV charging. Battery swapping technologies are explored as an alternative to traditional charging methods, aiming to reduce charging time by swapping depleted batteries with fully charged ones. In essence, this comprehensive literature review encapsulates the diverse dimensions of research on EV Charger block diagram shown in Fig. 3

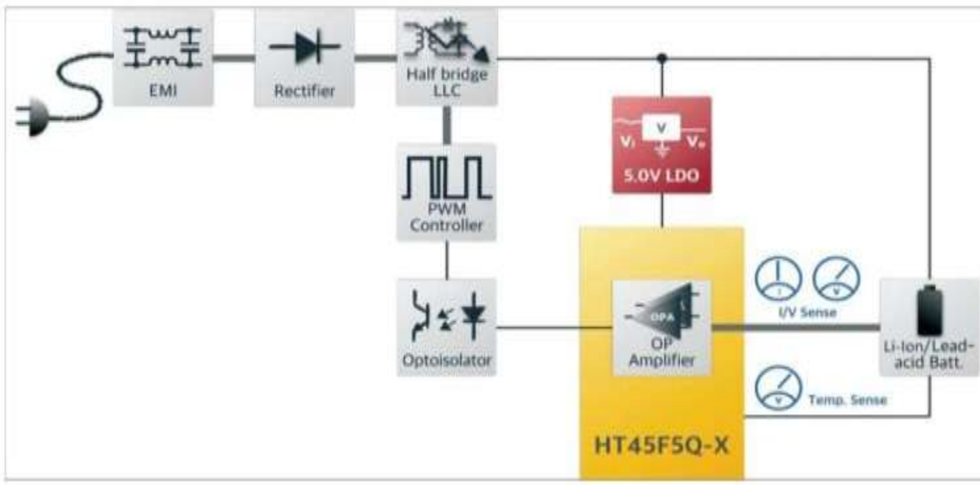

Fig. 3. EV Charger block diagram

In the realm of electric vehicle (EV) charging during vehicle operation, several challenges and gaps persist in current research, last updated in January 2023. The uneven and insufficient distribution of charging infrastructure in specific regions remains a hurdle, impacting the seamless operation of EVs and the overall user experience. Research gaps highlight the need to identify optimal strategies for increasing the density and accessibility of charging infrastructure. Factors such as urban planning, public-private partnerships, and innovative charging solutions should be considered in addressing these challenges. Issues with charging speed and range anxiety persist, influencing potential EV adopters. Research is needed to improve charging speed, advance battery technologies, and implement effective communication strategies to alleviate range anxiety. This may involve exploring ultra-fast charging, improved battery chemistries, and accurate range prediction algorithms. Battery degradation over time is another critical challenge affecting EV efficiency and lifespan. Research gaps call for the development of effective battery management systems, optimizing charging parameters, and minimizing degradation. Innovations in battery materials and thermal management are areas that require exploration. The integration of a growing number of EVs into the power grid brings challenges related to grid stability and increased demand. Research gaps emphasize the need for smart grid solutions, demand response strategies, and energy storage integration to balance the load and maximize the use of renewable energy sources during EV charging. Upfront costs of EVs and associated charging infrastructure, coupled with uncertainties about the long-term economic viability of charging networks, pose challenges to widespread adoption. Research efforts should focus on optimizing the cost-effectiveness of EV charging solutions, exploring innovative business models, and assessing the economic impact of large-scale EV integration. The lack of standardization and interoperability among charging networks, connectors, and communication protocols can lead to compatibility issues and hinder the ease of EV charging. Research endeavors should prioritize the development of global standards, common protocols, and interoperable technologies to create a seamless charging experience for EV users [13],[14].

A. Innovative Battery Chemistries

Advancements in Lithium-Ion Technology: On-going research focuses on enhancing the energy density, charging speed, and lifespan of lithium-ion batteries, the predominant type used in electric vehicles (EVs). Innovations include the integration of silicon anodes, solid-state electrolytes, and advanced materials to improve overall performance. Solid-State Battery Technologies: Solid-state batteries present the potential for increased energy density, enhanced safety, and extended lifespan compared to traditional liquid electrolyte batteries.

B. Efficient Battery Thermal Management:

Utilization of Advanced Thermal Management Systems: Advanced systems regulate EV battery temperature, ensuring optimal operating conditions. Technologies such as liquid cooling, phase-change materials, and active thermal control systems are employed to prevent overheating and enhance overall battery performance.

C. Rapid Charging Innovations:

Ultra-Fast Charging Technologies: Initiatives aim to significantly reduce charging times through the development of high-power chargers and advancements in charging protocols. Technologies based on gallium nitride (GaN) are explored to enable faster charging without compromising battery health.

D. Intelligent Battery Management Systems (BMS):

Smart BMS Optimization: Intelligent BMS optimizes charging and discharging processes, monitors real-time battery health, and implements strategies to prevent overcharging or deep discharging. Machine learning algorithms within BMS adapt to user behaviors, enhancing overall efficiency.

E. Energy Harvesting and Regeneration:

Regenerative braking systems are designed to capture and transform kinetic energy generated during braking into electrical energy, which is then redirected back into the battery. This innovative technology enhances overall efficiency by harnessing energy that would otherwise dissipate as heat during the braking process.

F. Wireless Charging Advancements:

Inductive and Resonant Wireless Charging: Wireless charging technologies eliminate the need for physical connectors, providing convenient and efficient charging. On-going research focuses on improving efficiency and standardization of wireless charging systems for EVs.

G. Second-Life Battery Applications:

Repurposing Used EV Batteries: Exploration of secondary applications, such as stationary energy storage, extends the lifespan of used EV batteries, contributing to sustainable energy solutions and minimizing waste.

H. Predictive Analytics and Machine Learning:

Enhanced Battery Management: Predictive analytics and machine learning algorithms analyse vehicle, charging infrastructure, and external data to predict user behaviour and optimize charging schedules, enhancing energy efficiency.

I. Grid Integration and V2G Technology:

Vehicle-to-Grid (V2G) Technology: Bidirectional energy flow between EVs and the electrical grid enables EVs to provide support during peak demand, potentially earning revenue for EV owners.

J. Advanced Electrode and Electrolyte Materials:

- Development of Advanced Materials: Research focuses on advanced materials for electrodes and electrolytes to improve energy density, charge/discharge rates, and overall battery performance.

K. Block chain Integration for Security:

- Secure Charging Ecosystem: Block chain technology secures and streamlines transactions within the EV charging ecosystem, enhancing transparency, security, and efficiency.

L. Dynamic Charging Systems Implementation:

- Charging While in Motion: Dynamic charging systems allow EVs to charge while in motion, addressing range anxiety concerns and enabling continuous operation. This technology is explored for public transportation and high-traffic routes.

M. Optimized Charging Strategies:

- Intelligent Charging Approaches: Development of intelligent charging strategies, including time-of-use charging and demand response mechanisms, optimizes energy consumption, reduces peak loads on the grid, and lowers charging costs for EV owners. [23].

N. Environmental Sustainability Measures:

- Sustainable Practices: Sustainable manufacturing processes, recycling programs, and eco-friendly disposal methods contribute to the environmental sustainability of EV batteries. Researchers explore ays to minimize the environmental impact of battery production and end-of-life processes.

III. METHODOLOGY

Improving the efficiency of electric vehicle (EV) battery charging and enhancing the overall efficiency of EVs in terms of average kilometres (KM) involves a multi-faceted methodology. Below are key approaches: Advanced Charging Infrastructure: Establish an extensive and advanced charging infrastructure network, including fast-charging stations strategically placed for convenient access. Utilize high-power chargers and implement technologies that enhance charging speed without compromising battery health. Smart Charging Algorithms: Develop intelligent charging algorithms that consider factors such as grid demand, energy prices, and optimal charging times. Incorporate machine learning to analyse user behaviour and adapt charging schedules for maximum efficiency.

Charging methods employed in on site chargers utilizing AC power adhere to standardized protocols. Level 1 charging, utilizing a 120 V single-phase AC power supply, boasts the slowest charging speed and is typically employed in domestic settings with lower power levels (up to 1.92 kW). This charging mode, suitable for extended periods or overnight charging, requires about 11-36 hours for a 1.9 kW charging power for a 16-50 kWh EV battery [26]. For private and public facilities, the primary choice is Level 2 chargers, known for their comparatively faster charging abilities. Level 2 charging, 3 to 5 times faster than Level 1, can deliver power up to 19.2 kW, requiring dedicated components and installations for high- power transfer. The charging time for Level 2 falls within the range of 2-3 hours for a 19.2 kW charger with an EV battery capacity of 30-50 kWh [27]. Charging connectors for Level 1 and 2 adhere to standards such as IEC62196-2 in Europe and SAEJ1772 and Tesla superchargers in the USA [25], [28].

DC fast charging, or Level 3 charging, integrates both AC and DC power to supply high-voltage DC power directly to the EV battery. Level 3 chargers, connected to the vehicle through off- board chargers, manage a high-power range from 20 kW to 350 kW, supplying DC voltage ranging from 300 Vdc to 800 Vdc. Charging times for Level 3 are notably faster, with a range of
0.2 - 0.5 hours for a 90 kW or larger charger. Connectors such as CHAdeMO, Tesla company superchargers, and CCS combo 1, 3 are commonly used for Level 3 speedy charging. Despite their faster charging times, Level 3 chargers may exert a higher negative impact on the power network during peak times, potentially causing overload in the local distribution grid in Fig. 4

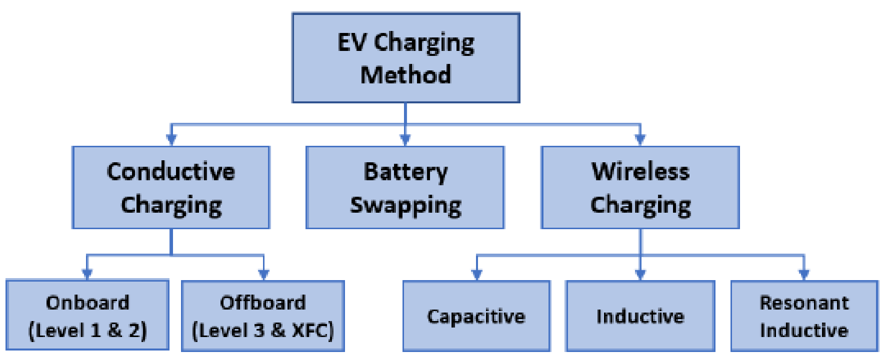

Fig. 4. Electric vehicle charging methods.

Extreme fast charging (XFC) systems represent a paradigm shift in charging experiences, mirroring the refuelling speed of internal combustion engine (ICE) vehicles. These systems can manage power exceeding 350 kW with an internal DC bus voltage of 800 Vdc, enabling a rapid battery recharge time of approximately 5 minutes. XFC stations incorporate advanced power electronic modules, including solid-state transformers (SST), isolated DC-DC converters, and front-end AC-DC converter steps and controllers. While the setting up cost of XFC is significant, combining multiple XFC systems in a station design offers the potential to reduce operational and capital investments, increasing economic feasibility. Furthermore, SST technology provides advantages over traditional line-frequency transformers in XFC stations by converting medium voltage levels into low voltage levels and providing galvanic isolation [29].

Dynamic Charging Systems:
Explore the implementation of dynamic charging systems that enable EVs to charge while in motion. This addresses range anxiety concerns and ensures continuous operation, especially on high-traffic routes and public transportation networks.
Wireless Charging Technologies:
Investigate and enhance wireless charging technologies, allowing for seamless and efficient charging without physical connections. Optimize the efficiency of inductive and resonant wireless charging systems for widespread adoption. Regenerative Braking Optimization: Improve regenerative braking systems to capture and convert more kinetic energy into electrical energy during deceleration. Enhance the efficiency of energy recovery systems to maximize the range extension through regenerative braking[24].
Battery Thermal Management:
Implement advanced thermal management systems to regulate battery temperature effectively. Optimize cooling and heating mechanisms to maintain an optimal temperature range, ensuring efficient charging and discharging processes.

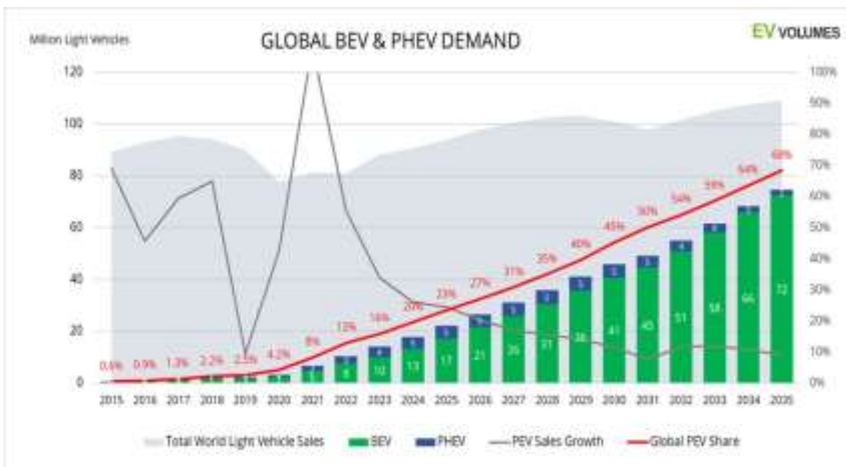

Fig. 5. EV Forecast to 2035

Integrate V2G technology to enable bidirectional energy flow between EVs and the grid. Allow EVs to feed excess energy back to the grid during peak demand, contributing to grid stability and potentially earning revenue for EV owners.
Enhanced Battery Management Systems (BMS):
Develop advanced BMS with real-time monitoring and adaptive control capabilities. Implement features that optimize charging and discharging parameters based on battery health, usage patterns, and external conditions in Fig. 5
User Education and Engagement: Launch educational programs to inform EV users about efficient charging practices. Encourage users to adopt optimal charging habits, such as avoiding frequent deep discharges and utilizing off-peak charging hours. Global market will lead EV technology up to 2035.

IV. ELECTRIFY & OPTIMIZE TECHNOLOGIES

- Explore cutting-edge technologies for enhancing EV battery charging
- Discuss advancements in charging infrastructure.
- Analyse smart grid integration and demand response strategies.

- Collaborate with utilities to implement incentive programs that encourage off-peak charging.
- Provide reduced electricity rates during specific hours to shift charging demand away from peak periods, benefiting both users and the grid.
- Collaboration with Renewable Energy Sources:
- Integrate EV charging infrastructure with renewable energy sources, such as solar and wind.
- Prioritize the use of clean energy for charging, reducing the environmental impact and promoting sustainable practices.
- Continuous Research and Development: Invest in on-going research and development to explore emerging technologies, materials, and methodologies that can further improve EV battery efficiency and charging capabilities.
- Describe the research design detail the methods used for data collection, explain the tools and technologies employed Provide a rationale for the chosen methodology

VI. CASE STUDIES

Tesla Supercharger Network:

Background: Tesla has implemented a widespread Supercharger network globally, aiming to provide convenient and rapid charging for Tesla EV owners. Case Study: Tesla's Supercharger stations, strategically placed along highways, facilitate fast-charging for long-distance travel. This case study

delves into the network's impact on EV adoption, user experience, and the scalability of fast-charging infrastructure. Case Study: This case study examines the practical application of V2G in a fleet of Nissan Leaf vehicles. It assesses the impact on grid stability, potential revenue generation for fleet operators, and the overall feasibility and benefits of bidirectional energy flow.

Smart Charging Algorithms in City EV Fleets: Background: An electric taxi company integrates energy harvesting technology, such as solar panels on vehicle roofs, to supplement battery charging. Regeneration data is scrutinized to evaluate the efficiency of regenerative braking systems, considering factors such as energy recovered and braking patterns. The contribution of regenerative braking to the overall range extension of the EV is assessed, along with the influence of driving habits and terrain on regeneration efficiency. Comparative analyses across different EV models offer insights into variations in charging and regeneration performance [30].

The findings lead to personalized recommendations for users to optimize charging habits and driving behaviour. Infrastructure providers receive insights on usage patterns for expansion or improvement. Automakers benefit from data-driven suggestions for enhancing regenerative braking systems and overall charging efficiency. Policymakers gain insights for informed decisions on EV infrastructure development and incentives. Environmental impact analysis considers factors such as the energy source for charging and reductions in brake wear, ensuring a holistic understanding of EV charging and regeneration dynamics. This data-driven approach supports stakeholders in making informed decisions for the continued advancement of the electric vehicle ecosystem. Interpret the results in the context of EV battery charging optimization use charts, graphs, and statistical analysis to support findings.

VI. CHALLENGES AND FUTURE DIRECTIONS

Identify challenges encountered during the research Propose recommendations for overcoming these challenges.

Discuss potential future research directions EV stock is significantly increased in 2021 when compared to previous years and the total number of battery electric cars on road to over 16.5 million. As shown in Fig. 6, the largest EV market belongs to China where cumulative EV sales reached 9.4 million in 2021, which represented 50% of global EV stock [14]. The second largest EV market belongs to Europe with 2.3 million annual sales of light duty EVs and the United States has the third largest EV market [12], [15]. Currently, The focus on electrified transportation has garnered significant interest from both governmental bodies and private entities aiming to achieve carbon neutrality by 2040. This commitment is evident through sustained policy backing, incentives, and subsidies, as depicted in Figure 6. Overcoming the substantial hurdle lies in implementing safe measures to charge batteries while electric vehicles are in motion. electrified transportation has attracted much attention from governments and private stakeholders to move towards carbon neutrality in 2040 through consistent policy support, incentives, and subsidies from the governments as shown below Fig. 6. The big challenge is to charge batteries while running EV with all safety measure.

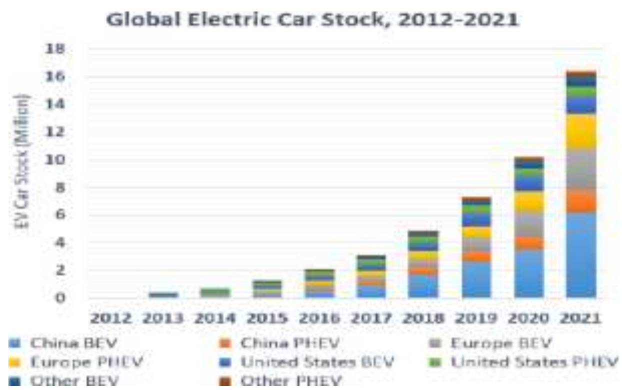

Figure 6. Electric passenger car stock, 2012-2021 [22].

VII. CONCLUSION

The integration of renewable energy sources into the charging ecosystem is essential to minimize the carbon footprint of EVs. Utilizing solar, wind, and other sustainable energy solutions establishes a symbiotic relationship between clean power generation and electric transportation, contributing simultaneously battery charging system.

Successful realization of this vision requires collaboration among governments, industries, and research institutions to foster the development and standardization of dynamic charging system. Policies incentivizing the establishment of charging stations, supporting research and development in battery technology and encouraging investments in sustainable energy play pivotal roles in shaping the future of EV charging. In essence, the electrification of transportation through optimized EV battery charging signifies a commitment to a more sustainable, resilient, and environmentally conscious future. As innovation and investments in this crucial facet of the electric mobility ecosystem persist, we are paving the way for a world where clean and efficient transportation is not only feasible but becomes the prevailing norm. The journey towards an electrified future of transportation is underway, and the evolution of EV battery charging stands at the forefront of this transformative endeavor.

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Automatic Load Sharing of Distribution Transformer using PLC

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Abstract— Transformer is part of any system that has an important role the transformer load does not always shift but varies depending on the load so that temperatures and other parameters can be detrimental to the transformer and shorten the life of the transformer. In this project we will try to create an automatic transformer sharing system where the current of the transformer is limited to the auxiliary transformer will automatically be entered into the system and the path is distributed between the two transformers so the current will flow halfway from the main and half transformer through the auxiliary that he uses with an external disturbance system.

Keyword – Capacity, Interruption, Load Transformer, PLC

I. INTRODUCTION

A digital computer utilized for practical operations is referred to as a programmable logic setup, or PLC, or remote control. PLCs are commonly found in various machinery and sectors. Unlike general-purpose computers, PLCs are designed to handle multiple inputs and are equipped for extended temperatures, electrical noise transmission, evacuation, and vibration resistance [1-7]. The PLC exemplifies challenging real-time software, as output generation must align with incubation conditions for a predetermined duration to prevent unforeseen operations. When a load exceeding the capacity of an existing transformer is applied, whether it is coupled in parallel with two or more other transformers, switches are connected in parallel [8-16].

Having multiple smaller units is not as reliable as having one larger unit. When two transformers are connected in parallel, the associated expenses for storage space become negligible. Installing a second transformer in a similar manner to replace the current transformer with a larger unit is typically more cost-effective. The cost of the secondary unit is lower than that of the primary unit when the two parallel units converge [17-22]. Additionally, an equal converter should certainly be employed because it is dependable. For this purpose, a single transformer output voltage can be applied to at least a portion of the load. We have devised a solution for this project capable of distributing multiple installed load sources.

The solution developed for this project automatically adds the following new power sources to the load, and the transformer will continue to operate even if the load slows down and is automatically disconnected. In this specific project, three modifiers serve as sources. The first transformer is now operational and will remain so as long as it is supplied. If damage errors occur or if the load capacity is interrupted again, a second converter will automatically take over, and the first one will be deactivated [23-30]. Consider another scenario now. If the load rises above the average voltage, the second transformer will automatically be added to the circuit, along with any additional load sources. Conversely, if the load falls below the average voltage, the reduced transformer will be removed [31-34]. The PLC enables the software to function as a cohesive unit. We will provide you with a PLC capable of automatically adjusting the transformer cycles based on our specifications [35-43]. The distribution of electrical electricity is crucial because it operates continuously and supplies load to various applications. The transformer's load may occasionally increase rapidly due to overloading, which could damage the transformer. The primary objective of the project is to provide energy consumers with a continuous, high-quality power supply. By implementing this plan, we aim to prevent transformer issues [44-52].

II. LITERATURE REVIEW

The paper titled "Automatic Load Sharing of Transformers Using PLC" authored by Pawar, P., Gite, N., & Sonawane, M. [2] likely delves into the utilization of Programmable Logic Controllers (PLCs) for automating load sharing among transformers. It probably explores various methods and techniques employed to implement automated load sharing, aiming to enhance efficiency and reliability in electrical distribution systems. Expect discussions on the design, operation, and advantages of PLC systems in optimizing transformer load sharing.

In the paper titled "Automatic Load Distribution on Transformers" authored by Mane, M. A. S., Kale, M. S. A., & Jagdale, M. M. M [6], the focus is likely on automatically distributing electrical loads across transformers. It probably covers methods and systems utilized for efficient load distribution among transformers. Expect discussions on the utilization of automation and control techniques to ensure effective load sharing among transformers, which can enhance the reliability and performance of electrical distribution systems.

The paper "PLC-Based Load Sharing of Transformers" authored by Rana, I., Ali, M., Channar, F. S., Ali, M., & Memon, M. [8] explores the application of Programmable Logic Controllers (PLCs) to optimize load sharing among transformers. The authors likely discuss how PLC technology can enhance the efficiency and reliability of electrical distribution systems by ensuring equitable load distribution among transformers. Expect detailed exploration of the technical aspects of PLC implementation and its benefits in electrical engineering and power distribution ensuring readiness of the other lines. Subsequently, a brief delay, as per the LCD datasheet, is observed before lowering EN back to low (0).

III. METHODOLOGY

Power Supply

A power supply is an electrical apparatus responsible for delivering electricity to an electrical load. Its primary function involves converting electrical current from a source into the required voltage, current, and frequency for the intended load. Power supplies typically transform mains AC into regulated low-voltage DC power for wired connections and facilitate wireless energy transmission as well. The RS line, also known as "Register Select," serves as a critical component in this process. When RS is set low (0), the incoming data is interpreted as either a command or a special case.).

PLC

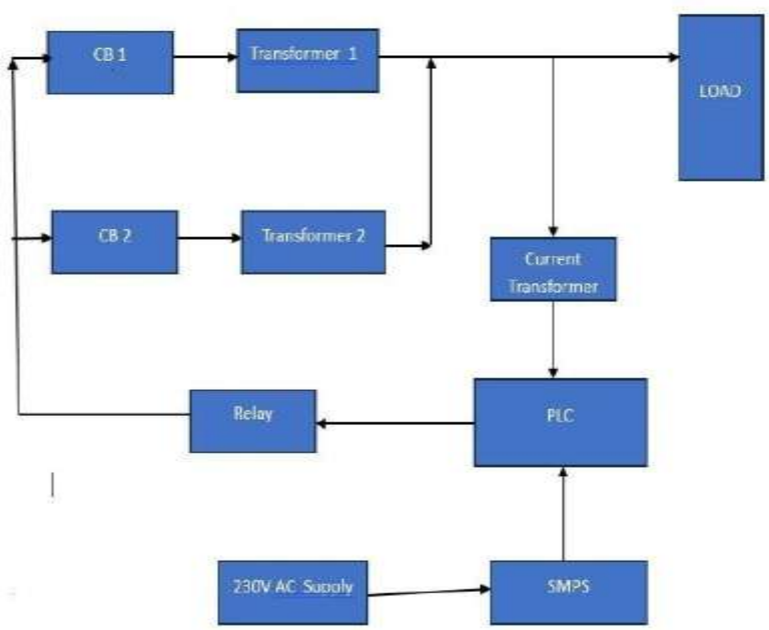

Fig.1 Block Diagram

Transformer

An electrical transformer is a device that utilizes electromagnetic induction to transfer electrical energy between two or more circuits. When converting AC voltage from one level to another, transformers experience some power loss. The functioning of a transformer is based on mutual induction, a form of electromagnetic induction. This particular transformer is designed as a one-to-one transformer, enabling direct rectification and supply of data to measurement instruments. Several criteria must be satisfied for transformers to operate successfully in parallel:

I) The primary and secondary voltage ratings should possess identical voltage and turns ratios.

II) Matching X/R ratio, percentage impedance, and KVA ratings.

III) Consistent vector group (with the same phase angle shift).

IV) Uniform frequency grade and polarity.

LCD Display Unit

The display being utilized is a 16x2 LCD (Liquid Crystal Display), capable of showing 16 characters per line across 2 lines. It employs the HD44780U controller chip to interface directly with the LCD, receiving data from an external source, such as an Atmega16 microcontroller. Operating in 8-bit mode, it utilizes an 8-bit data bus for communication. Control is managed through three lines: EN (Enable), RS, and RW. The EN line, labeled "Enable," is toggled high (1). A programmable logic controller (PLC), also known as a programmable controller, is an industrial computer ruggedized and tailored for controlling manufacturing processes. Developed by Dick Morley in 1968, with the creation of the Modicon 084 for General Motors, he is hailed as the father of PLCs. PLCs vary in size, ranging from compact integrated processors to modular devices with numerous inputs and outputs (I/O) or extensive rack-mounted systems connected to other PLCs and SCADA systems. They offer diverse digital and analog I/O configurations, wider temperature tolerances, immunity to electrical noise, and resilience against shock and vibration. Initially designed to replace hard-wired relay logic systems in automotive manufacturing, PLCs have since become widely adopted for their flexibility, ruggedness, and ease of programming. Operating as hard real-time systems, PLCs must produce output responses within a specific timeframe to prevent unintended operations.

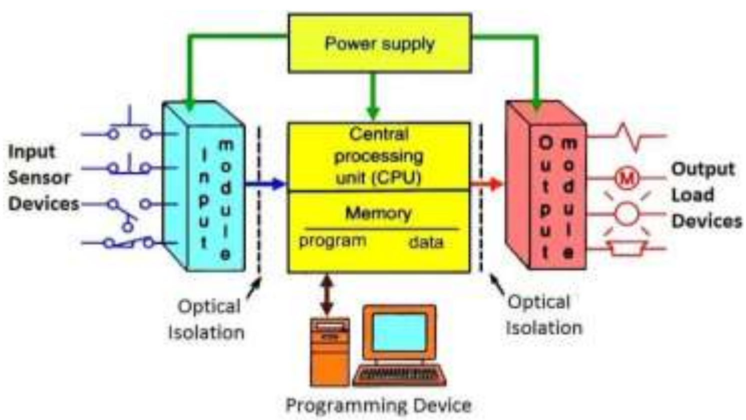

Fig.2 Block Diagram Of PLC

IV. RESULT AND DISCUSSION

Discussing the benefits of real-time monitoring and control facilitated by PLCs, it's noteworthy how these systems effectively adapt and respond to dynamic load conditions. Through automated adjustments to shifting load demands, they notably reduce the risk of transformer failures, thereby enhancing the reliability of the distribution network. Moreover, by integrating robust fault tolerance mechanisms, these frameworks empower users to manage and recover from unforeseen events, minimizing service disruptions.

V. CONCLUSION

The report is structured around a review of PLC-based burden sharing. When the load exceeds the capacity of a single current transformer, at least two transformers are interconnected in parallel. This ensures seamless load distribution and can be efficiently managed using logical control systems like PLCs. Opting for multiple units instead of a single larger one enhances reliability and reduces maintenance costs associated with gaps. A key focus of our project is analyzing load sharing among transformers, bridging theoretical insights with practical applications to provide comprehensive guidance. The work on "Automated load sharing of transformers using PLC" has been meticulously planned, tested, and includes a demonstration unit capable of synchronizing three transformers to share the load automatically. This setup safeguards primary transformers from overload and overheating, ensuring uninterrupted power supply to customers.

VI. FUTURE SCOPE

The project will primarily focus on enhancing the efficiency of substations in the future. During peak hours, substations often require an additional transformer to manage the increased load effectively. In our project, transformers are automatically linked under heavy loads, ensuring optimal distribution of power without any transformer operating at excessive levels, especially during off-peak times. Integrating the project with smart grid technology is essential for better coordination among transformers. This may involve incorporating communication protocols such as IEC 61850 and facilitating the exchange of load data between transformers and other smart grid components. By analyzing demand patterns and adjusting transformer configurations accordingly, we aim to maximize energy efficiency. This includes optimizing load distribution to minimize energy losses and implementing algorithms to forecast periods of peak demand accurately.

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Solar Outdoor Air Purifier with Air Quality Monitoring System

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Abstract— A solar-powered outdoor air purifier with an integrated air quality monitor aims to provide an eco-friendly solution for improving outdoor air quality. This project involves incorporating solar panels, a power storage system, an efficient air purifier unit, and a real-time air quality sensor. The goal is to create a self-sustaining system capable of enhancing the surrounding air while monitoring and responding to changes in air quality. Effective weatherproofing is crucial for the durability and reliability of this environmentally conscious outdoor device.The solar-powered outdoor air purifier with an integrated air quality monitor is designed to address the growing concerns about outdoor air pollution. The system leverages solar panels to harness renewable energy, making it sustainable and independent of external power sources.The solar energy is stored in a power storage system, ensuring continuous operation even during periods of low sunlight. An efficient air purifier unit is incorporated to filter pollutants and particulate matter from the outdoor air, contributing to an improved environment

Keywords— Arduino, Air purifier,

I. INTRODUCTION

The increasing concern over outdoor air quality has prompted the development of innovative solutions to mitigate pollution and enhance environmental well-being. This project introduces a solar-powered outdoor air purifier with an integrated air quality monitor, aiming to provide a sustainable and autonomous system for improving the air we breathe outdoors [1-5]. By harnessing solar energy through dedicated panels, the system ensures a self-sustaining power source, reducing reliance on conventional electricity. The inclusion of a power storage system guarantees uninterrupted operation, even in periods of limited sunlight [6-14]. The heart of the system lies in its efficient air purifier unit, designed to filter pollutants and particulate matter from the surrounding air. This contributes to creating a cleaner and healthier outdoor environment [15-28]. An essential component of the project is the real-time air quality monitor, which continuously assesses the atmospheric conditions. The sensor provides valuable data on various air quality parameters, facilitating informed decision-making for the system's operation [29-40]. To withstand the challenges of outdoor conditions, robust weatherproofing measures are integrated, ensuring the durability and reliability of the solar-powered air purifier [41-47]. This introduction sets the stage for a comprehensive exploration of a forward-thinking solution that merges sustainable energy practices with cutting-edge air purification technology, all geared towards fostering a cleaner and healthier outdoor atmosphere [48-52].

II. LITERATURE REVIEW

Developing a Solar-Powered Air Purifier Equipped with Air Quality Monitoring System" by Pooja M., Bhagya P. K., Anil Kumar N, Niveditha M.U. This innovative system integrates solar energy with advanced air purification technology and real-time air quality monitoring to provide an eco-friendly solution for enhancing outdoor air quality. In his research papers, Dr. Nagendra Kumar M, Darshan K Gowda, Suprith S, Vinay N Subramanian Sundararajan, et al explored the efficacy of HEPA filters and activated carbon filters in removing airborne contaminants. They found that HEPA filters can achieve up to 99.97% efficiency in filtering micro-particles and sterilizing microorganisms in the air. Similarly, Satyam Ray, Kartik Meghwal, Vipin Pandey, and Waqar Ahmed discussed the importance of air quality monitoring technology. Their study delves into various types of sensors utilized for monitoring air quality, compares different monitoring methods, and evaluates their accuracy.

III. METHODOLOGY

Figure 1 illustrates the block diagram of the solar air purifier system described in our paper. We employ a 10-watt solar panel to capture sunlight, which is then directed to a battery for storing the converted solar energy as electrical energy. The battery, rated at 12 volts and 1.3 amps, is connected to an L298 controller, which converts the 12-volt supply to 5 volts for the Arduino Uno board.

Two connections from the controller are linked to two Arduino boards, while another connection powers a brushless fan. Additionally, an MQ135 sensor is connected to the brushless fan to measure air quality within a 10-meter range. The brushless fan functions to draw in air and propel it towards the filter.

The filter, situated downstream of the fan, is also equipped with an MQ135 sensor. It captures and bonds with pollutants present in the air. Both sensors, along with two LCDs, are connected to the Arduino boards to monitor air quality and display input and output data from the system.

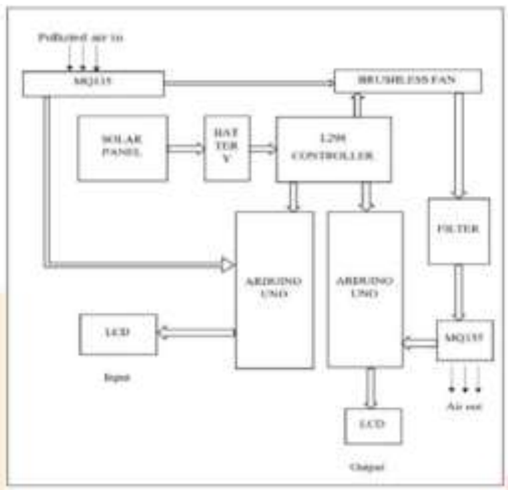

Fig. 1 Schematic block diagram for Solar Outdoor Air Purifier with Air Quality Monitor

1. Solar panel

Solar panels are devices designed to absorb sunlight and convert it into either electricity or heat. They consist of an array of solar cells, also known as photovoltaic cells, which harness the photovoltaic effect to generate electricity. These cells are typically arranged in a grid-like pattern on the surface of the solar panel. Therefore, a solar panel can be described as a collection of photovoltaic modules mounted on a supporting structure.

A photovoltaic (PV) module typically comprises a connected assembly of solar cells, often arranged in a 6×10 configuration. The majority of solar panels are manufactured using crystalline silicon solar cells due to their efficiency and reliability. In our setup, we utilize a 10-watt capacity solar panel to harness solar energy.

2. Battery (12v)

A battery is an electrochemical apparatus, comprising one or more cells, capable of being charged with electric current and discharged as needed. Typically, batteries consist of multiple electrochemical cells connected to external terminals for input and output. They find extensive use in powering various small electronic devices like mobile phones, remote controls, and flashlights. Traditionally, the term "battery" has denoted the amalgamation of two or more electrochemical cells.

3. Arduino UNO

The Arduino Uno is a microcontroller board featuring the ATmega328P. It boasts 14 digital input/output pins, with 6 available for pulse-width modulation (PWM) outputs, along with 6 analog inputs. The board is equipped with a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

4. LCD

A liquid-crystal display (LCD) is a type of flat-panel display or electronically controlled optical device that utilizes the light-modulating characteristics of liquid crystals along with polarizers. Unlike emitting light directly, liquid crystals rely on a backlight or reflector to generate images in either color or monochrome. LCDs offer versatility to showcase various images, ranging from arbitrary ones like those in computer displays to fixed content with minimal information, such as preset words, digits, and seven-segment displays found in devices like digital clocks.

5. MQ135 sensor

The MQ-135 Gas sensor is capable of detecting various harmful gases such as Carbon Monoxide (CO), Ammonia (NH_3), Sulfur (S), Benzene (C_6H_6), Carbon Dioxide (CO_2), LPG, and smoke. Similar to other sensors in the MQ series, this sensor features both digital and analog output pins. When the concentration of these gases exceeds a predefined threshold in the air, the digital pin switches to a high state. This threshold can be adjusted using the onboard potentiometer. The analog output pin generates a voltage proportional to the level of gases detected in the atmosphere.

Technical specifications of the MQ135 Gas Sensor include:

- Operating Voltage: 2.5V to 5.0V
- Power Consumption: 150mA
- Detectable Gases: CO, NH_3, NOx, CO_2, Alcohol, Benzene, Smoke, LPG
- Typical Operating Voltage: 5V
- Digital Output: 0V to 5V (TTL Logic) at 5V VCC
- Analog Output: 0-5V at 5V VCC

6. PCB

A printed circuit board (PCB) provides mechanical support and electrical connections for electrical or electronic components by utilizing conductive tracks, pads, and other features etched from one or more layers of copper on a nonconductive substrate. Components are typically soldered onto the PCB to establish both electrical connections and secure mechanical attachment.

7. I2C module

The I2C Module is equipped with a built-in PCF8574 I2C chip, responsible for converting I2C serial data into parallel data suitable for the LCD display. These modules typically come with a preset I2C address, which could be either 0x27 or 0x3F. To identify the specific version, one needs to inspect the black I2C adaptor board located on the module's underside. If there are three sets of pads labeled A0, A1, and A2, the default address will be 0x3F. Conversely, if there are no pads, the default address will be 0x27. Additionally, the module features a contrast adjustment potentiometer on the underside of the display, which may need adjustment to ensure correct text display on the screen.

8. DHT 11 sensor

The DHT11 is a widely utilized sensor for measuring temperature and humidity. It incorporates a specialized NTC (Negative Temperature Coefficient) to gauge temperature and an 8-bit microcontroller for transmitting temperature and humidity readings as serial data.

9. L298 controller

The module features two screw terminal blocks designated for motor A and B, along with an additional terminal block for Ground pin, VCC for the motor, and a 5V pin, which can function as either an input or output. It effectively steps down a 12V power supply to 5V to power the Arduino UNO board.

10. Brushless fan

A brushless DC fan employs brushless DC motors (BLDC motors) featuring a configuration of four permanent magnets arranged in a cross pattern on the rotor's sides. Unlike brushed DC motors, BLDC motors operate without the need for a commutator or brushes. The brushless DC fan consists of a robust BLDC motor, shaft, and fan blades. Renowned for their durability, reliability, and exceptional energy efficiency, these fans operate silently and without generating sparks in the circuit.

11. Carbon filter

Carbon air filters are widely employed for gas removal, primarily targeting volatile organic compounds (VOCs). These filters function by passing gases through a layer of activated carbon, also known as activated charcoal. Commonly utilized to address VOC emissions from household items, they are also effective at eliminating outdoor odors like tobacco smoke.

IV. MERITS, DEMERITS AND APPLICATIONS

Merits

- Eco-Friendly: This system promotes environmental sustainability by utilizing clean energy sources and minimizing harmful emissions.
- Enhanced Air Quality: It contributes to better indoor air quality by effectively filtering out pollutants and contaminants.
- Cost-Effective: It offers economic benefits through reduced energy consumption and maintenance expenses.
- Minimal Maintenance: With low upkeep requirements, it ensures hassle-free operation and longevity.
- Real-Time Monitoring: It provides continuous monitoring and feedback on air quality parameters for timely interventions.
- Energy Self-sufficiency: It reduces reliance on external energy sources by harnessing renewable energy, leading to greater energy independence.
- Sustainable: By integrating eco-friendly practices and technologies, it promotes long-term environmental stability and resource conservation.

Demerits

Even though Solar Outdoor air Purifier have many advantages. It has numerous flaws, including

- Reliance on Solar Energy: The system's functionality is contingent upon sunlight availability, which may affect its performance during periods of low sunlight or at night.
- Capacity Constraints: Its capability is bounded by the amount of solar energy it can capture and store, potentially limiting its effectiveness in high- demand scenarios.
- Upfront Investment: The initial setup expenses associated with procuring and installing solar panels and related equipment represent a significant upfront cost. However, over time, the system's energy savings and environmental benefits may offset this initial investment.
- Applications in Domestic sector
- The project has diverse applications suitable for various settings:
- Public Squares and Plazas: Implementing our system in public squares and plazas can enhance the overall air quality, creating a healthier environment for visitors and residents alike.
- Open Air Markets: Introducing air purification systems in open air markets can significantly improve the air quality, fostering a healthier atmosphere for vendors and shoppers while reducing exposure to outdoor pollutants.
- Recreational Sports Fields: Installing air purifiers on recreational sports fields can offer benefits to athletes and spectators by minimizing their exposure to harmful outdoor air pollutants, thereby promoting overall well-being during sports activities.

V. FUTURE SCOPE

The future prospects for a solar-powered outdoor air purifier with a power quality monitor entail envisioning potential advancements and progressions in technology, market trends, and its practical applications.

i) Technological Advancements: Anticipated developments in air purification technology and enhancements in solar power efficiency are poised to yield more effective and energy-efficient outdoor air purifiers.

ii) Integration with IoT: Integration with the Internet of Things (IoT) holds promise for creating intelligent devices capable of remote operation, data analysis, and adaptation to dynamic environmental conditions.

iii) Green Infrastructure: These systems can play a pivotal role in green infrastructure initiatives, contributing to the establishment of healthier and more sustainable urban environments.

iv) Environmental Initiatives: Solar-powered outdoor air purifiers align with broader sustainability objectives, potentially experiencing increased adoption as governments and organizations prioritize clean energy and air quality improvements [5].

VI. CONCLUSION

Solar outdoor air purifiers with air quality monitors present a promising technology with the potential to address outdoor air pollution in various settings. These systems harness solar power to operate air purifiers equipped with monitors that assess and improve air quality. While they offer several advantages, such as sustainability and reduced reliance on external power sources, there are important considerations and potential disadvantages to keep in mind. The key advantages of solar outdoor air purifiers include their environmentally friendly operation, suitability for off- grid locations, and applications in diverse outdoor settings. These systems can contribute to creating healthier public spaces, recreational areas, and work environments by reducing outdoor air pollutants.

However, it's crucial to acknowledge the potential disadvantages, such as dependence on sunlight, limited capacity, initial cost, and maintenance challenges. The effectiveness of these systems may be influenced by weather conditions, geographical factors, and the overall integration with existing infrastructure.

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DTMF Based Irrigation Water Pump Control System

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Abstract—One of the issues farmers in the agricultural industry deal with is the occasional waste of water during the watering routine. A poorly designed irrigation system may waste water, causing the soil to become overly wet and harming the crops. In agricultural industries, load control systems are crucial, particularly for irrigation systems, as they can impact operational productivity and efficiency. In order to function profitably, the agricultural sectors have also included many of the newest technology into their systems, such as irrigation systems, temperature and humidity sensing systems, and many more. Therefore, in order to overcome the inefficiencies of the manual irrigation system, a desirable load control system utilising Dual-Tone Multiple Frequency (DTMF) will be designed for the irrigation system. The irrigation system can be controlled in a variety of ways and will take less time if DTMF is used.

Keywords—GSM Module, Float sensor, Solenoid Valve

I. INTRODUCTION

The majority of modern applications and systems are now operated wirelessly, leading to increased production efficiency while reducing time and labor requirements. Manual methods in agricultural systems often result in operational inefficiencies, prompting the need for wireless technology integration [1-14]. The core concept of our project revolves around employing wireless technology to manage agricultural operations, utilizing Dual-Tone Multiple Frequency (DTMF) wireless technology.

Given the continual rise in food demand, advancements in food production technology are imperative. In regions like India, where agriculture and climate conditions are unpredictable, stagnant conditions due to factors such as insufficient rainfall and limited water resources hinder full agricultural resource utilization [15-24]. Thus, the "DTMF Based Irrigation Water Pump Control System" aims to optimize water usage and enhance productivity with minimal manual intervention.

Our project's objective is to remotely regulate various electrical loads, such as irrigation water pumps situated in remote locations, using a telephonic signaling system based on the dual-tone multi-frequency technique [36-42]. By leveraging the DTMF signal received from any mobile phone, users can control electrical loads such as irrigation water pumps, tube wells, farms, and businesses. This approach aims to reduce manual labor for farmers while improving productivity and financial returns.

Moreover, controlling agricultural applications, such as motors, via cell phones simplifies the operation and management process. The mobile phone serves as the primary control device for controlling numerous applications in the field or farm, while also providing real-time monitoring of environmental conditions like humidity, temperature, and light intensity. A DTMF decoder interprets the code attached to analog signals from the mobile device and converts them into corresponding digital commands.

The controller then transmits signals to activate or deactivate relays, thereby controlling the connected loads based on commands from the sender's mobile device. The key advantage of this system lies in its ability to operate applications remotely from farmland or fields [43-53].

This enables farmers to conveniently activate or deactivate water pumps installed at various locations on the land via the cell phone keypad, aligning with their specific requirements. The DTMF decoder and controlling circuit receive input commands and manage the on-off mode of the connected electrical motor pump. This circuit design is readily achievable using various electrical and electronic circuit components.

II. LITERATURE REVIEW

- Pooja B. Mahale, Bhagyashree B. Bhoir, and Shubhangi B. Shinde present "Smart Agriculture Using DTMF," focusing on software simulation via Arduino IDE and Proteus, followed by hardware development.
- Mandeep Guleria, Akanksha Rathi, Deepraj Singh Sajwan, Jasbir Singh Negi, and Nidhi Chauhan explore the "DTMF Based Irrigation Water Pump Control System," which aims to control remotely positioned agricultural water pumps using the DTMF technique.
- Beza N. Getu, Nasser A. Hamad, and Hussain A. Attia introduce "Remote Controlling of an Agriculture Pump System Based on the Dual Tone Multi Frequency Technique," employing a wireless sensor network and embedded DTMF signaling to manage water flow for various irrigation methods such as sectored, sprinkler, or drip irrigation.
- Amit Verma, Ankit Kumar, Avdesh Sikarwar, and Atul Sahu present "Automatic Irrigation System Using DTMF," aiming to provide farmers with automatic irrigation capabilities utilizing DTMF technology, allowing remote motor operation controlled by a microcontroller 8051.
- V. Ramanjaneyulu, K. Devendra Reddy, and P. Madhuri discuss the "DTMF Based Irrigation Water Pump Control System," detailing the conversion of received cell phone codes into digital commands using a DTMF decoder.

III. METHODOLOGY

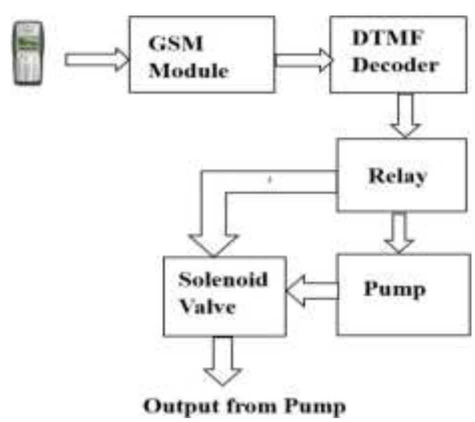

Fig. 1. Schematic block diagram for DTMF Based Irrigation Water Control System

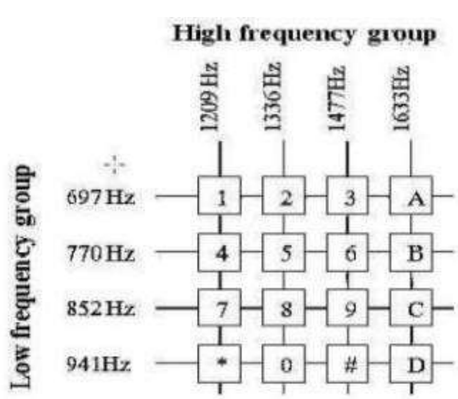

Fig 2. DTMF frequency Range

Agricultural irrigation often relies on AC motors (either single-phase or three-phase) to power the pump mechanism responsible for water distribution. The size of the motor is chosen based on the dimensions of the agricultural area. In large agricultural sites, multiple motors may be necessary to pump water to various locations, sometimes situated far from the farmer's residence. Utilizing modern technology can alleviate the challenges associated with managing irrigation across vast and remote areas.

With modern technology, a farmer located remotely can control water pumps at different locations on the site by simply pressing the keypad of a telephone handset. Depending on the need, one or more pumps can be activated or deactivated simultaneously or at different intervals. To achieve this, a DTMF decoder and control logic circuit are employed to interpret commands encoded as audio DTMF signals and control high-power pumps accordingly.

Unlike previous designs that relied on commercially available DTMF decoders and microcontrollers, our approach involves designing the DTMF decoder and subsequent logic controller using readily available passive and active electrical and electronic components.

Implementing DTMF-based control for agricultural pump systems is particularly impactful in regions with water and rainfall scarcity, such as desert areas. Here, farmers can effectively manage water resources based on weather, environmental, and seasonal conditions. Remote control functionality enhances flexibility, reducing the need for physical presence to operate pump systems [1].

Beyond agricultural pump control, DTMF-based remote control holds significance for various domestic and industrial applications. It minimizes the risk of leaving equipment running unnecessarily for extended periods in the absence of operators. The ability to switch equipment on and off from any location and at any time enhances convenience and efficiency.

1. Arduino:

The Arduino Nano, developed by the Arduino team, is a microcontroller board akin to the Atmega168 or Atmega328p. It shares similarities with the Arduino Uno but offers a smaller footprint and distinct pin configuration. Ideal for embedded systems and robotics projects, the Nano's compact size caters to design preferences for smaller components. Targeted at novices entering technical realms, Nano boards serve as accessible tools for learning and developing electronic projects..

2. GSM Module:

The SIM800L GSM/GPRS module serves as a compact cellular GSM modem, seamlessly integrating with microcontrollers to imbue them with GSM capabilities, enabling GPRS data transmission. Facilitating phone calls, SMS exchange, and internet connectivity via GPRS, TCP, or IP, it links microcontrollers to mobile networks. Further, its quad-band GSM/GPRS support ensures global operability. Its affordability, compactness, and extensive functionalities render it an ideal choice for projects requiring long-range connectivity and IoT integration.

3. Float Sensor:

Float switches find utility across diverse industrial processes, providing point-level detection to indicate whether a liquid level is open or closed at a specific point. They detect various factors such as foaming, dielectric properties, conductivity, pressure, temperature, and more. This versatility makes them suitable for virtually all liquid types. Operating without direct contact and independent of voltage supply, float switches offer a straightforward functionality applicable across a broad spectrum of applications, spanning from general industrial settings to process plants and shipbuilding industries.

4. Relay Module:

A relay is an electromechanical switch employed to manage high-power applications via low-power signal electronic circuits. For instance, a basic timer circuit operating at a 5V DC bias lacks the capacity to control a high-voltage light bulb directly. By integrating a relay component into the circuit, it becomes feasible to effectively regulate the light bulb's operation.

5. Solenoid Valve:

A solenoid valve functions as an electronically operated valve. It comprises a solenoid consisting of an electric coil encasing a movable ferromagnetic core, known as a plunger, situated at its center. By default, the plunger seals a small orifice when in the resting state. When an electric current passes through the coil, it generates a magnetic field, exerting an upward force on the plunger, thereby opening the orifice. This fundamental mechanism governs the operation of solenoid valves, enabling them to open and close.

6. Pump:

The cooler pump, also known as a compact submersible water pump or centrifugal pump, is commonly utilized in air coolers, aquariums, and fountains. It operates by drawing water through one side as the impeller inside rotates, expelling it from the other end. The impeller's size determines the water flow rate, with larger impellers capable of pumping more water. Through centrifugal force, water moves from the impeller's inlet to the outer volute, where it exits through the outlet, causing a drop in water pressure at the inlet. The pump then draws in new water to match the outgoing flow. These pumps are typically submerged, eliminating the need for priming before operation.

IV. MERITS, DEMERITS AND APPLICATION OF DTMF BASED IRRIGATION WATER PUMP CONTROL SYSTEM

Merits

Advantages of an irrigation water pump include its cost- effectiveness, facilitated by the integration of wireless technology, which reduces the need for manual labor and saves time. Furthermore, the implementation of such technology allows for efficient water management, enabling precise water scheduling to optimize irrigation cycles. Additionally, features like dry run out detection enhance operational safety by preventing damage to the pump in case of water scarcity or malfunction.

Demerits

While the DTMF Control System offers several benefits, it also presents various drawbacks. These include a substantial initial investment and susceptibility to network disruptions caused by changes in climate conditions.

Applications in agriculture sector

The project is applicable to various scenarios, including:

- Crop irrigation
- Efficient water system frameworks, particularly suitable for paddy and rice fields
- Beneficial irrigation practices in agricultural fields

V. FUTURE SCOPE

This initiative has replaced traditional farming watering methods with automated irrigation, significantly reducing water wastage and minimizing the labor-intensive tasks farmers typically undertake. Future enhancements may include integrating sensors to monitor soil humidity levels and land temperatures, especially crucial in areas prone to crop fires. This proactive approach enables timely interventions to prevent crop damage and alleviate farmers' burdens. Additionally, the system finds utility in industrial load management and home automation, offering convenience through DTMF and cellphone- controlled automation systems in various settings, including departmental cabins.

VI. CONCLUSION

The project proposes a cost-effective and straightforward solution for wirelessly and automatically monitoring water levels in tanks. Our design is ideally suited for small towns and specific zones, extending its practicality to residential and office areas. Recognizing the significance of water management around homes and offices, our focus is on implementing an affordable and efficient remote system. Unlike wired setups prone to issues like wire breakage, our solution eliminates such concerns. Moreover, this concept can be scaled up for commercial use and expanded to cover larger areas, replacing wired sensors with remote ones. Furthermore, the remote detection method can be adapted to detect water leaks. Scaling up, this solution could be adopted across municipal structures, offering comprehensive water monitoring without requiring EEPROM links. Data can be stored locally and transferred to computers for analysis, generating charts and facilitating detailed audits of water usage in specific areas. Stream meters serve as verification tools.

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Development of a Test-Bench for Battery-Motor-Propeller Assemblies Designed for Multirotor Drone

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Abstract: This paper highlights the necessity for a thorough test bench tailored for battery-motor-propeller assemblies in drones, offering a comprehensive tool for drone testing. Our emphasis lies in methodical evaluation, enabling the examination of vital drone parameters such as flight time, motor thrust, and overall system performance. Leveraging mathematical modeling, including MATLAB simulations, facilitates precise measurement of drone flight characteristics and motor behavior. Real-world validation further enhances the accuracy and reliability of the proposed methodologies. Future endeavors will focus on algorithm optimization and the incorporation of additional tests to assess drone performance, such as power consumption and efficiency tests.

Keywords: Drone Technology, Test-bench Development, Battery-Motor-Propeller Assemblies, Mathematical Modelling, Flight Characteristics

I. INTRODUCTION

In the past few years, the increased use of drones has increased the demand for improvements in drones. The core of these unmanned aerial vehicles (UAVs) resides in their propulsion systems, where the complex interaction among batteries, electric motors, and propellers plays a key role in determining the drone's performance.

The expanding range of applications, spanning from aerial photography to agriculture and surveillance, requires a sturdy and effective design for these fundamental components. Traditional multi-rotor propulsion systems, consisting of fixed-pitch propellers and electric motors powered by battery packs, have limitations in terms of endurance and range, primarily constrained by battery capacity [1]. This has led to an increasing focus on enhancing the design and performance of battery-motor- propeller assemblies to address these limitations.

The advancements in multirotor unmanned aerial vehicles (UAVs) have witnessed a rapid increase in their use across various industries such as cargo transportation, mapping, agriculture, and more [2]. However, the predominant use of fixed-pitch propellers in many designs has contributed to challenges in achieving extended hover times [2].

Recognizing this limitation, researchers have explored innovative solutions, including variable-pitch propellers, to improve efficiency and control in different operating conditions [2]. Additionally, the development of test systems for pre-flight control and evaluation of Vertical Take-Off and Landing (VTOL) drones has become crucial [3]. These systems, equipped with test platforms and graphical user interfaces, facilitate comprehensive pre- flight tests, ensuring the safety and optimal performance of VTOL multirotor drones [3].

In the context of experimental test benches, there have been significant strides in designing test platforms for various types of UAVs, including convertiplane types with controlled electric drives and tilt rotors [4]. These test benches serve as intermediaries between simulation processes and real-time UAV flights, enabling the evaluation of solutions and the development of control methods [4]. Moreover, the educational aspect of multirotor UAVs is not overlooked. A modular design approach has been proposed for the development of an Educational Multirotor

Platform (EMMR), offering students opportunities to delve into control theory and aerial robotics [5]. The aerodynamic performance of propellers, particularly about geometric parameters such as pitch, has been a subject of in-depth investigation [6].

Experimental results, obtained through wind tunnel tests and dimensional analysis, contribute to the understanding of propeller performance under various conditions [6]. The interest in electrically-driven propeller airplanes has expanded from small remotely piloted vehicles to larger high-altitude/long-endurance aircraft, with a focus on accurate range and endurance predictions [7]. As the drone industry evolves, there is a growing need for comprehensive testing platforms and methodologies. These include thrust test benches capable of measuring parameters such as thrust, RPM, power, torque, and temperature [9]. The development of such test benches is crucial for assessing the structural and functional behavior of UAV engines or motors. This paper deals with the detailed analysis of multirotor drones. By using mathematical models of each part of the drone, we developed a MATLAB program that takes input from the user and outputs the test results. So, tests on each part of the drone have been carried out and test results have been compared with real drone hardware.

In recent years, the escalating utilization of drones has spurred a demand for enhancements in their design and performance. At the heart of these unmanned aerial vehicles (UAVs) lies their propulsion systems, where the intricate interplay among batteries, electric motors, and propellers significantly influences drone performance.

The burgeoning array of applications, ranging from aerial photography to agriculture and surveillance, necessitates robust and efficient designs for these pivotal components. Traditional multi-rotor propulsion systems, comprising fixed-pitch propellers and electric motors powered by battery packs, face limitations in endurance and range, primarily due to battery capacity constraints. This limitation has spurred an intensified focus on enhancing the design and performance of battery-motor-propeller assemblies to overcome these challenges.

The rapid advancement of multirotor UAVs has seen a surge in their application across various industries such as cargo transportation, mapping, and agriculture. However, the prevalent use of fixed-pitch propellers has posed challenges in achieving prolonged hover times. In response, researchers have explored innovative solutions, including variable-pitch propellers, to enhance efficiency and control across different operational conditions. Moreover, the development of test systems for pre-flight control and evaluation of Vertical Take-Off and Landing (VTOL) drones has become indispensable. These systems, equipped with test platforms and user-friendly interfaces, facilitate comprehensive pre-flight tests, ensuring the safety and optimal performance of VTOL multirotor drones.

Significant strides have also been made in designing experimental test benches for various types of UAVs, including convertiplane types with controlled electric drives and tilt rotors. These test benches bridge the gap between simulation processes and real-time UAV flights, enabling the evaluation of solutions and the development of control methods.

Furthermore, the educational dimension of multirotor UAVs is being explored through a modular design approach for an Educational Multirotor Platform (EMMR), offering students opportunities to delve into control theory and aerial robotics. The analysis of propeller aerodynamic performance, particularly concerning geometric parameters such as pitch, has been subject to in-depth investigation, with experimental results contributing to understanding propeller performance under various conditions.

As the drone industry continues to evolve, there is an escalating need for comprehensive testing platforms and methodologies, including thrust test benches capable of measuring parameters such as thrust, RPM, power, torque, and temperature. Such developments are crucial for assessing the structural and functional behavior of UAV engines or motors. This paper delves into a detailed analysis of multirotor drones. Utilizing mathematical models of each drone component, we developed a MATLAB program that solicits input from users and generates test results. Consequently, tests on each drone component have been conducted and compared with real drone hardware, providing valuable insights into their performance.

II. DETAILING OF DRONE

2.1 Dynamics of Flight

Flight dynamics is the branch of aerospace engineering that focuses on the study of the motion and behavior of aircraft in response to external forces, control inputs, and

environmental conditions. It encompasses the principles governing the stability, control, and maneuverability of flying vehicles, including airplanes, helicopters, and drones.

Air is a physical substance with weight, comprised of constantly moving molecules. Air pressure is generated by the movement of air molecules, creating forces that affect objects like kites, balloons, birds, and planes.

Air is a mixture of gases, including oxygen, carbon dioxide, and nitrogen, and it plays a crucial role in the flight of various objects. In 1640, Torricelli discovered that air has weight, observed through its mercury pressure. Francesco Lana conceptualized an airship in the late 1600s, based on the idea that removing air from a hollow sphere would allow it to float due to reduced weight. Hot air expands and becomes lighter than cool air, causing balloons filled with hot air to rise. When hot air cools and is released, the balloon descends.

Airplane wings are shaped to increase airspeed over the top, creating lower pressure, resulting in lift. The difference in pressure between the top and bottom of the wing generates a force that lifts the aircraft.

The laws of motion of Newton are crucial for a drone to be able to fly. According to the first law of motion, until an outside force acts against an object, it will remain at rest and an object in motion will continue to move. According to the second law of motion, an object's force is determined by multiplying its mass by its acceleration. Additionally, according to the third law of motion, there is an equal

A drone follows all three laws of motion. Before takeoff, a drone is at rest, and according to the first law, it will remain stationary until force is applied. The propellers generate the necessary thrust, overcoming inertia and initiating motion. Similarly, once in motion, the drone will continue moving until external forces, like air resistance or control inputs, act upon it.

When a drone takes off, the force generated by its propellers accelerates it upward. The acceleration is influenced by the net force created by the thrust and the drone's mass. To change direction or altitude, the drone's flight controller adjusts the thrust, adhering to Newton's second law.

The propellers of a drone create thrust by pushing air downward. According to Newton's third law, the reaction to this action is an equal force pushing the drone upward. This principle is crucial for lift generation in drones. Additionally, when the drone maneuvers or changes direction, the corresponding propeller adjustments follow the same action-reaction principle. Lift (upward force), Drag (backward force), Weight (downward force), and Thrust (forward force) are the four fundamental forces influencing flight.

The pilot controls the plane's yaw, pitch, and roll using various control surfaces such as ailerons, elevators, and rudders. Yaw is controlled by the rudder, pitch by the elevators, and roll by the ailerons. The pilot uses instruments such as the throttle for engine power, ailerons for roll, rudder for yaw, and elevators for pitch. These controls allow the pilot to manage the direction, altitude, and stability of the aircraft during flight.

2.2 Drone Subparts

A drone, short for unmanned aerial vehicle (UAV), is a remotely piloted or autonomously operated aircraft. Drones come in various sizes and configurations, from small consumer quad-copters to large military surveillance and reconnaissance vehicles. They are equipped with sensors, cameras, or other payloads, enabling them to capture data, images, or videos, and are used for a wide range of applications, including recreational purposes, aerial photography, surveillance, search and rescue, agriculture, and more. Drones are typically controlled by a ground-based operator using a remote control or a dedicated software interface.

The frame serves as the structural foundation of the drone, providing support for all other components. Frames are commonly made of lightweight materials like carbon fibre or aluminum to optimize the drone's weight and durability. Propellers generate lift and thrust, allowing the drone to ascend, descend, and move in different directions. Drones often have multiple propellers (quad-copters, hexa-copters, octo-copters) for enhanced stability and control.

Motors drive the propellers' rotation, creating the necessary thrust for flight. Brushless motors are commonly used in drones due to their efficiency and reliability. ESCs regulate the speed of each motor, translating electronic signals from the flight controller into the appropriate motor speed. ESCs contribute to maintaining the drone's stability and responsiveness.

The flight controller is the brain of the drone, processing input from sensors and adjusting motor speeds to stabilize and control the drone's movement. It may include an inertial measurement unit (IMU), gyroscopes, and accelerometers to sense changes in orientation and acceleration.

Drones are powered by rechargeable batteries, typically lithium-polymer (Li-Po) batteries. Battery capacity and voltage impact flight time, with larger batteries providing longer endurance. Various electronic components include a power distribution board, wiring, and connectors. The power distribution board distributes power from the battery to the ESCs and other electronic components. Camera Drones are equipped with cameras that can take photos and videos.

Gimbals stabilize the camera, ensuring smooth footage by compensating for drone movements. GPS modules enable accurate positioning, navigation, and return-to-home functionalities. Drones may use GPS for way-point navigation and geo-fencing. The radio transmitter is the handheld controller operated by the pilot. The receiver on the drone receives signals from the transmitter, translating them into commands for the flight controller. Telemetry systems provide real-time data on the drone's status, including altitude, speed, battery level, and GPS coordinates.

2.3 Types of Drones

Drones can be classified into various types based on different criteria. Here are some common classifications, Based on Application. Recreational drones are used for fun and hobbyist purposes. Professional drones are designed for commercial applications like photography, surveying, and mapping. Military drones are utilized for defense and surveillance purposes. Based on configuration, drones are classified as multi-rotor drones that have multiple rotors, commonly used for aerial photography. Fixed-wing drones resemble airplanes and are suitable for covering large areas. Single-rotor helicopter drones feature a single large rotor and are often used for heavy lifting. Fixed-wing Hybrid VTOL drones combine the benefits of fixed-wing and multi-rotor designs.

Based on size drones are classified as very small nano drones, and are often used for military surveillance. Small drones are suitable for indoor use and recreational photography. Medium drones, which are larger and heavier, are used for professional applications. Large drones are comparable to smaller aircraft and are used for military and civil applications.

Based on payload capacity, drones are classified as featherweight drones that carry light payloads, often used for military surveillance. Lightweight drones are used for recreation and photography, with a moderate payload capacity. Middleweight drones have higher payload capacities, suitable for professional applications. Heavy-lift drones are designed to carry significant payloads, used for combat and civil applications.

Based on range, drones can be classified as very close-range drones limited to a short distance, often for recreational use. Close-range drones can cover short distances, used for military surveillance and photography. Short-range drones cover up to 150 km, suitable for surveillance and mapping. Mid-range drones, capable of longer flights, are often used for military purposes. Long-range drones cover extensive distances, used for military surveillance and mapping.

Based on power sources, drones are classified as battery- powered drones which use batteries for power. They are common in recreational and professional drones. Gasoline- powered drones use gasoline for longer flight times and heavier payloads. Hydrogen fuel cell drones use hydrogen for efficiency and environmental friendliness.

Solar drones utilize solar energy for extended flight times. Based on motors, drones are classified as brushed drone motors are common in recreational drones, but require more maintenance. Brush-less drone motors are more efficient, require lower maintenance, and provide higher power. Based on abilities & equipment, drones are classified as toy drones which are designed for beginners, often found in toy departments.

Photography/ videography drones are equipped with cameras for capturing images and videos. Racing drones are used for competitive drone racing. Professional drones feature advanced equipment for specialized applications. Military drones are specifically designed for military use. Delivery drones are designed for transporting goods.

2.4 Applications of Drone

Aerial photography drones have become instrumental in reshaping the landscape of cinematography. traditionally, capturing dynamic and fast-paced action scenes, along with sci-fi sequences, required expensive helicopters and cranes. aerial drones, equipped with advanced stabilization systems and high-quality cameras, have made cinematography more accessible and cost-effective.

Beyond the film industry, drones are making significant strides in real estate and sports photography, providing unique perspectives and angles. Additionally, journalists are exploring the use of drones for live broadcasts, enabling them to collect footage and information from vantage points that were once challenging to access.

Major companies like amazon, UPS, and DHL are actively exploring the use of drones for delivery services. The potential benefits are immense, from saving significant manpower to alleviating road traffic congestion. Drones offer a swift and efficient means of delivering small packages, food, letters, medicines, and other goods, particularly over shorter distances. The concept of drone delivery has the potential to transform the logistics and e- commerce industries, offering faster and more streamlined delivery services.

Geographic mapping drones have democratized geographic mapping, making high-resolution data collection accessible to both amateurs and professionals. These unmanned aerial vehicles are particularly valuable in reaching difficult-to-access locations such as coastlines, mountaintops, and islands.

The data collected by drones is utilized for creating detailed 3d maps and contributing to crowd-sourced mapping applications. The ability to acquire precise and up- to-date geographical information has applications in urban planning, environmental monitoring, and disaster response. Disaster management in the aftermath of natural or man- made disasters.

Drones serve as invaluable tools for disaster management. Equipped with high-definition cameras, sensors, and radars, drones provide quick and detailed information to aid in search and rescue operations. Their small size and maneuverability allow them to navigate through debris and rubble, offering a higher field of view compared to traditional methods.

Drones present a cost-effective alternative to manned helicopters, minimizing risks and optimizing resources during critical phases of disaster response. Precision agriculture has witnessed a significant transformation with the integration of drones. Farmers and agriculturists now have an affordable and effective means of regularly monitoring their crops.

Equipped with infrared sensors, drones can detect crop health variations, enabling farmers to respond promptly with targeted interventions such as fertilizer or insecticide applications. This not only enhances crop management practices but also contributes to improved yields. With drones expected to constitute a substantial portion of the agricultural market, their role in precision agriculture is set to grow even further.

Search and rescue drones play a crucial role in search and rescue operations, particularly in challenging terrain or adverse conditions. Their thermal sensors provide night vision capabilities, aiding in the location of lost people or victims. Drones can access areas where larger aerial vehicles might prove perilous or inefficient.

In addition to locating individuals, drones can be deployed to drop essential supplies to stranded victims in disaster-stricken or war-torn regions before traditional rescue crews can mobilize. Weather forecast drones are emerging as valuable tools for monitoring and collecting data on dangers and unpredictable weather conditions. Their cost-effectiveness and unmanned nature make them suitable for tasks such as flying into hurricanes and tornadoes to provide valuable insights into their behaviors. Specialized sensors on drones can detail weather parameters, contributing to more accurate weather forecasting. The ability to gather data in real-time from within extreme weather events has the potential to enhance our understanding of meteorological phenomena. Wildlife monitoring drones play a vital role in wildlife conservation by serving as a deterrent to poachers.

Equipped with thermal cameras and sensors, drones operate during the night, providing unprecedented protection to animals like elephants, rhinos, and big cats, common targets for poaching. The ability to monitor wildlife without causing disturbance allows researchers and conservationists to gain valuable insights into animal behavior, migration patterns, and habitat preferences.

Law enforcement agencies are increasingly turning to drones for surveillance and monitoring activities. Drones offer a bird's-eye view of large crowds during events, enhancing public safety measures. They prove invaluable in monitoring criminal and illegal activities, providing law enforcement with crucial situational awareness. Border patrols, for example, use drones to monitor activities such as fire investigations, the smuggling of migrants, and the illegal transportation of drugs along coastlines, where traditional methods may fall short.

Entertainment drones have entered the realm of entertainment, contributing to innovative experiences and competitions. Drone-based fight clubs, where contenders and their drones go head-to-head, showcase the agility and capabilities of these unmanned aerial vehicles. Artificial drone intelligence is harnessed not only for competitive purposes but also for capturing captivating videos and photographs. Concepts like the drone, designed for taking selfies, demonstrate the creative and recreational potential of drones in the entertainment industry.

As drone technology continues to evolve, new and exciting applications in the realm of entertainment are likely to emerge. Drone testing is a comprehensive process designed to assess the performance, safety, and compliance of unmanned aerial vehicles (UAVs) or drones. Testing is crucial to ensure that drones meet specific standards, regulations, and functional requirements, providing confidence in their reliability and safe operation.

III. DEVELOPMENT OF TEST BENCH FOR DRONE

First, we decided on the specific things we wanted to measure and understand about our project. For example, if we're working on a drone, we might want to know how high it can fly, how long it can stay in the air, and how quickly it can move. These are the things we'll keep an eye on to see how well our project is doing.

Next, we use math to create models that help us understand and predict how our project should work. Think of it like making a map before you go on a journey. These models tell us what we can expect from our project under different conditions. For our drone, it’s like figuring out how fast it can go based on its motors and how much power the battery provides. To test our project, we write computer programs using a tool called MATLAB.

These programs help us gather data and simulate how our project should behave. For our drone, we can use MATLAB to see how high it should fly, how long the battery should last, and how fast it should move under different circumstances. It's like trying out our project in a virtual world. We then run tests on our project in the real world and collect data.

For our drone, we might take it out for flights and measure how high it actually goes or how long it stays in the air. After the tests, we compare the real results to what our mathematical models and MATLAB simulations predicted. This helps us understand if our project is working as expected or if there are any problems.

We make sure that the numbers we calculated using math and MATLAB match with what we see in the real world. If they match, it's a good sign that our project is doing what it's supposed to do. If there are differences, we investigate to figure out why and make necessary adjustments. This method helps us build and test projects in a structured way, ensuring that they meet our goals and perform as we intend them to.

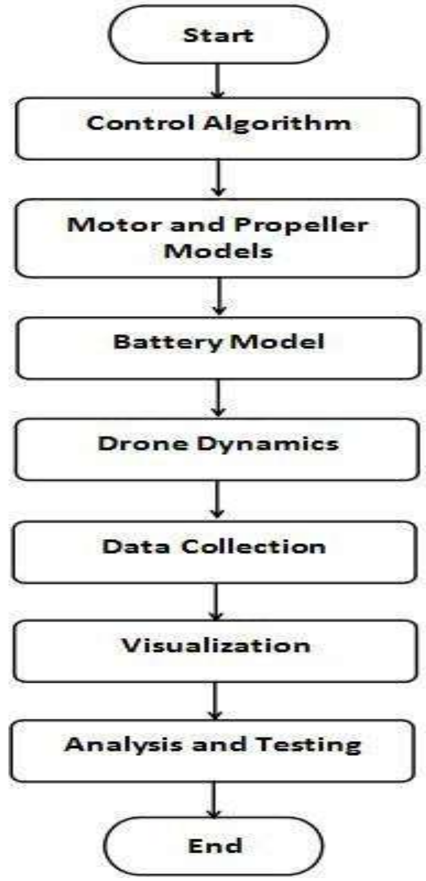

Fig. 1 Flowchart of the Testing Process

The flowchart for a drone project (Fig.1) encapsulates the sequential processes essential for the operational framework of the unmanned aerial vehicle (UAV). It commences with power-on initialization procedures, encompassing the activation and initialization of the drone's core systems, software, and hardware components.

This phase establishes the groundwork for subsequent functions by ensuring the proper initialization of sensors, internal systems, and communication interfaces. Following initialization, the flowchart progresses to sensor calibration and comprehensive system checks. Sensor calibration is critical for accurate data acquisition and interpretation during flight operations.

The systematic checks performed subsequently serve to validate the operational readiness of critical components and software functionalities, assuring their optimal performance and reliability. The subsequent stage within the flowchart delineates the flight mode selection process. This pivotal phase allows the operator to choose from a range of flight modes, which can include manual, autonomous, or stabilized flight modes. The chosen mode determines the drone's operational behavior and response to user inputs, showcasing the flexibility and adaptability of the UAV for various operational scenarios.

The subsequent segment focuses on flight control, managing motor speeds based on real-time sensor inputs and operator commands, and facilitating controlled and precise flight maneuvers. Throughout the flight, continuous monitoring of parameters such as position, altitude, and battery level is conducted, ensuring real-time awareness of the drone's operational status.

In the event of issues or user-initiated commands, the flowchart illustrates the transition to landing or return-to- home procedures, highlighting safety measures and contingency protocols. Finally, the flowchart concludes with the shutdown process encompassing landing, power- off, and system maintenance, ensuring safe termination of flight operations and maintenance of the drone's overall integrity.

3.1 Testing drone Flight Time

Drone flight time is given by the formula in (1)

Time = Capacity × Discharge / AAD (1)

Where, Time – Flight time of the drone, expressed in minutes. Capacity - The capacity of the battery expressed in milliampere hours (mAh) or ampere-hours (Ah). can be found printed on a Li-Po battery. The higher the capacity, the more energy is stored in the battery. Discharge – Battery discharge during the flight. It is good practice not to discharge more than 80% of the charge as lithium polymer batteries can be damaged when fully discharged. AAD – Average amp draw of drone, calculated in amperes. The amp draw is based on parameters such as the quadcopter weight or battery voltage.

The following (2) is used to calculate the AAD:

AAD = AUW × P / V (2)

Where, AAD – Average amp draw, expressed in amperes., AUW – All-up weight of drone – the total weight of the equipment that goes up in the air, including the battery. It is usually measured in kilograms. P - The power required to lift one kilogram of material, expressed in watts per kilogram, V – battery voltage expressed in volts.

By Ohm's law, we use an alternative version i.e. (3) of the formula above:

AAD = AUW × I (3)

Where, I - The current (in amps) required to lift one kilogram into the air.

IV. MATLAB PROGRAM FOR TESTING DRONE FLIGHT TIME

The explanation of the code is as follows: User Input: The code begins by prompting the user to input several parameters related to the drone. These inputs include the weight of the frame, battery, payload, battery capacity,battery discharge percentage, and battery voltage.

Drone Weight Calculation: The total weight of the drone isthen calculated by summing the weights of the frame, battery, and payload. Average Amp Draw (AAD) Calculation: Assuming a power consumption rate of 105 W/kg, the average amp draw (AAD) is calculated based onthe weight of the drone and the battery voltage.

```
% Prompting user for required inputs
frameWeight = input('Enter the weight of the frame in grams: ');
batteryWeight = input('Enter the weight of the battery in grams: ');
payloadWeight = input('Enter the weight of the payload in grams: ');
capacity_mAh = input('Enter the battery capacity in (mAh): ');discharge = input('Enter the battery discharge in
percentage : ');
batteryVoltage = input('Enter the battery voltage in volts: ');
% Calculating drone weight
droneWeight payloadWeight;=  FrameWeight + batteryWeight +
% Calculating average amp draw (AAD) powerPerKg = 105; % Assuming 105 W/kg
AAD = droneWeight * powerPerKg / batteryVoltage;

% Calculating flight time
time_minutes = (capacity_mAh * discharge / 100) / AAD * 60;
% Convert hours to minutes
% Displaying results
fprintf('Drone Flight Time: %.2f minutes\n', time_minutes);
```

The explanation of the code is as follows: User Input: The code begins by prompting the user to input several parameters related to the drone. These inputs include the weight of the frame, battery, payload, battery capacity, battery discharge percentage, and battery voltage.

Drone Weight Calculation: The total weight of the drone is then calculated by summing the weights of the frame, battery, and payload. Average Amp Draw (AAD) Calculation: Assuming a power consumption rate of 105 W/kg, the average amp draw (AAD) is calculated based on the weight of the drone and the battery voltage.

4.1 Flight Time Calculation

The flight time is then calculated using the battery capacity, discharge percentage, and the previously calculated average amp draw (AAD). The result is converted from hours to minutes.
Result Display: Finally, the calculated drone flight time is displayed using fprintf.
Results: We conducted tests with the above program for various drones

4.2 Dji Mavic Pro

DJI Mavic Pro has a battery of 11.4 V,3830 mAh capacity, and the combined weight of frame, battery, and payload is 743 grams. Input these values into our program

4.3 DJI Phantom 4 Pro

DJI Phantom 4 Pro has a battery of 15.2 V,5870 mAh capacity and the combined weight of frame, battery, and payload of 1388 grams. Input these values into our program

```
Enter the weight of the frame in grams: 887 Enter the weight  of the battery in
grams: 468Enter the weight of the payload in grams: 33Enter the battery capacity
in (mAh): 5870
Enter the battery discharge percentage: 80 Enter the battery voltage in volts: 15.2
Drone Flight Time: 29.39 minutes
```

We got a flight time of 29.39 minutes, which is nearly equal to its real flight time of 30 minutes.

4.4 Parrot ANAFI Ai

Parrot ANAFI Ai has a battery of 4.4 V,6800 mAh capacity and the combined weight of frame, battery, and payload of 1300 grams. Input these values into our program

```
Enter the weight of the frame in grams: 570 Enter the weight of the battery in grams: 198
Enter the weight of the payload in grams: 32
Enter the battery capacity in (mAh): 3500
Enter the battery discharge percentage: 70
Enter the battery voltage in volts: 11.55 Drone
Flight Time: 34 minutes
```

We got a flight time of 34.09 minutes, which is close to its real flight time of 32 minutes.

4.5 DJI MAVIC AIR 2

Parrot ANAFI Ai has a battery of 11.55 V, 3500 mAh capacity, and the combined weight of the frame, battery, and payload is 800 grams. Input these values into our program
We got a flight time of 34 minutes, which is equal to its real flight time of 34 minutes.

V. MATLAB PROGRAM FOR TESTING DRONE MOTOR THRUST

Testing Drone Motor Thrust: -

The total thrust required for flying a drone is given by (4)

$$\text{Thrust} = \text{Thrust-to-Weight-ratio} \times \text{Total Drone Weight} \quad (4)$$

The thrust of each motor is given by (5)

Thrust per motor = Thrust/Number of motors (5)

Where Thrust–Drone motors are rated for thrust, Total Drone, Weight – Total weight of the drone is a combination of the following different weights,

- Drone weight includes the weight of the frame, motors, propellers, landing gear, etc.
- Battery weight.
- Equipment weight includes any additional equipment such as cameras and lights.

Thrust-to-weight ratio –The thrust-to-weight ratio measures how much thrust is available per unit mass of the drone. This is based on the drone application. For aerial photography.

```
% Input: Testing Drone Motor Thrust
frameWeight = input('Enter the weight of the frame ingrams: ');
batteryWeight = input('Enter the weight of the battery ingrams: ');
equipmentWeight = input ('Enter weight of equipment in gm:');
thrustToWeightRatio = input('Enter desired thrust to weightratio ');
numMotors = input('Enter the number of motors in thedrone: ');
% Calculate total drone weight

Total Drone Weight = frame Weight + battery Weight +equipment Weight;

% Calculate the thrust required for the drone

thrust Required = thrust To Weight Ratio * total DroneWeight;
% Calculate thrust per motor

Thrust Per Motor = thrust Required / num Motors;

% Display results
Fprintf ('Total Drone Weight: %d grams\n', total DroneWeight);

Fprintf ('Thrust Required: %d grams\n', thrust Required); fprintf('Thrust
per Motor: %d grams\n', thrust Per Motor);
```

VI. RESULT AND DISCUSSION

We conducted tests with this program for various drones DJI Matrice 300 RTK Consider the example of DJI Matrice 300 RTK.

```
Enter the weight of the frame in grams: 3000
Enter the weight of the battery in grams: 3000
Enter the weight of additional equipment in grams: 930
Enter the desired thrust to weight ratio (e.g., 2 for 2:1): 2
Enter the number of motors in the drone: 4
Total Drone Weight: 6930 grams
Thrust Required: 13860 grams
Thrust per Motor: 3465 grams
```

```
% Prompting user for required inputs

frameWeight = input('Enter the weight of the frame in kg: '); batteryWeight = input('Enter the weight of the battery in kg:');

payloadWeight = input('Enter weight of the payload in kg: '); capacity = input('Enter the battery capacity in Ah: '); discharge = input('Enter the battery discharge percentage: '); batteryVoltage = input('Enter the battery voltage in volts: '); thrustToWeightRatio = input('Enter desired thrust to weight ratio: ');

numMotors = input('Enter the number of motors in thedrone: ');

kv = input('Enter motor Kv rating (RPM/V): ');

% Calculating drone weight

droneWeight = frameWeight + batteryWeight +payloadWeight;

% Calculating average amp draw (AAD) powerPerKg = 105; % Assuming 105 W/kg

AAD = droneWeight * powerPerKg / batteryVoltage

% Calculating flight time

time = (capacity * discharge / 100) / AAD;

% Calculating thrust

fullThrust = droneWeight * thrustToWeightRatio;motorThrust = fullThrust / numMotors;

% Calculate electrical power electricalPower = batteryVoltage * AAD;

% Convert Kv to SI units (Radians/Second/Volt)

%Calculate motor torque coefficient (Kt)kt = 1 / kv_si;

% Calculate motor torquetorque = kt * AAD;

% Calculate motor RPM

rpm = kv_si * batteryVoltage;

% Calculate mechanical power mechanicalPower = torque * (2 * pi * rpm / 60);
```

So, the thrust required is 13.8 kg and we have to choose the motor which gives 3.4 kg thrust.

6.1 Test-bench for drone complete program:

By combining MATLAB code of various tests we get the final code for testing the drone following the code and its general output

```
% Calculate motor efficiency

Motor efficiency = mechanical power / electrical power;

% Calculate propeller efficiency

propeller Efficiency =motor Thrust / mechanical power;

% Calculate powertrain efficiency

Powertrain efficiency = motor thrust / electrical power;

% Displaying results

fprintf('Drone Flight Time: %.2f hours\n', time); fprintf('Motor Thrust: %.2f grams\n',
motorThrust); fprintf('Electrical Power: %.2f Watts\n', electricalPower);

fprintf('Mechanical Power: %.2fWatts\n',mechanicalPower);

fprintf('Motor Efficiency: %.2f\n', motorEfficiency); fprintf('Propeller Efficiency:
%.2f\n', propellerEfficiency);fprintf('Torque: %0.4f N.m\n', torque);

fprintf('Motor RPM: %d RPM\n', rpm);
```

The code prompts the user to input various parameters related to the drone and its components. The code then performs calculations for drone weight, average amp draw, flight time, thrust, electrical power, motor torque, RPM, mechanical power, motor efficiency, propeller efficiency, and power-train efficiency. Finally, the code displays the calculated results using fprintf statements.

VII. CONCLUSIONS AND FUTURE SCOPE

The development of a specialized test bench for battery- motor-propeller assemblies in multirotor drones signifies a significant leap forward in drone technology. This research leverages mathematical modeling and real-world validation to address limitations in traditional multi-rotor propulsion systems, underscoring the pivotal role of batteries, electric motors, and propellers in determining drone performance. The proposed educational multirotor platform contributes to educational outreach initiatives, offering students invaluable hands-on experience in control theory and aerial robotics.

The research's focus on algorithm optimization, integration of adaptive control systems, collaboration with manufacturers, and further exploration of propulsion systems lays a solid foundation for future advancements in drone technology. Future endeavours will prioritize optimizing algorithms for enhanced drone control, integrating adaptive control systems for improved adaptability, and collaborating with manufacturers to incorporate cutting-edge technologies. Continued research into propulsion systems, particularly variable-pitch propellers, is essential to overcome endurance and range limitations.

Expanding the educational multirotor platform in educational institutions and further developing thrust test benches for comprehensive motor assessment are critical objectives. Additionally, exploring remote sensing applications could broaden the scope of drone technology, contributing significantly to fields such as environmental monitoring and disaster response.

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IoT-enabled Solar-based EV Charging Station

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Abstract— The primary goal of the present work is to reduce greenhouse gas emissions and the use of fossil fuels. The paper describes how an E-vehicle module is charged using a solar panel, how an IoT device monitors the maximum power generated by the solar panel, and how an MPPT controller can track the maximum power generated. The complete system is linked to the Arduino Uno, a rechargeable battery that generates and distributes charge, which is displayed on an LCD. This device allows you to charge many automobiles with solar energy by using a solar panel. The GSM modem will send a warning message if the system's power is reduced. To check the status of the battery being charged, a web page is used, which also displays the amount of charge transferred to the charge module and the location of a nearby charging station. This project seeks to develop a smart application that connects to the grid and learns about the various tariff pricing accessible. The program improves low-carbon technology utilizing rule-based algorithms on a single linked platform, uploading data to the Internet of Things (IoT) to indicate battery status and tariff rates.

Keywords— Arduino, Solar panel, LCD display, wifi module, Battery, Internet of Things (IoT), solar energy, electric vehicle (EV), charging infrastructure, sustainability, smart grid, energy management, case studies, future outlook.

I. INTRODUCTION

The widespread adoption of electric vehicles (EVs) worldwide emphasizes the urgent need for robust infrastructure to support their expanding presence [1]. With EVs gaining traction, the demand for efficient charging solutions becomes paramount for both national power grids and charging station network operators. Recognizing this trend, there is a pressing need to develop an intelligent application that seamlessly integrates with the grid, taking into account diverse tariff rates [1]-[11].

This application aims to empower users by delivering real- time information on incoming and outgoing power rates, providing insights into the state of charge (SOC) of the vehicle's battery upon connection to the grid [12]-[21]. To achieve optimal results and promote low carbon technologies, a unified platform employing rule-based algorithms will be implemented.

In this endeavor, the concept of the "Internet of Things" (IoT) plays a pivotal role. IoT involves a network of physical objects, including vehicles, utilities, and home furnishings, equipped with sensors, software packages, and electronic connections [15]. This interconnected system enables seamless communication and data sharing, particularly in the realm of electric vehicle smart charging stations, which play a crucial role in supplying the electric energy necessary for recharging EVs [5]-[10].

The landscape of charging stations is evolving rapidly, with a growing number of widely dispersed, publicly accessible facilities. Some of these stations offer enhanced charging capabilities, facilitating quicker charging at higher voltages and currents beyond what home electricity sources can provide. Moreover, these charging stations feature a variety of heavy- duty connectors that adhere to different specifications for electric charging connectors.

As the transition from combustion engines to electric motors progresses, batteries, as widely adopted energy storage technology, underscore the significance of accurately determining the status of the battery's charge. A key aspect of the intelligent application will be to relay this crucial information to users [18]-[21].

However, challenges such as a shortage of charging outlets could potentially contribute to range anxiety and diminish the practicality of EVs, thereby hindering their widespread adoption. Therefore, a comprehensive approach to infrastructure development is essential to ensure the seamless integration and widespread adoption of electric vehicles, fostering a sustainable and low-carbon future [1]-[21].

Unlimited, clean energy from the sun is harnessed every day, powering everything on Earth through the utilization of photovoltaic panels. These solar panels convert sunlight into electrical energy without emitting harmful CO_2, making them environmentally friendly and cost-effective [1].

Solar energy eliminates variable expenses and the need for conventional fuels, further reducing greenhouse gas emissions during electricity generation. The scalability of solar power allows for large-scale electricity production without the risks and costs associated with fuel supply, minimizing air pollution and energy consumption while enhancing overall comfort [10].

This paper delves into the convergence of two groundbreaking technologies—the Internet of Things (IoT) and solar energy—in the realm of Electric Vehicle (EV) charging infrastructure. By examining the potential and challenges of integrating IoT into solar-powered EV charging stations, it provides valuable insights into the advancements, benefits, and future prospects of this innovative approach.

II. RELATED WORK

The paper presents an innovative strategy to enhance the efficiency of current PV solar panels by integrating them into electric vehicle (EV) charging stations. At the Institute of Energy, the solar PV system produces 13,792 kWh/year, allowing for the utilization of 21% (2861 kWh/year) to charge two electric buses, while the surplus energy contributes 9837 kWh/year to the national grid.

To address the intermittent nature of solar energy, the paper proposes implementing an energy storage system. This green transportation concept not only optimizes solar energy usage for charging but also reduces greenhouse gas emissions by 52,944 kg/year, benefiting both the electricity grid network and the environment. With the transport sector accounting for 35% of total CO_2 emissions, cleaner energy solutions like electro mobility are imperative. The paper showcases a charging station design integrating solar panels, photovoltaic cells, and batteries.

The photovoltaic system design, optimized using Hybrid Optimization by Genetic Algorithms (iHOGA) software, ensures continuous electricity supply to EVs throughout the day. Integration of Internet of Things (IoT) technology facilitates real-time monitoring of rechargeable battery status, nearby charging station locations, and battery voltage. A cloud-based IoT platform enables multiple users to access and update data, enhancing user convenience.

Acknowledging global growth in solar and EV industries, exemplified by the increasing number of solar rooftops and electric vehicles in the United States, the paper foresees challenges in establishing solar-based EV charging as conventional but recognizes the synergy between EVs and solar energy as offering new business opportunities and environmental sustainability. This anticipated EV-PV synergy is poised to foster cleaner energy solutions and future growth.

The paper conducts comprehensive literature reviews to identify optimization, design, and simulation studies focusing on solar charging systems for EVs, offering a global perspective on energy-generating system implementation. The central theme centres on green solar charging stations for EVs.

Highlighting the environmental drawbacks of non- renewable petroleum resources, the paper emphasizes their significant emissions of harmful pollutants like sulphur dioxide, nitrogen oxides, and carbon dioxide during combustion, contributing to global warming. Reduction of greenhouse gas emissions is thus a primary motivation for the increasing focus on the electrification of mobility.

The paper provides a thorough overview of existing studies, setting the stage for the exploration of green solar charging stations as a sustainable solution for EVs. It underscores the critical need for strategically scheduling

EV charging to mitigate network load escalation, introducing a characteristic demand profile derived from 15-minute energy request blocks, based on data from the Indian Power Exchange (IEX), illustrating load variations throughout the day.

III. METHODOLOGY

The items included in the set up are: Arduino UNO R3, power supply, solar panel, WIFI module, current sensor, voltage sensor, two batteries, relay drivers, LCD display, MPPT charger, and an Android application.

Description

- The MPPT controller oversees the solar panel's optimal power output while charging the E-vehicle module.
- The entire configuration is linked to the Arduino UNO R3, which supervises battery levels, manages power generation and distribution, and presents battery status on an LCD screen.
- A web page is employed to monitor the charging status of both the main station battery and the vehicle battery. It also tracks the power transferred from the solar panel to the main battery, which subsequently charges the vehicle battery.
- The LCD display indicates the charging status of both batteries and provides information on the charging module and available station locations.
- The charging station's status is recorded on ThingSpeak and accessed via an Android application. The primary aim of this system is to alleviate greenhouse gas emissions and diminish dependence on fossil fuels.

Components of Proposed Work

Solar panel:

Solar energy, in essence, refers to the energy originating from the sun. This energy manifests in the form of solar radiation, enabling the generation of solar power. The conversion of light into electricity lies at the core of this process. Essential to solar road lighting systems, the solar panel plays a pivotal role in transforming solar energy into electrical power. Utilizing photons from sunlight, solar modules generate energy through the photovoltaic effect. Additionally, solar power harnesses reflectors to retain solar heat. Essentially, a solar panel converts sunlight into either electricity or heat, which can then be utilized to supply power to homes or structures. Typically, solar panels comprise numerous small solar cells distributed across a large area to ensure an ample supply of power.

MPPT Charger:

A device referred to as an MPPT Solar Charge Controller, or Maximum Power Point Tracker, functions as an electronic DC-to-DC converter, precisely aligning the solar array (PV panels) with the battery bank for optimal performance. Its primary function involves converting the elevated voltage DC output from solar panels into the lower voltage necessary for battery charging, while simultaneously transforming surplus panel voltage into current, thereby enhancing the overall output of the solar system.

Arduino:

The Arduino Uno was selected for its ability to simplify programming complexities and its cost-effectiveness. It accurately measures current and voltage using analog pins, enabling power and energy computations. Powered by the Atmel AVR® core, the Arduino Uno offers features like In- System Programmable Flash, EEPROM, and SRAM, making it versatile for various applications. It also includes multiple I/O lines, Real-Time Counter, Timer/Counters, USART, and Serial Interface, enhancing its functionality. Additionally, it features a 10-bit ADC, Watchdog Timer, SPI serial port, and power- saving modes for efficiency.

Wifi-module (ESP8266EX):

The ESP8266EX is specifically tailored for mobile, wearable electronics, and Internet of Things applications, prioritizing minimal power consumption through a blend of proprietary techniques. Its power-saving architecture primarily operates in three modes: active mode, sleep mode, and deep sleep mode. Through advanced power management methods and logic, it selectively powers down unnecessary functions and orchestrates the transition between sleep and active modes.

Relay:

In our project, a relay is employed to manage power supply, intervening if faults arise in the solar power supply.

Voltage Divider:

A voltage divider, also referred to as a potential divider, is a passive linear circuit generating an output voltage (Vout) that is a fraction of its input voltage (Vin). Voltage division occurs as the input voltage is distributed among the divider's components.

Current Sensor:

A current sensor detects electric current within a wire, generating a signal that corresponds to the current detected. This signal can be presented as an analog voltage or current, or even as a digital output. It can be used to display the measured current on an ammeter, saved for later analysis in a data acquisition system, or utilized for control functions.

LCD Display:

A liquid-crystal display (LCD) is a flat panel display that utilizes the light-modulating properties of liquid crystals to create electronic visual displays. The designation "20x4" indicates that the LCD can display 20 characters in each of its rows, allowing a total of 80 characters to be displayed simultaneously.

DC Voltage regulation:

The final component in a regulated DC power supply is DC voltage regulation. Variations in input from the AC mains, alterations in load current at the output, or shifts in temperature can cause fluctuations in output voltage or current. To mitigate this issue, a regulator is employed to maintain a consistent output despite changes in input or other factors. Depending on the specific application, transistor series regulators, fixed and variable IC regulators, or Zener diodes operated in the Zener region can be utilized. Integrated circuits such as the 7812 and 7905 are commonly employed to achieve fixed output voltage values, with the 7812 providing a constant 12V DC output and the 7805 delivering a steady 5V DC output. The output from the 7805 is directed to the Arduino LCD and all required sensors, where sufficient power is necessary. Arduino, known for its user-friendly programmable circuitry, open-source hardware and software, is robust and capable of effectively supporting various devices. It is based on the ATmega328 microcontroller, featuring 14 digital I/O pins, 6 analog outputs, a USB interface, an ICSP connector, a power jack, and a reset switch, facilitating connectivity with a laptop via USB or an AC-DC power source.

ESP8266:

The ESP8266 serves as a straightforward and cost- effective tool for network applications. Functioning independently, it can operate as an Access Point (displaying a hotspot) or a Station (connecting to Wi-Fi), facilitating the download and transfer of data to the web, thus simplifying the creation of a Web of Things ecosystem. It operates on 3.3V exclusively, as higher voltages, such as 3.7V, can potentially damage the module when interfaced with circuits.

Buzzer:

A buzzer or beeper serves as an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Common applications include alarm systems, timers, and confirmation of user input such as mouse clicks or keystrokes.

Current Transformer:

A Current Transformer (CT) is utilized to measure the current in another circuit. These are commonly used globally to monitor high-voltage lines across national power grids. The CT produces an alternating current in its secondary winding, which is proportional to the current in its primary winding. In the context of EV charging using solar power, Arduino reads the current value and total units, displaying them on an LCD and transmitting the data to a web server. The ThingSpeak server is utilized to monitor the data graphically and numerically. A Wi- Fi network is necessary for transmitting the data wirelessly from the transmitter to the receiver, with the ESP8266 Wi-Fi Module enabling access to the Wi-Fi network for vehicles. Optimistic utilization of electric vehicles is essential for numerous applications.

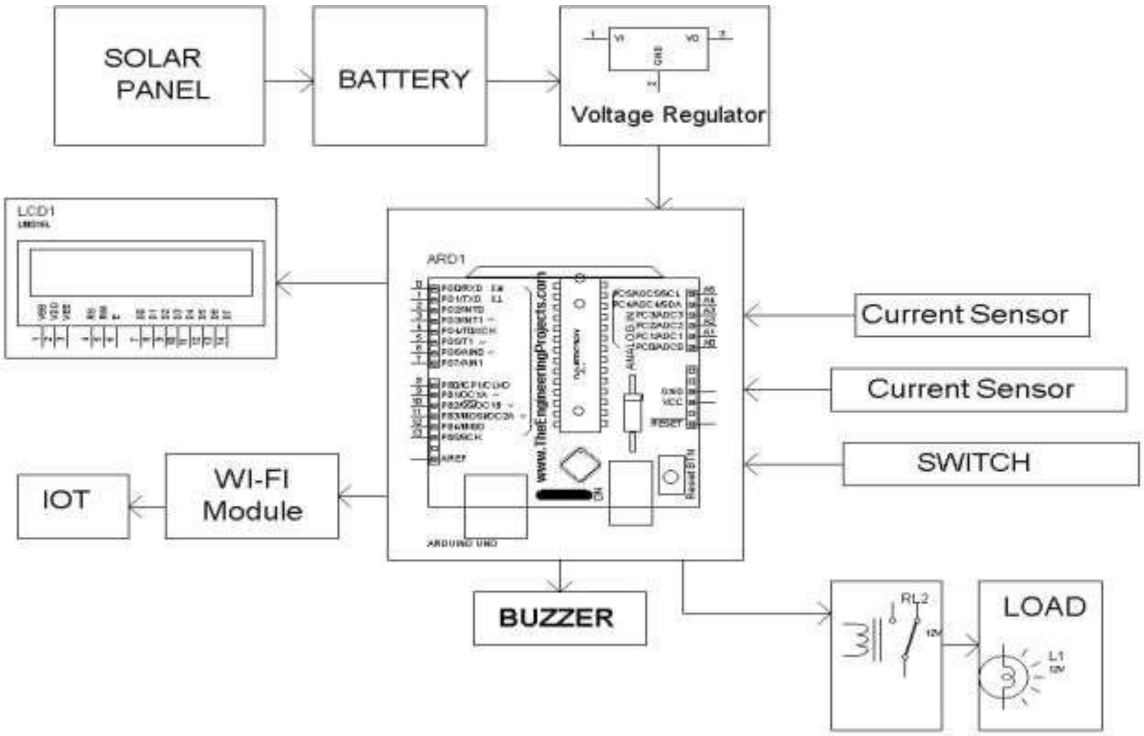

Fig.1: Schematic block diagram for IOT-enabled solar-based electric vehicle charging station prototype

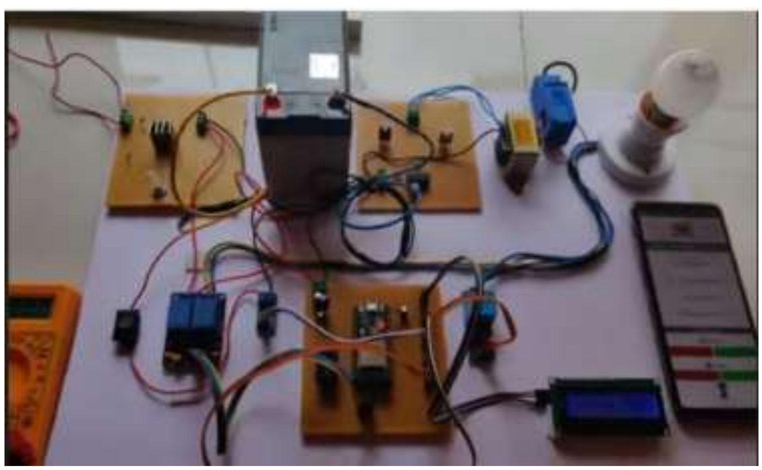

Fig.2: Hardware set-up for IoT-enabled solar-based EV charging station

IV. RESULTS

The Internet of Things (IoT) enables monitoring of battery status, effectively transforming it into an energy storage system. Utilizing a cloud platform for management, this IoT implementation allows users to track nearby charging stations and observe fluctuations in voltage supply. Data stored within the Arduino remains accessible until the battery ceases to charge. Additionally, user profiles for electric vehicle (EV) clients who utilize the stations are stored and regularly updated in the database, ensuring efficient distribution among various users. The quest for an eco-friendly and sustainable environment hinge upon our collective actions, particularly in terms of vehicular usage and its impact on pollution levels. Optimal utilization of solar energy involves selecting efficient components capable of generating the requisite energy to charge EVs, thus contributing to a greener environment.

V. CONCLUSIONS

The study highlights the crucial integration of IoT technology with solar energy systems in EV charging infrastructure, emphasizing the need for ongoing research, innovation, and collaboration to advance intelligent and sustainable transportation solutions. Through IoT connectivity, users can efficiently manage power by monitoring battery status and reallocating surplus charge as necessary. The project aims to simplify the establishment of EV charging stations, enhancing accessibility and maintenance for residential use. With an expected surge in plug-in EVs on the roads by 2030, the addition of fast-charging stations could greatly facilitate long- distance travel between two cities.

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Pick and Place Robotic Vehicle with Soft Catching Gripper

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Abstract— This paper outlines the design analysis of an Android-controlled "Pick and Place" Robotic vehicle. Operated through an Android application for remote control, the robotic arm executes commands transmitted to the receiver, enabling movement in different directions. The vehicle integrates four motors linked to the microcontroller: two for arm and gripper actions, and two for overall mobility. The project aims to develop a Bluetooth-driven robotic arm to relocate items, supporting various technological sectors. Using an Android device as a transmitter, it acts as a remote control, while the Bluetooth device at the receiver connects to the microcontroller, controlling DC motors via a motor driver IC for remote operation via smartphones or tablets.

I. INTRODUCTION

The project aims to develop a pick-and-place robotic vehicle equipped with a soft-catching gripper. This endeavor seeks to create a mobile robot capable of transporting objects from one location to another, leveraging an Android app for control. With modern industries increasingly relying on computer-based interactions and robotics to enhance productivity and maintain competitive advantage, this project aligns with the trend toward automation.

The proposed robot is designed to execute physical tasks and can operate in diverse environments, including hazardous conditions and military operations. With applications ranging from underwater tasks to assisting disabled individuals, the versatility of this robot extends to various scenarios. The vehicle is powered by four motors controlled by a microcontroller, with two motors dedicated to arm and gripper movement and the remaining two for body movement.

Utilizing an Android application device as a transmitter, commands are relayed to the robot's receiver to direct its movements—forward, backward, left, or right. At the receiving end, the microcontroller interfaces with four motors, enabling precise control over the robot's actions. Remote operation is facilitated via smartphones or tablets running the Android OS, offering intuitive touch-screen control through a graphical user interface (GUI). Notably, the robot's soft-catching arm prioritizes object safety by minimizing pressure during gripping.

The importance of autonomous vehicles in modern society cannot be overstated, as they undertake tasks that may be impractical or unsafe for humans. In industries where manual labor is laborious or repetitive, autonomous vehicles enhance efficiency while reducing reliance on human resources. Furthermore, the integration of line-following capabilities into the pick-and- place robot offers a solution to navigational challenges, ensuring uninterrupted operation along predetermined paths. As industries increasingly embrace automation to streamline processes and cut costs, the development of the pick-and-place arm with a line follower robot represents a significant advancement. These robots, equipped with Bluetooth-enabled control systems and object detection capabilities, are instrumental in manufacturing plants, where they navigate predefined routes to retrieve and deposit components accurately.

In summary, the integration of pick-and-place functionality with line-following capabilities in this robotic system represents a promising innovation in industrial automation, offering improved efficiency and reliability in material handling tasks.

II. LITERATURE REVIEW

Robots are typically controlled through tethered (wired), wireless, or autonomous means, with traditional wireless methods including mobile phones, joysticks, keypads, and computer terminals. They can even be interfaced with the internet for remote control from anywhere. Here are some commonly used control methods for both robotic vehicles and arms.

The fundamental operation of a pick and place robot relies on its joints, which are akin to human joints and connect consecutive rigid bodies within the robot. These joints can be rotational or linear, and adding a joint to any part of a robot requires understanding its degrees of freedom and movement. Degrees of freedom govern the body's linear and rotational motion, while degrees of movement indicate the number of axes it can traverse. Equipped with an Atmega328 microcontroller IC, Bluetooth module, and four DC motors with driver IC, the pick and place robotic arm is affixed to a moving vehicle, allowing it to navigate various surfaces. This setup employs two motors for vehicle movement and an additional two for pick and place operations. The arm comprises an assembly with a jaw capable of vertical motion, driven by one motor, and jaw opening and closing, controlled by another.

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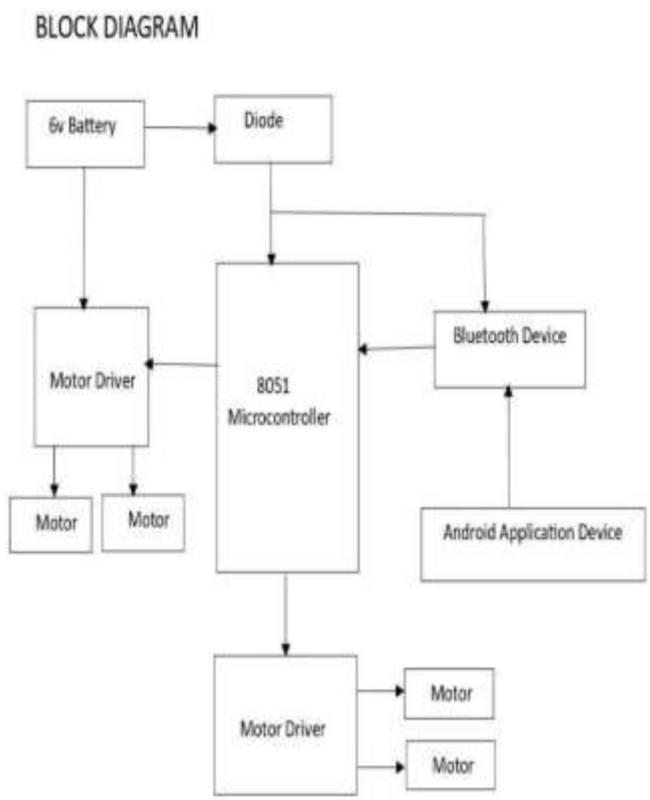
III. METHODOLOGY

Robots can be controlled through wired, wireless, or autonomous means. Traditional wireless control methods include mobile phones, joysticks, keypads, computer terminals, and internet interfacing, enabling remote control from anywhere. Various control methods are employed for both robotic vehicles and robotic arms. The fundamental operation of a pick-and-place robot is facilitated by its joints, which serve as connections between consecutive rigid bodies within the robot. These joints can be rotational or linear, depending on the specific application. Adding a joint to any part of the robot requires determining its degrees of freedom and degrees of movement. Degrees of freedom define the linear and rotational motion capabilities of the body, while degrees of



movement indicate the number of axes along which the body can move.

Fig.1 Block Diagram

Equipped with an Atmega328 microcontroller IC, Bluetooth Module, four DC motors with driver IC, and power supply, the pick-and-place robotic arm is mounted on a mobile vehicle, enabling it to traverse various surfaces with ease. The system utilizes two motors for vehicle movement and two additional motors for pick- and-place operations. A belt-type tire is attached to the vehicle for smooth operation.

The pick-and-place arm assembly comprises an arm with a gripper, capable of vertical motion. Two motors are employed—one for vertical movement and another for opening and closing the gripper. This configuration enables precise positioning and manipulation of objects during pick-and-place operations. To begin, locate and install the Blue Control application from Google Play on your Android device. Once installed, open the application from your list of applications. Activate Bluetooth on your device and initiate a scan for the device named "HC-05." Connect to this device by entering the PIN "1234." Next, access the Blue Control app and tap the options button, then select the "connect" option. A list of available devices will appear; locate "HC- 05" and again enter the PIN "1234," then click "OK." Wait for confirmation that the connection has been established ("Connected to HC-05"), indicating that the application is now ready to communicate with the Bluetooth module in the pick-and-place robotic vehicle.

Below are the operational steps:

- Press the up button for robot forward movement.
- Press the down button for robot backward movement.
- Press the left button for robot leftward movement.
- Press the right button for robot rightward movement.
- Press the A button to open the robot gripper.
- Press the B button to close the robot gripper.
- Press the C button to move the robot arm upward.

The pick-and-place robotic vehicle is equipped with an Atmega16 microcontroller IC, a Bluetooth module, four DC motors with driver ICs, and a power supply. The robotic arm is mounted on a mobile vehicle, allowing it to traverse various surfaces regardless of their texture. The vehicle's movement is facilitated by two motors, and a belt-type tire ensures smooth and reliable operation, akin to those found in tanks.

- ARDUINO UNO

Figure 2: Arduino Uno

Arduino is a pioneering open-source hardware and software endeavor, fostering the development of single-board microcontrollers and kits for constructing digital devices and interactive objects. Under GNU licenses, Arduino boards offer versatile microprocessors and controllers, supporting digital and analog I/O pins for various expansions. Its user-friendly programming environment, established in 2003, democratizes device creation. Arduino operates openly, with hardware designs accessible under a Creative Commons license, although the name "Arduino" is reserved for official products. Its boards, like the Uno, facilitate program loading via USB, while variants like the Mini utilize detachable adapters or Bluetooth for connectivity. These boards typically expose numerous I/O pins for external circuitry, often augmented by plug-in shields.

- ROBOTICS ARM

Figure 3: Robotic Arm

A gripper, an essential component of robot vehicles, serves to seize, secure, or manipulate objects, finding application in material handling, pick-and-place tasks, and search and rescue operations. Grippers vary in type, including parallel, angular, or vacuum-based, each tailored to specific tasks and object shapes, enabling effective interaction with the environment. A soft catching gripper, a subtype designed for delicate objects, boasts features like compliance, object protection, sensing, and control, versatility, and suitability for collaborative robotic environments. Commonly employed in industries like food handling and electronics manufacturing, soft catching grippers exemplify the broader field of soft robotics, emphasizing gentle interaction with the environment.

- Bluetooth Module HC-05

Figure 4: Bluetooth Module HC-05

The bluetooth module is a user-friendly Bluetooth SPP (Serial Port Protocol) device, facilitating seamless wireless serial connections. It operates on Bluetooth V2.0+EDR with a 3Mbps data rate and features a compact footprint of 12.7mmx27mm. Utilizing CSR Blue core 04 technology and AFH, it ensures efficient communication with CMOS technology. The module supports AT commands for configuring settings, typically controlled via a microcontroller like Arduino. Designing a Bluetooth-enabled pick and place robotic vehicle with a soft-catching gripper involves integrating components such as microcontrollers, motor drivers, Bluetooth modules like HC-05, and navigation sensors. Gripper design, possibly using servo motors or actuators, depends on soft-catching requirements. Microcontrollers must be programmed to receive Bluetooth commands for movement and gripping actions, considering power supply and safety features for the soft-catching mechanism.

• SOFTWARE REQUIREMENT: (MIT APP INVERTOR)

Figure 5: MIT App Inverter

During app development, it is recommended to conduct testing simultaneously with the development process. This can be easily accomplished with App Inventor, thanks to the live connection provided between your phone (or emulator) and the App Inventor development environment. By default, App Inventor is set up so that the screen of your app is "scrollable," thereby enabling the user interface to extend beyond the screen's limit, allowing users to scroll down by swiping their finger, akin to scrolling on a web page. When a Canvas is utilized, the "Scrollable" setting should be deactivated (UNCHECKED) to prevent screen scrolling. This action allows the Canvas to occupy the entire screen, ensuring a seamless user experience.

IV. SCOPE OF THIS PROJECT

“Pick and Place Robotic Vehicle with Soft Catching Gripper” project aims to transform material handling across industries by introducing an innovative mobile robotic system. The key goal is to develop a versatile robotic platform equipped with an advanced soft catching gripper, capable of delicately handling various objects to minimize damage. Unlike conventional rigid grippers, this technology ensures the safe manipulation of fragile items during picking and placing operations. The system boasts a robust chassis for navigating diverse environments, enhanced with sensors and computer vision for autonomous object detection and assessment. The gripper's compliance with different object shapes and materials ensures a gentle yet secure grip, promoting reliable and damage-free handling. Moreover, the project focuses on creating a user-friendly interface for seamless control and monitoring, coupled with smart technology integration for remote operation and real-time feedback, thus improving overall system efficiency.

V. RESULT

The Pick and Place Robotic Vehicle with a soft catching gripper is an advanced system designed to autonomously handle objects in diverse environments. Combining mobility with a specialized gripper, it efficiently picks up and places objects while minimizing damage risk. Equipped with sensors and cameras, it navigates complex spaces, avoiding obstacles and identifying targets. The soft catching gripper allows gentle handling of delicate or irregular objects, crucial for various applications. Advanced algorithms enable real-time decision-making, adapting to dynamic environments. Its versatile applications include manufacturing, warehouse logistics, and healthcare, promising improved efficiency and safe object handling. Overall, it represents a cutting-edge solution with mobility, sensing, and manipulation capabilities poised to revolutionize industries.

VI. CONCLUSION

The Pick and Place Robotic Vehicle, featuring a soft-catching gripper, marks a significant leap forward in automation, especially for material handling and logistics. Its incorporation of the soft-catching gripper enhances versatility and safety, enabling delicate object manipulation, crucial for industries like electronics and pharmaceuticals.

This vehicle boasts adaptability to diverse environments, with the gripper ensuring secure yet gentle handling, reducing damage risks. Enhanced mobility and navigation make it suitable for dynamic workspaces, bolstering efficiency in flexible tasks.

Advanced sensors and computer vision tech bolster the vehicle's perception and interaction abilities, facilitating intelligent navigation and accurate object detection. Machine learning algorithms further refine decision-making, enhancing performance over time. Operationally, the vehicle streamlines workflows, diminishing the need for human intervention in routine tasks, reducing errors, and boosting productivity and cost-effectiveness.

In essence, the Pick and Place Robotic Vehicle with a soft-catching gripper is a groundbreaking solution catering to industries' evolving needs for precise material handling. Its integration of soft gripping tech, advanced sensors, and autonomous navigation positions it as a valuable asset in modern manufacturing and logistics, promising seamless automation for intricate tasks, ensuring both efficiency and precision.

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Solar Powered Wireless Charging System

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Abstract— one kind of charging technology is called wireless charging, which transfers energy through electromagnetic induction using an electromagnetic field. A method called mutual induction is used to transfer energy between devices (the transmitter and receiver). To charge the battery in the receiving inductive coil, solar energy is supplied into a transmitter inductive coil, which converts it into an electric current. An AT mega controller, copper coils, a half-wave rectifier circuit, a solar panel, a battery, and an LCD display are used in the development of the system. The design demonstrates how to use a charge controller in conjunction with a solar panel to power the battery. The battery receives and holds DC power.

Keywords: Arduino, solar panel, inductive coil

I. INTRODUCTION

Wireless charging, also known as wireless power transfer, is a groundbreaking technology that enables the transfer of power to a device without the need for physical cords. By combining wireless charging with solar power banks, a unique product is created that merges solar charging with efficient battery support and wireless charging capabilities. This integration empowers the device to autonomously charge itself during daylight hours, guaranteeing uninterrupted power for users. In the realm of wireless charging, it is often referred to as inductive charging, which eliminates the need for charging cables, thereby reducing wear and tear on hardware ports. This technology has gained traction, with Samsung introducing wireless charging in its Galaxy S6 mobiles back in 2015. Compared to wire charging, wireless charging offers several advantages.

One notable advantage lies in its user-friendliness, as it eliminates the need for cables, allowing different mobile devices to utilize the same charging pad. Additionally, wireless charging enhances product durability by making devices waterproof and dustproof. The flexibility it provides is another advantage, especially in situations where connecting cables for charging can be costly. Moreover, it boasts the advantage of being radiation-free.

The development of wireless charging technology is progressing through two main avenues: radiative wireless charging, also referred to as radio frequency (RF)-based wireless charging, and inductive charging, also known as coupling-based wireless charging. Radiative wireless charging utilizes electromagnetic waves such as microwaves and RF waves to transmit energy through radiation. However, due to safety concerns related to RF exposure, this method operates within a low-power limit. On the other hand, inductive charging relies on mutual induction, where a magnetic field connects two coils. Although the power transfer distance is limited due to the rapid weakening of the magnetic field, inductive charging is widely accepted for everyday use due to its safety and convenience. Mobile phones have become indispensable in our daily lives, but the inconvenience of frequent charging persists. The promising solution offered by wireless charging technology is taken to the next level in this project by incorporating solar power. Through the utilization of cutting-edge components and pioneering technologies, this endeavor addresses the growing demand for convenient, sustainable, and user-friendly mobile phone charging.

II. LITERATURE REVIEW

The concept of wireless charging, as proposed by Abhijith Nidmar et al. (2019), involves the use of electromagnetic fields to transmit energy through electromagnetic induction. This technology enables the transfer of energy between a transmitter and receiver device. In the case of solar power banks with wireless charging, as explored by Sanju Tandan et al. (2023), it has become a popular and environmentally responsible option for charging mobile devices. However, there are certain drawbacks associated with these devices, such as their reliance on sunlight, slower charging rates, limited capacity, and inconsistent performance in indoor or shaded environments [1].

This literature review, covering studies conducted from 2017 to 2022, suggests that while consumers generally have positive attitudes towards these gadgets, further research is needed to improve their performance and usability. Factors like sunlight intensity, temperature, and device compatibility can impact the efficiency and speed of charging. Understanding these advantages and limitations can help users make informed decisions about the suitability of a solar power bank with wireless charging [2].

Rahil Imtiyaz and colleagues (2021) introduced the concept of wireless charging, a method that utilizes an electromagnetic field to transmit electricity through electromagnetic induction. This process of mutual inductance enables the wireless exchange of electricity between a transmitter and a receiver. The transmitter coil converts solar energy into AC, which is then wirelessly transferred to the receiver coil and subsequently to the battery. Currently, the efficiency of this wireless charging method stands at 11%, indicating room for improvement in the future. This technology holds potential for supplying power to electric vehicles and various business equipment.[3]

Professor Sara Anjum (2022) investigated how electricity is transported across devices (sender and receiver) using the same input procedure. Solar power is sent into the input of the inductive transmitter coil, while the inductive receiving coil receives it and turns it into electrical power to charge the battery. However, there are several hurdles to implementing wireless charging with current products. In this publication, a foundation for wireless charging technologies and the most recent improvements are described [4].

Vasava Dhrumil and et al., (2022) showed that energy may be obtained in a variety of ways, including unique herbal resources, solar power, nuclear power, and chemical fuel strength. The document provides wi-fi charging solutions for electric vehicles that make use of solar energy. The petrol used in today's vehicles creates noise and air pollutants, which have a significant environmental impact. However, the wi-fi charging period outweighs these pollution issues. Wireless Power Transmission [WPT] represents a totally dependable, efficient, noiseless, and pollution-free age [5].

Prof. Rupali Tirale, along with colleagues (2022), concentrated on the main goal of their research, which is to create a solar power bank integrated with an inverter system that can generate a 230V AC output. The solar power bank technology streamlines the process of charging mobile phones by utilizing a wireless power transmission coil and a minimal number of circuit components. The central idea revolves around wireless mobile charging, which employs electromagnetic induction to transfer energy through an electromagnetic field. Energy is transferred between devices through this induction process.

III. PROPOSED WORK

The proposed system incorporates a solar panel, battery, half-wave rectifier circuit, primary and secondary copper coils, ATmega controller, and LCD. This innovative setup aims to showcase the wireless charging of mobile can be inconvenient during travel or outdoor activities. Therefore, the objective is to develop an intelligent solar-powered power bank with AC outputs, allowing for wireless phone charging or charging through an AC charger [6]. The solar panel, which is regulated by a charge controller, generates power to charge the battery, which stores DC power. In order to transmit this DC electricity wirelessly, it is converted to AC through a transformer. The resulting alternating current is then regulated by circuitry. This regulated AC power is used to energize the copper coils responsible for wireless energy transmission.

An additional copper coil is positioned beneath the electric vehicle. As the vehicle passes over this coil, energy is transferred from the transmitter coil to the EV coil. It is important to note that the energy is initially induced into this coil as DC current. To make it suitable for charging the EV battery, it is converted back to DC using an AC-to-DC conversion circuitry.

The Atmega microcontroller monitors the input voltage and provides real-time feedback on the charging process by displaying the results on an LCD. This technology demonstrates a solar-powered wireless charging system for electric vehicles, offering a potential solution that could be integrated into roadways [7]. Santosh E. and et al., (2023) introduced the system that uses a solar panel, battery, transformer, regulator circuits, copper coils, AC to DC converter, Atmega controller, and LCD display to construct the system. The technique reveals how to charge electric automobiles while driving, removing the need to stop for charging. The solar panel powers the battery via a charge controller. The battery is charged and holds dc power. To transmit the DC electricity, it must first be converted to AC. In this case, we employ a transformer. The transformer converts the electricity to alternating current, which is then regulated by regulator circuitry. This electricity is now utilised to power the copper coils that transmit wireless energy. A copper coil is also installed below the electric car. When the car passes over the coil, energy is transferred from the transmitter coil to the EV coil. Please keep in mind that the energy is still being induced into this coil as DC current. Now we convert this back to DC so it may be utilised to charge the EV battery. We employ an AC-to-DC conversion circuitry to convert it back to DC. We now use an Atmega microcontroller to measure the input voltage and display the results on an LCD. Thus, the technology illustrates a solar-powered wireless charging system for electric vehicles that can be implemented into roadways [7]. Phones using solar energy, the solar panel, equipped with a charge controller, supplies power to charge the battery. Once charged, the battery stores DC power, which needs conversion to AC for wireless transmission.

To accomplish this conversion, a Full Wave Rectifier is employed. Unlike a half-wave rectifier, which only utilizes one half of each alternating wave cycle, a full-wave rectifier converts both halves, resulting in a smoother and more steady DC signal. This is crucial for efficient power transfer, as a significant power loss occurs in the half-wave rectifier. Santosh E. et al. (2023) introduced a comprehensive system that includes various components such as a solar panel, battery, transformer, regulator circuits, copper coils, AC to DC converter, Atmega controller, and LCD display. The main objective of this system is to enable the charging of electric vehicles while they are in motion, eliminating the need for frequent stops for charging.

The power generated in DC form is then utilized to energize copper coils responsible for transmitting wireless energy through inductive coupling. The system is divided into two main components: the transmitter side and the receiver side. Furthermore, a solar system is integrated into the setup, providing a DC power supply to charge the battery. The DC power from the solar system is converted into AC to ensure efficient wireless power transmission. The transfer of wireless power relies on the mutual inductance between the transmitter and receiver loops of current-carrying conductors, which creates a magnetic field. The AC power generated by the full-wave rectifier is then transmitted to the transmitter. Through mutual inductance, the receiver captures the AC power and converts it back to DC using a bridge rectifier. The output of the bridge rectifier is unregulated direct current, which is subsequently regulated by a voltage controller to maintain a constant voltage.

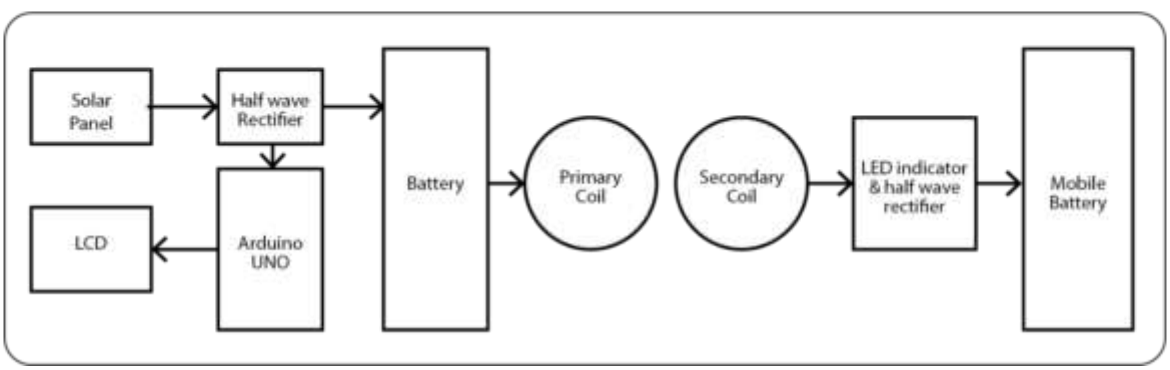

Fig 1. Block Diagram of the Proposed Model.

The regulated output voltage is utilized to recharge the batteries of low-power devices such as portable iPods and smartphones. The entire system illustrates an eco-friendly and convenient approach to mobile phone charging, utilizing solar energy and wireless power transmission technology.

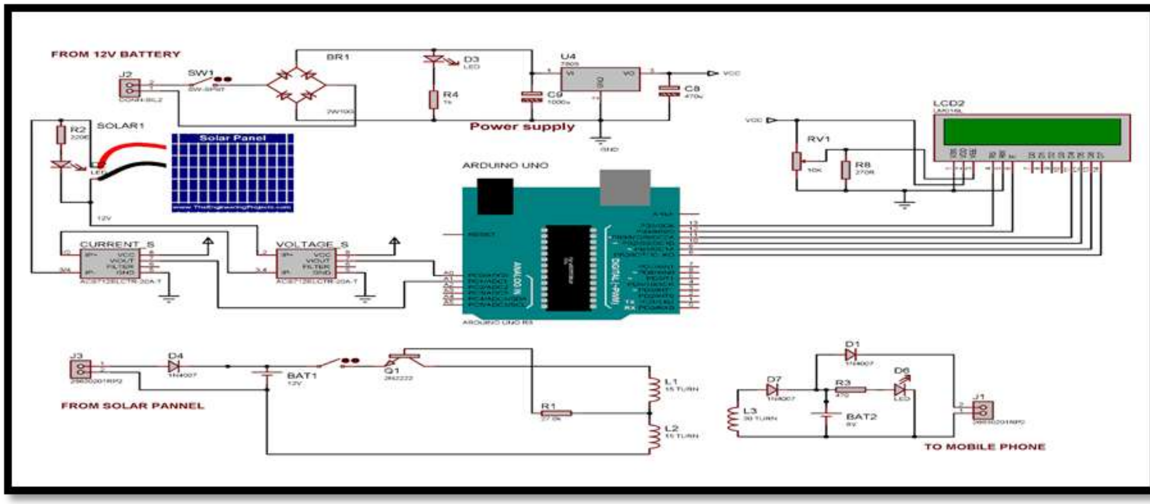

Fig 2. Circuit Diagram of proposed Model.

a) Solar Panel:

A solar panel, also referred to as a solar cell panel, solar electric panel, photo-voltaic (PV) module, or simply solar panel, consists of photo-voltaic cells arranged within a framework specifically created for installation. Solar panels harness sunlight as their source of energy to generate direct current (DC) electricity. A collection of PV modules is called a PV panel, and a system of PV panels is called an array—arrays of a photovoltaic system supplying solar electricity to electrical equipment.

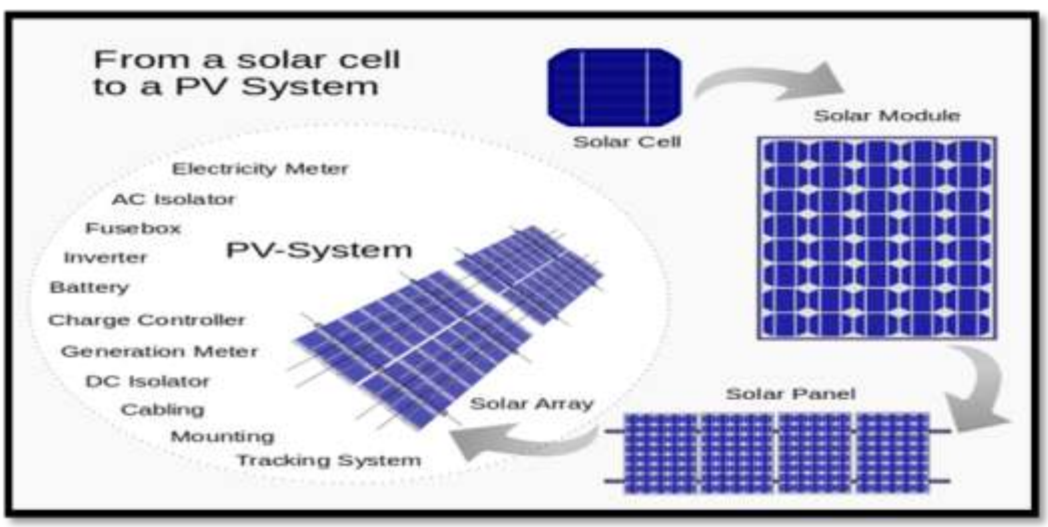

Fig. 3. Solar Panel

Photovoltaic modules harness sunlight to produce electricity using the photovoltaic effect. These modules are commonly made with wafer-based crystalline silicon cells or thin-film cells. The protective layer of a module can be located on either the front or back, safeguarding cells from damage and moisture. While most modules are rigid, there are also flexible options available, often utilizing thin-film cells. Electrically, cells are typically connected in series and then in parallel to achieve the desired voltage and increase current output. The power output of a module, measured in watts, is determined by multiplying its voltage (in volts) by current (in amperes). Manufacturing standards for solar panels are defined under standard conditions, which may differ from the actual conditions at the installation site.

Photovoltaic modules utilize sunlight to generate electricity through the photovoltaic effect. The majority of modules use either wafer-based crystalline silicon cells or thin-film cells. The load-carrying component of a module can be either the top or back layer. It is essential to protect the cells from mechanical damage and moisture. While most modules are rigid, there are also semi-flexible ones that are based on thin-film cells. The cells are typically connected in series and then in parallel to achieve the desired voltage and increase current. The module's power is determined by multiplying its voltage and current. Manufacturing specifications for solar panels are established under standard conditions, which may differ from the actual operating conditions at the installation site.

b) LCD

LCD (Liquid Crystal Display) technology is prevalent in modern devices such as CD players, DVD players, digital watches, and computers. LCDs have replaced Cathode Ray Tubes (CRTs) due to their lower power consumption and compact size. The LCD 16×2, commonly used in screens, operates by blocking light rather than dissipating it. This display module is widely used in various circuits and devices such as mobile phones, calculators, computers, and TV sets. LCDs are recognized for their affordability, ease of programming, and ability to showcase personalized characters, unique symbols, and animations.

c) Arduino Uno

Arduino UNO, a microcontroller board designed by the Arduino team, utilizes the Atmega168 or Atmega328p microcontroller. While similar to the Arduino Uno, the Nano board is smaller and preferred for its pin configuration and features. Arduino boards are widely used in electronic projects, embedded systems, and robotics. The Nano board is specifically introduced for beginners without a technical background who are involved in designing embedded systems with small-size components.

In the realm of power sources, an electric battery functions as the primary source of electric power. It is comprised of one or more electrochemical cells with external connections that are specifically designed to power electrical devices. When providing power, the battery's positive terminal acts as the cathode, while the negative terminal serves as the anode. Electrons move from the negative terminal to the positive terminal through an external electric circuit. When connected to an external electric load, a redox (reduction-oxidation) reaction takes place within the battery, transforming high-energy reactants into lower-energy products. The resulting difference in free energy from this reaction is then transferred to the external circuit as electrical energy. Over time, the term "battery" has evolved to include devices made up of a single cell, deviating from its original association with multiple cells.

Primary (single-use or "disposable") batteries are utilized once and then discarded due to the fact that the electrode materials are permanently altered upon discharge. A well-known example is the alkaline battery used in flashlights and various portable electronic devices. Secondary (rechargeable) batteries can be discharged and recharged multiple times with the application of an electric current, and reverse current can restore the original composition of the electrodes. Examples include lead-acid batteries used in vehicles and lithium-ion batteries used in portable devices like laptops and mobile phones. Batteries come in various shapes and sizes, ranging from small cells used in hearing aids and wristwatches to large battery banks the size of rooms that provide backup or emergency power for telephone exchanges and computer systems. Despite being heavier (in terms of mass) than conventional fuels like gasoline, the higher efficiency of electric motors in converting electrical energy to mechanical work, as opposed to combustion engines, somewhat balances this out in automobiles.

d) primary coil

Consists of two inductors: transmitting and receiving coils. The circuit operates primarily on the idea of mutual induction. The transmitting coil's dimensions are 22.1*13.1*3.2 mm, and its inductance is 3.7 uH.

e) Secondary Coil

The receiver module consists of several components, including an inductor coil, bridge rectifier, voltage regulator, and rechargeable battery. The bridge rectifier plays a crucial role in converting the AC signal received by the coil into a DC signal. However, the voltage produced by the bridge rectifier is not regulated and needs to be converted into a constant voltage. This is where the voltage regulator IC 7805 comes into play. It ensures that the voltage remains stable and regulated. Additionally, the receiving inductor coil has specific dimensions of 24.2*9.38*5.36 mm and an inductance of 14uH.

f) Bridge Rectifier

The bridge rectifier converts alternating electricity to direct current. When compared to a center-tapped full wave rectifier, it has high rectification efficiency (82%), as well as a cheap implementation cost. The diode used is 1N4007**.**

g) LED

LED Indicator & Half Wave Rectifier: An LED, or light-emitting diode, is a semiconductor device that emits light when an electric current flows through it. When electrons and electron holes recombine within the semiconductor material, energy is released in the form of photons, resulting in light emission. The color of the emitted light is determined by the energy required for this recombination, which is influenced by the semiconductor's band gap. To achieve white light, different semiconductors can be combined or a layer of light-emitting phosphors can be applied to the LED. This approach enables the creation of a wide range of colors using LEDs.

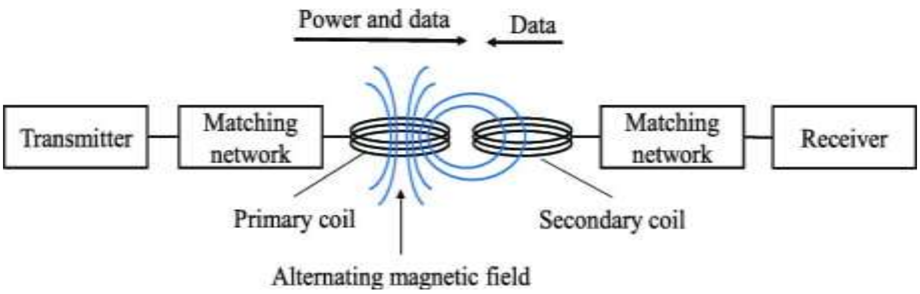

Fig. 4 Inductive Coupling

h) Inductive coupling

Inductive coupling enables wireless power transmission across the system by utilizing mutual inductance. The magnetic field transfers the maximum energy possible, following Faraday's law of electromagnetic induction. This mechanism operates akin to resonant transformers, with alternating current voltage playing a crucial role. The primary coil is situated on the transmitter side, while the secondary coil is located on the receiver side. The inductance quantifies the connection between the two coils, allowing for an output of up to 5V.

i) Battery

This idea employs a battery to store electricity generated by solar power. The project utilizes a 12v/1.2Ah lead acid battery for this purpose. It effectively stores and transfers energy from the solar panels to the remaining components of the system.

IV. METHODOLOGY

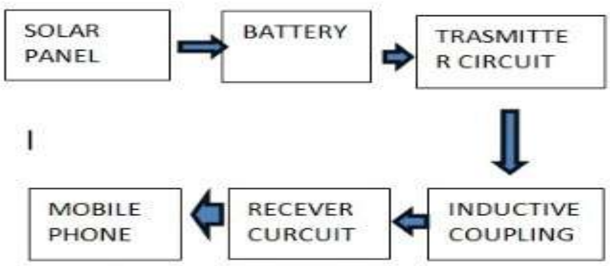

Fig 5. Diagrammatic Representation of Model.

The battery functions as a storage unit for solar energy conversion. The solar panel transmits electricity to the transmitter circuit, which consists of components like a BD139 transistor, capacitor, and resistor. The BD139 transistor monitors the charge voltage of the battery to ensure effective charging. Additionally, the transmitter circuit contains an inductive coil at the output, enabling wireless power transfer to the receiver section through inductive coupling. Inductive coupling operates based on mutual inductance, where current in one conductor induces a voltage in a nearby conductor, allowing for wireless electricity transfer. On the receiver end, a voltage regulator maintains a steady 5V output, ideal for charging mobile devices. This regulated voltage guarantees a reliable and secure charging process for the device being charged.

Fig 6. Final Output (wireless solar mobile charger).

VII. RESULT

The results of our efforts are outlined below. By increasing the number of coil turns, we observed a rise in the output voltage. For wireless electricity transfer through inductive coupling, we utilized 20-turn coils on both the transmitter and receiver ends. The 20-turn coil has a diameter of 4.5cm and can manage a maximum of 1.3 amps of electricity. The inductive coupling yielded a voltage of approximately 5v. Please refer to the table for detailed output information.

Table 1. Result

Sr .No	Value of Ranges	DC Output Voltage
1.	00	00
2.	0.5	0.10
3.	1.0	0.50
4.	1.5	0.89
5.	2.0	1.0
6.	2.5	1.10
7.	3.0	1.21
8.	3.5	2.20
9.	4.0	3.15
10.	4.5	3.50
11.	5.0	3.90

V. CONCLUSION

Solar power is a sustainable energy source that can be harnessed to generate electricity, like a portable wireless solar mobile charger. This innovative charger is ideal for off-grid locations and offers a safe and eco-friendly alternative to traditional chargers that often consume excessive power.

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ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Baby Care Monitoring System

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Abstract— In this competitive world, both the parents are busy in their career. The main problem of today's parents is that they are unable to nurture their child because of their work. In India both the parents have to work and take care of their baby so there is more work pressure and stress on such parents especially on women. The number of mothers who are working has increased so baby care becomes a big challenge for many parents. So, mostly parents send their baby to their grandparent's house/relatives house or to the baby care centres. The parents are unable to continuously monitor their baby's condition in these situations. The solution to this problem is the design of a monitoring system which continuously monitors the baby and it should be of low cost. This project presents a Baby Care Monitoring system for busy and working parents so that they can take proper care and ensure safety of their baby. This baby monitoring system is able to detect crying of the baby automatically. For this, we use impact sound detection sensor. So that the system can monitor crying of the baby when the crying sound goes above the predetermined range then the GSM Module will send SMS to provided mobile number. The goal of our project is to save time, Provide maximum security and safety.

Keywords: Arduino, Cradle, Infant cry, Sound sensor, Buzzer, Camera, GSM Module

I.INTRODUCTION

Since last few years there is huge relocation of people in metropolitan cities in search of good job opportunities specially womens. Currently parents who are working face problems to give time & take care of their baby. Since COVID period people are working from home and it is difficult for them to maintain balance in both work and baby care. This problem not only hampers their career but also put a stress on them. We all know the problems faced by Parents to take care of their baby and especially in case where mother is working. In such case to give whole day for baby is not to possible. So, we need to create a system that can assist parents to continuously monitor the baby and notify about the same. Thus, we are presenting an idea to create a Baby care monitoring System which will help the parents to monitor their child even if they are not with baby & detect every movement of the baby and take proper care and nurturing of baby. Our project is a good idea to overcome this problem by creating "Baby Care Monitoring System" to keep watch & nurture baby in an proper way. We have to create a baby monitoring system to help parent in monitoring of their child irrespective of their presence whether they are at workplace or at home. It also has detection of baby crying sound and it will send notification to parents after certain time limit of baby cry. A camera module is attached to the cradle so that parent can have continuous watch on their baby while they away from baby.

II. Need of Project

Working Woman
Now a days every woman is working so it is impossible to then to balance workload and monitor the baby so to overcome this problem We are inventing "BABY CARE MONITORING SYSTEM USING IOT".

Ease For Parenting
Parents face many problems during parenting especially working parents. This system will make it easy to parents to nurture their baby.

Caring System

This system is not only for baby but we can also use it for patients who are at bed rest or for senior citizens. It will help to take care of them and monitor their activities.

Long Distance Monitoring

Sometimes parents go outside from their house for work keeping their child with their relatives. In this case parents require monitoring on their baby. This system helps parents to monitor baby from long distance.

III. PROBLEM DEFINITION

When both the parents are working and building their career for betterment of themselves and their family, it becomes next to impossible to take care of your baby and do work simultaneously because of these parents get workload and stress which is leading to various kinds of health issues to parents and lack of proper nurturing of baby. Sometimes they have to compromise with their career for taking care of the baby especially mother of that baby. Taking care and nurturing the baby should not be a problem in career of the parents. As a result we require a Baby care monitoring system which will help parents for proper care and nurturing of their baby. This system will help parents in various aspects for proper care of their baby.

IV. OBJECTIVES

1. To make ease for women to balance her work and nurturing the baby.
2. To make parenting easy.
3. To help parents to take care and nurture the baby.
4. Nurturing baby should not be obstacle for women to maintain their career.

V. SCOPE OF PROJECT

This system can be enhanced by adding Health monitoring system to it which will help to monitor baby's health & lead to parents give proper treatment to baby. To enhance our project we can use machine learning and artificial intelligence that will capture and record all the activities of baby for some days especially baby body cycle and then tells us when baby is hungry or it will urinate etc

VI. EXPECTED OUTCOME

Baby Care Monitoring System is a useful system for caring and nurturing of baby efficiently especially for working parents. It consists of cry detection module and music player also it has swinging of cradle on detecting baby cry. We are having an application for controlling of various modules. It can be an efficient way for working parents to take care and nurture their baby without disturbing their career.

VII.LITERATURE REVIEW

1] IOT Based Baby Monitoring System Smart Cradle by Senoj Joseph; Ajay Gautham.j
In this paper the author has proposed the method for creating baby monitoring system smart cradle by involving different modules like swinging, health monitoring, cry detection etc. This system is created with the help of components like sound sensor, servo motor, Arduino and main component is raspberry pi.
2] IRJET-IOT Based Baby Monitoring System Using Raspberry PI
In this paper a raspberry pi based baby monitoring system is created which results in efficient care and nurturing of baby with the help of raspberry pi. Different modules are involved in this system such as cry detection, Swinging of cradle etc. This system involves components like sound sensor, servo motor, Arduino.
3] IoT-BBMS: Internet of Things-Based Baby Monitoring System for Smart Cradle by Waheb A Jabbar
In this paper the methodology used for development of the IOT based Baby Monitoring system for smart cradle involves use of Node MCU, Arduino UNO, sound sensor, and tempreture and humidity sensor. This system helps in proper care and nurture of the baby in absence of the parents as it involves camera for monitoring the activities of the baby.
4] Smart Cradle by Dr.Isuru Nawinne; Dr.Mahanama
The given solution involves monitoring of the baby through a mobile app remotely. Sound Sensor for the detection of the baby's crying activity. When it detect crying, it send a message to parent, and plays a song. The Tempreture sensor notifies the parent about the environmental temperature near the baby and turn on the fan automatically with temperature
5] Baby Monitoring Smart cradle by Manas Dhruve In this paper the method given to create the baby monitoring smart cradle involve the components like Arduino mega, Raspberry pi, servo motor, sound sensor, etc. It also involves development of mobile app for controlling of the system.

VIII.METHODOLOGY

The given methodology, tries to solve the limitations of the currently available system. It mainly consists of sensors, hardware unit, Arduino, GSM module , Sound Sensor. The below block diagram shows how all element are connected with each other.

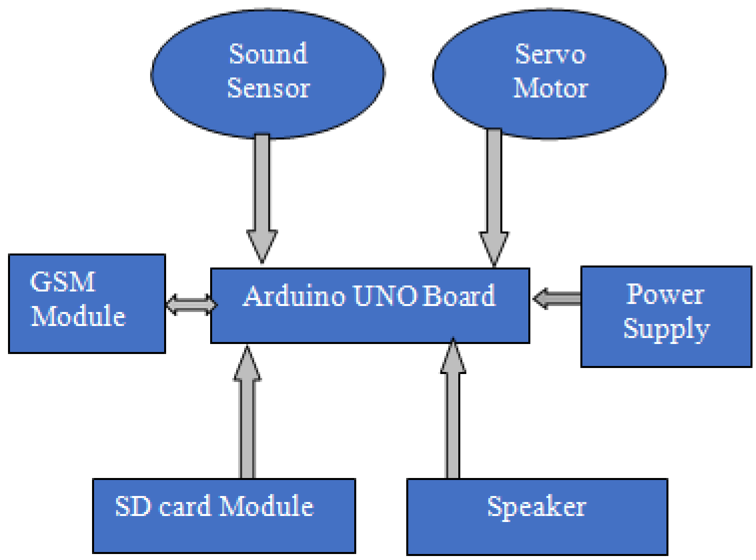

Fig.1 Methodology

The System takes input as baby's crying sound through sound sensor, by detecting this sound the system will run. This system consists of the servo motor which is used for swinging of cradle. It consists of SD card module which will play song on cry detection and it has 12V DC fan which is used to comfort the baby. Main component of the system is camera which is used for live monitoring of the System.

Step1:
Circuit Designing: Connection Of Arduino and NodeMCU with Different Modules Like sound sensosr temperature and humidity sensor, servo motor, etc.

Step 2:
Arduino Program Coding: The different Modules interfaced with Arduino UNO by simple C programming for Arduino using Arduino IDE software.

Step 3:
Connection Of Components: The different components are connected to each other by connecting wires.

Step 4:
Final Result Testing

IX. HARDWARE USED

Arduino
An Arduino is a microcontroller board which is an open source platform. It is based on easy to use hardware and software(Arduino IDE). It is used to build real world applications. It consists of circuit board which can be readily programmed using Arduino IDE software. It Uses microcontroller ATMega328p. We have used Arduino for interfacing of different devices to create this project.

Fig.2 Arduino

- Operating Voltage: 5V.
- Input Voltage (recommended): 7-12V
- Input Voltage (limit): 6-20V
- Digital I/O Pins: 14 (6 provide PWM output)
- PWM Digital I/O Pins: 6.

Sound Sensor

A sound sensor is an electronic sensor that detects sound through its intensity. Based on cry detection other modules will work. A crying child can expose caregivers and health care providers to sound pressures as high as 120 dB(A).


Fig.3 Sound Sensor

- Operating Voltage: 3.3V to 5V DC
- LM393 comparator with threshold preset
- PCB Size: 3.4cm * 1.6cm
- Induction distance: 0.5 Meter
- Operating current: 4~5 mA
- Microphone Sensitivity (1kHz): 52 to 48 dB
- Easy to use with Microcontrollers or even with normal Digital/Analog IC
- Small, cheap and easily available

GSM Module

GSM stands foe Global System for Mobile Communication. SIM900A GSM Module is the smaller and cheaper module for GSM communication. It is common with Arduino and microcontroller in most of the application. We have used GSM Module for sending SMS on parents mobile number. When sound sensor will detect the baby cry then GSM module will send message as “Baby is Crying” on given mobile number.

Fig.4 GSM Module

- Single supply voltage: 3.4V – 4.5V
- Power saving mode: Typical power consumption in SLEEP mode is 1.5mA
- Frequency bands:SIM900A Dual- band: EGSM900, DCS1800. The SIM900A can search the two frequency bands automatically. The frequency bands also can be set by AT command.
- GSM class: Small MS
- GPRS connectivity:GPRS multi-slot class 10 (default) , GPRS multi-slot class 8 (option)
- Transmitting power: Class 4 (2W) at EGSM 900, Class 1 (1W) at DCS 1800
- Operating Temperature: -30ºC to
- +80ºC
- Storage Temperature: -5ºC to +90ºC
- DATA GPRS: download transfer max is 85.6KBps, Upload transfer max 42.8KBps
- Supports CSD, USSD, SMS, FAX
- Supports MIC and Audio Input

Servo Motor

Servo Motor is closed loop servomechanism which is us for controlling motion and final position. In our project we have used servo motor for swinging of cradle. We ha SD Card Module programmed Arduino to interface the servo motor so that can be used for create the motion of cradle i.e swinging the cradle.

Fig.5 Servo Motor

- Operating Voltage is +5V typically
- Torque: 2.5kg/cm
- Operating speed is 0.1s/60°
- Gear Type: Plastic
- Rotation : 0°-180°
- Weight of motor : 9gm

Quantum USB Camera QHM495B

We have used this USB camera for continuous surveillance of baby. It will make live monitoring of baby activities. When parents are away from the baby it will help to monitor the baby.

Fig.6 Quantum USB Camera QHM495B

SD Card Module

SD Card Module is used for SD card processes the cradle, such as reading and writing with a microcontroller. The board can be used with microcontroller systems like Arduino. We have used sd card module to play a lullabuy when baby cry is detected. We have to save a song in wav format and sd card is directly inserted in to the sd card module.

Fig.7 SD Card Module

- Operating Voltage: 4.5V - 5.5V DC
- Current Requirement: 0.2-200 mA
- 3.3 V on-board Voltage Regulator
- Supports FAT file system
- Supports micro SD up to 2GB
- Supports Micro SDHC up to 32GB

Speaker

Speakers are output devices that enable the people to hear to a sound as an output. We have used speakers to listen the lullabuy playing after baby cry detection.

Fig.8 Speaker

X.RESULT

Thus we have developed Baby care monitoring system using Arduino and it assists parents in monitoring their baby. Because of using Node MCU overall system cost reduces. The experimental demonstration show the system works successfully and efficiently and results of the system is given below.

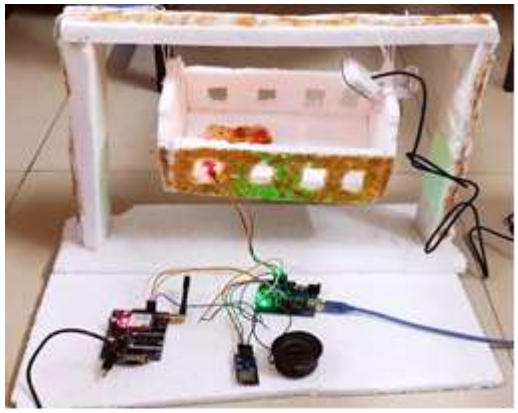

Fig.9 Hardware

XII. CONCLUSION

The baby care monitoring system can be used in situations when we have to monitor the baby's activities. It can also be used when a person's health has to be checked. It will help working parents to proper care and nurture the baby. This system can be helpful in hospitals or in baby care centers which will reduce manpower.

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Smart Farm Hub

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Abstract—The "SmartFarm Hub" project focuses on developing an IoT- enabled system for efficient farm management by enabling farmers to remotely oversee their farms. By implementing IoT technology, the system aims to streamline daily farming tasks and provide farmers with real-time data through a user- friendly mobile application. The raw data received from multiple sensors is processed and analyzed to offer actionable insights for optimized remote monitoring, controlling, and irrigation. The solution contributes to sustainable farming practices, improves productivity, and enhances profitability in the agricultural sector which summarizes the methods and techniques used in Wireless Database Management to create an IoT system tailored for farmers who can easily understand the farm condition in graphical forms.

Keywords: Arduino, node MCU, temperature sensor, humidity sensor, soil moisture sensor, electronic motor, relay, GSM module, solenoid valve, solar panel, electronic motor relay, battery, plugs, switches, pipes, wires, database, android application.

I. INTRODUCTION

The Internet of Things (IoT) will be the foundation of smart computing in the future. It plays a vital part in converting "Traditional Technology," which is used in offices and homes, into "Next Generation Everywhere Computing." The "Internet of Things" is becoming increasingly prominent in global research, particularly in the field of advanced wireless communications. IoT is currently affecting everyone and, from the perspective of the average user, is building the groundwork for the creation of several products, including automation, smart living, smart health services, and smart education in schools. Additionally, it is employed commercially in a variety of industries, including business management, transportation, manufacturing, and agriculture.

Agriculture is the IoT domain with the most research. Because the world's population is growing at an accelerating rate, it is vital to guarantee food security. When researchers initially began using ICT-based techniques in this field, they were helpful in certain ways but ultimately would not solve our problems. Thus, they are currently investigating IoT as a substitute for ICT in agriculture. Applications for agricultural products are required, such as supply chain management, infrastructure management, soil moisture monitoring, and environmental condition monitoring for temperature and moisture.

After the sensors' data is gathered, it is stored on a server, and mobile applications and a cloud-hosted database are created. A facility with instruments and equipment that provides information to make moisture detection in our surrounding environment is what is known as a moisture monitoring system. It will track temperature, humidity, precipitation total, and moisture content while providing real-time weather updates at a specific location, making the data accessible from anywhere in the globe. The system's goal is to deliver an effective environmental monitoring system by using Internet of Things (IoT) technology to measure and monitor weather data. It also displays weather data via a mobile application that users can easily and quickly access.

Raindrop module, moisture sensor, temperature and humidity sensor (DHT11), and other weather-related sensors are collected using Node MCU in this study. The real-time database is created using the sensor data, and an Android mobile application and cloud-hosted database are created to display the local weather in real-time for that area. The key benefit of this type of system is its lower cost advantage over other weather station projects of a similar nature due to its use of Node MCU, a module that provides low power consumption and cost-effective Wi-Fi connectivity for the Internet of Things applications. applications are developed to show the real-time weather conditions of a particular region on an Android mobile phone. The main preferences of such a system include lower cost advantage compared to other similar weather station projects because of using Node MCU, designed for Wi-Fi connectivity for IoT applications module with a cost-effective solution and low power consumption.

II. RELATED WORK

The project's goal is to use the Internet of Things (IoT) to build a smart farming system that will enable farmers to remotely manage their properties using a mobile app. We need to look at other projects and conduct research in several areas to do this effectively. We should first investigate the applications of IoT in agriculture, such as data collection via sensors and equipment control via remote access. Next, we need to comprehend the operation of wireless sensors on farms, particularly those that take measurements of soil moisture and temperature. We can also gain knowledge from current smart farming initiatives that employ technology to assist farmers in increasing crop yields and optimizing resource utilization. To make our app user-friendly, we must investigate mobile apps tailored for farming. We also need to figure out how databases store this data and how to interpret and process the data that is gathered from the sensors. We must learn how to make our devices energy-efficient since power conservation is essential to the Internet of Things. Different methods of communication between devices will be used, and we must be aware of the advantages and disadvantages of each. For accurate data, we should become familiar with the functioning of the sensors that we will be using to monitor the weather. We must compare the cost-effectiveness of our solution to others because cost is a significant consideration. Finally, we want to look at eco-friendly practices and make sure our app is user- friendly for farmers to make farming more sustainable. We can get ideas and improve our project by looking into these areas.

III. PROPOSED SYSTEM

3.1: Overview and Significance of SAMS:

The "SmartFarm Hub" project introduced a ground-breaking solution called the Smart Agriculture Management System (SAMS). It makes use of the Internet of Things (IoT) capabilities to revolutionize farm management. With IoT changing the face of technology, SAMS wants to empower farmers by giving them the ability to effectively manage their farms from a distance. The project acknowledges the increasing importance of the Internet of Things and concentrates on tackling particular issues in a range of industries, with a primary focus on agriculture.

As the world's population continues to rise quickly, it is critical to ensure food security. Although traditional ICT (information and communication technology) solutions have proved useful, they are unable to keep up with the changing demands of the agriculture industry. To monitor environmental conditions, manage infrastructure, improve agricultural supply chains, and monitor soil moisture, the project embraces IoT as a strong alternative.

3.2 : Essential Elements and Advantages of SAMS:

The main component of this project is SAMS, which is intended to make regular farming chores easier and give farmers access to real-time data via an intuitive mobile application. The principal functions of the system comprise the gathering, manipulation, and interpretation of data from multiple sensors, such as soil moisture, temperature, humidity, and specialty weather-related sensors like the Raindrop module and DHT11. To optimize remote monitoring, control, and irrigation, SAMS depends on this data to offer insightful information. IoT connectivity, wireless sensor networks, a user-friendly mobile application, sophisticated data processing, dependable database management, power-efficient design, support for several communication protocols, real-time weather monitoring, and an economical strategy are just a few of the crucial elements that the system integrates. This project, spearheaded by SAMS, represents a breakthrough in agricultural management. Providing farmers with up-to-date information, practical advice, and intuitive mobile applications, enhances agricultural output and sustainability. Accessible, economical, and in line with the evolving needs of the farming sector, SAMS encourages ecologically friendly farming methods and food security.

3.3 Smart Agriculture Management System

An essential part of the larger initiative to transform farm management is the Smart Agriculture Management App. This mobile application is essential to enable farmers to effectively manage their farms from a distance in a world where the Internet of Things (IoT) is having a profound impact. This application assumes a crucial role, acknowledging the growing significance of IoT and its potential to address the unique challenges within the agriculture sector. Food security has become increasingly important due to the world's population growth, and this app has the potential to support sustainable farming methods while also increasing agricultural productivity and profitability. Farmers can use the app to access real-time data that helps them make educated decisions. It provides insights into several aspects of their farms, including information on soil moisture, temperature, humidity, and specific weather conditions. This app allows farmers to remotely operate and control

agricultural machinery and irrigation systems, saving them a great deal of time and resources. It is more than just a passive source of data. It also distinguishes itself with its easy-to-use interface, which is meant to be understandable and accessible to farmers with different levels of technical expertise. In addition to being displayed, the data gathered from the farm's sensors is processed and analyzed in-depth by the app. With the help of this analysis, farmers will be able to make well-informed decisions and maximize the effectiveness of their farm management techniques.
Through the use of secure connections to databases hosted in the cloud, the application guarantees farmers access to historical and current farm data from almost anywhere, providing them with a level of convenience and flexibility never before possible. This app stands out in part because of its dedication to affordability. Its broad range of farmer customers is served by its affordable and easily accessible design, which helps to democratize sophisticated farm management tools. The Smart Agriculture Management App is a huge advancement in farm management. Real-time data, actionable insights, and smooth control options are provided to farmers through the application of IoT technology and advanced data processing. It is made to be as affordable as possible, serving a wide variety of farmers, and coordinating well with the changing needs of the agriculture sector. This app serves as a trailblazing illustration of smart agriculture, whereby the use of a mobile interface renders remote farm management not only practical but also effective and user-friendly.

IV. IOT AND INTELLIGENT SYSTEMS FOR WATER AND FERTILIZATION MANAGEMENT IN AGRICULTURE

4.1Cloud Technology

Because cloud technologies make data collection, storage, processing, and sharing more efficient, they have sparked a revolution in smart agriculture and irrigation systems. These technologies are the foundation for operations that are more accessible, efficient, and data- centric. and Google Cloud are examples of scalable and secure data storage platforms that enable the centralization, organization, and easy retrieval of agricultural data from a variety of sources. By providing farmers with insights, crop predictions, and optimal irrigation schedules, data analytics and machine learning raise crop yields and resource efficiency. Irrigation systems can be remotely monitored and controlled in real- time, from any location, allowing for quick schedule modifications to conserve water. Secure data sharing makes stakeholder collaboration easier, especially when tackling difficult crop-related issues.
Cloud solutions provide scalability and cost-efficiency because they scale with agricultural operations and because costs are directly correlated with resource consumption, reducing the need for upfront hardware purchases. Sensitive agricultural data is protected even in the event of a hardware failure thanks to strong data security and redundancy protocols. Furthermore, cloud-based applications, which are frequently accessed through web dashboards and mobile apps, simplify data interaction and intuitive control and monitoring through their user- friendly interfaces. Essentially, data-driven decision- making in smart irrigation and agriculture systems and increased agricultural efficiency have been made possible by cloud technologies.

Fig.1.Sensors

4.2Architecture of SmartFarm Hub

i. Sensor of Soil Moisture:
An essential part of the project is the Soil Moisture Sensor, which uses a number of probes to gauge the soil's moisture content. Accurate readings are guaranteed by the strategic placement of this sensor within the target soil area. Its analog or digital output, which shows the moisture content of the soil, is closely linked to the ESP8266 microcontroller.

ii.Sensor of Humidity and Temperature:
By recording ambient temperature and humidity levels, the Temperature and Humidity Sensor improves the project's environmental monitoring capabilities. For applications like agriculture or indoor climate control, where weather conditions are important, this sensor is essential. Its output is seamlessly integrated into the ESP8266 as either analog or digital signals.

iii.Weather Station
Acting as a clever middleman, the Weather Station coordinates the data transfer between the sensors and the ESP8266 microcontroller. This part serves as a central hub for gathering, evaluating, and possibly displaying the environmental data and has data processing capabilities. An essential component of maintaining effective system communication is the Weather Station.

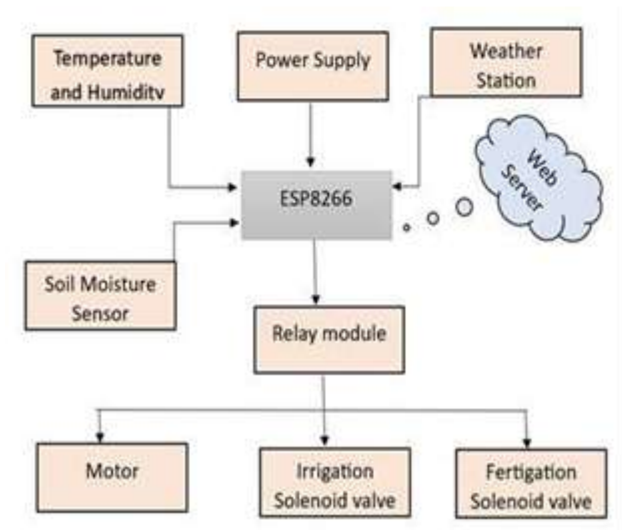


Fig.2 Block Diagram

iv.Microcontroller ESP8266:
The project's central nervous system is the ESP8266 microcontroller, a strong and adaptable part. It can send data to a specified platform or user interface after processing inputs from the temperature and humidity sensor and the soil moisture sensor. The microcontroller's capacity to manage Wi-Fi connectivity makes it possible to do real-time data analysis and remote monitoring.

v.Relay Module:
A relay module receives the output that the ESP8266 microcontroller produces. This part functions as a switch, allowing or denying connected devices power in response to commands from the ESP8266. It ensures precise control by acting as a vital connection between the operating components and the microcontroller.

vi.Power Supply:
The system's mainstay, the power supply unit gives all of the other parts a steady and dependable source of power. This guarantees uninterrupted and continuous operation. To ensure optimal functionality, the Soil Moisture Sensor, Temperature and Humidity Sensor, and ESP8266 are carefully connected to the power supply output.

vii.Motor Irrigation:
The motor irrigation system is connected to the output of the relay module. This part is in charge of managing the irrigation system, including turning on and off the water pump. With the Relay Module interface provided by the ESP8266, irrigation can be intelligently managed using environmental data.

viii.Fertigation Solenoid Valve:
The Fertigation Solenoid Valve is the recipient of another output that comes from the Relay Module. The irrigation system's flow of nutrients or fertilizers is managed by this valve. Based on real-time data from the sensors, the ESP8266's integration with the Relay Module enables automated and controlled fertigation processes.

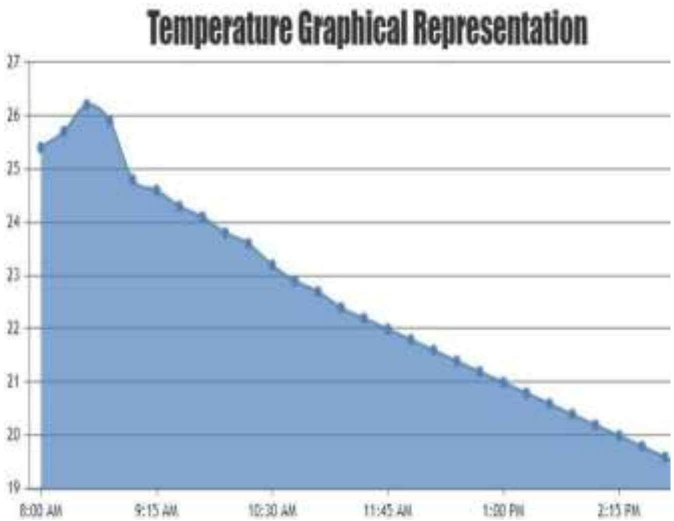
ix.ESP8266 to Web Server:
The ESP8266 not only processes data but also acts as a communication link, connecting to a web server. This connection enables users to remotely monitor environmental conditions and control irrigation and fertigation processes through an online platform. In simpler terms, it allows users to keep track of and manage the system from anywhere using the internet.

x. Data Visualization:
The data visualization process is started by the ESP8266 when it receives data from the web server. Using this data, the server creates various graph types that dynamically depict temperature, humidity, soil moisture content, and irrigation cycles.

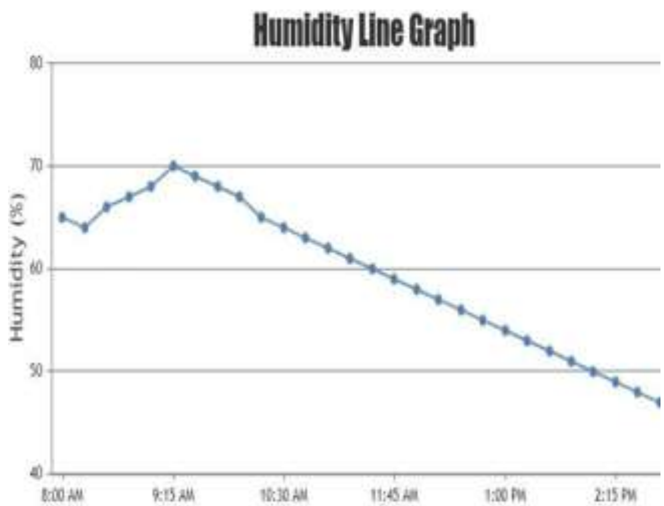
V. RESULT AND DISCUSSION

A strong and user-focused solution is produced by implementing this expanded Smart Agriculture System architecture. An easy-to-use web interface allows users to effortlessly monitor real-time data, such as temperature, humidity, soil moisture, irrigation activities, and fertigation processes. The system provides users with visually striking graphs that dynamically represent environmental conditions and system performance, going beyond simple data. Analyzing historical data is made possible by the web server's systematic spreadsheet storage of all transmitted data. Users can identify trends and patterns and make well- informed decisions about the best farming practices with the help of this historical archive. By enabling users to personalize data displays to suit their preferences, the user interface promotes interaction. Essentially, the outcome is a comprehensive and intelligent Smart Agriculture System that gathers, processes and converts data into useful insights for increased productivity and sustainable farming methods.

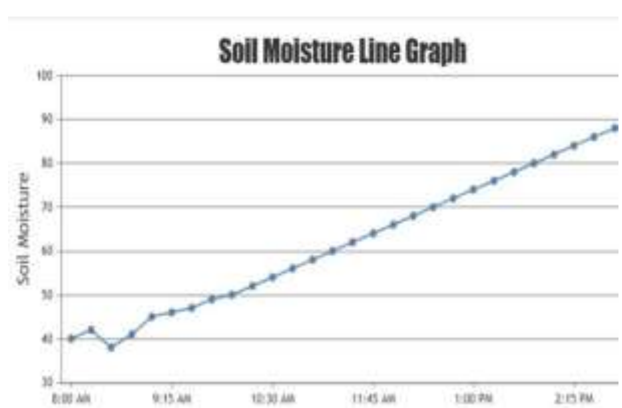
5.1 Performance Evaluation
The temperature sensor graph, spanning from 8 am to 2:15 pm, reveals distinct patterns in ambient temperature. Morning hours witness a gradual rise, followed by midday stability. Peak temperatures are observed around noon, providing valuable insights into environmental dynamics crucial for agricultural decision-making during this specific timeframe. Fig.5(a). The humidity sensor graph, covering the period from 8 am to 2:15 pm, illustrates the fluctuation in atmospheric moisture. Morning hours typically show a rise in humidity, while midday stability is observed. The graph's peak values around noon offer insights into crucial environmental conditions, providing valuable information for agricultural decision-making during this specific timeframe Fig.5(b). The soil moisture sensor graph, spanning from 8 am to 2:15 pm, delineates the dynamics of soil moisture levels. Morning hours may reveal changes influenced by overnight conditions. The graph showcases variations in soil moisture, with potential peaks or troughs around specific times. This data is instrumental for gauging optimal irrigation and agricultural practices during the specified timeframe Fig.5(c). The light intensity sensor graph, capturing data from 8 am to 2:15 pm, depicts the variations in natural light exposure. Morning hours mark a gradual increase, reaching a potential peak around midday. The graph offers insights into the duration and intensity of optimal light conditions crucial for plant growth, aiding in informed decisions for agricultural practices during this specific timeframe Fig.5(d).



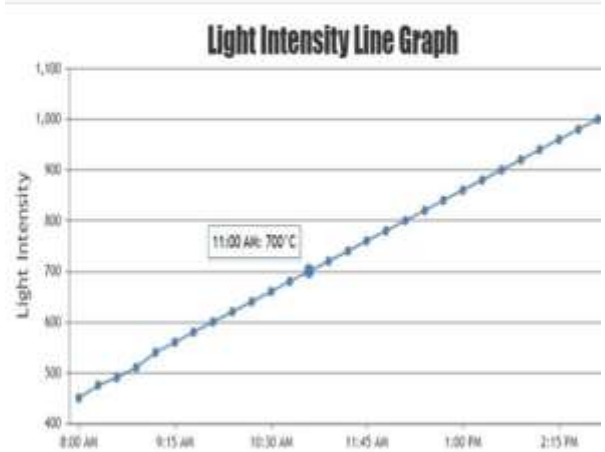
(a)Temperature



(b)Humidity



(c)Soil Moisture



(d)Light Intensity

Fig.3. weather station scheduled (a)Temperature (b)Humidity (c)Soil Moisture (d)Light Intensity

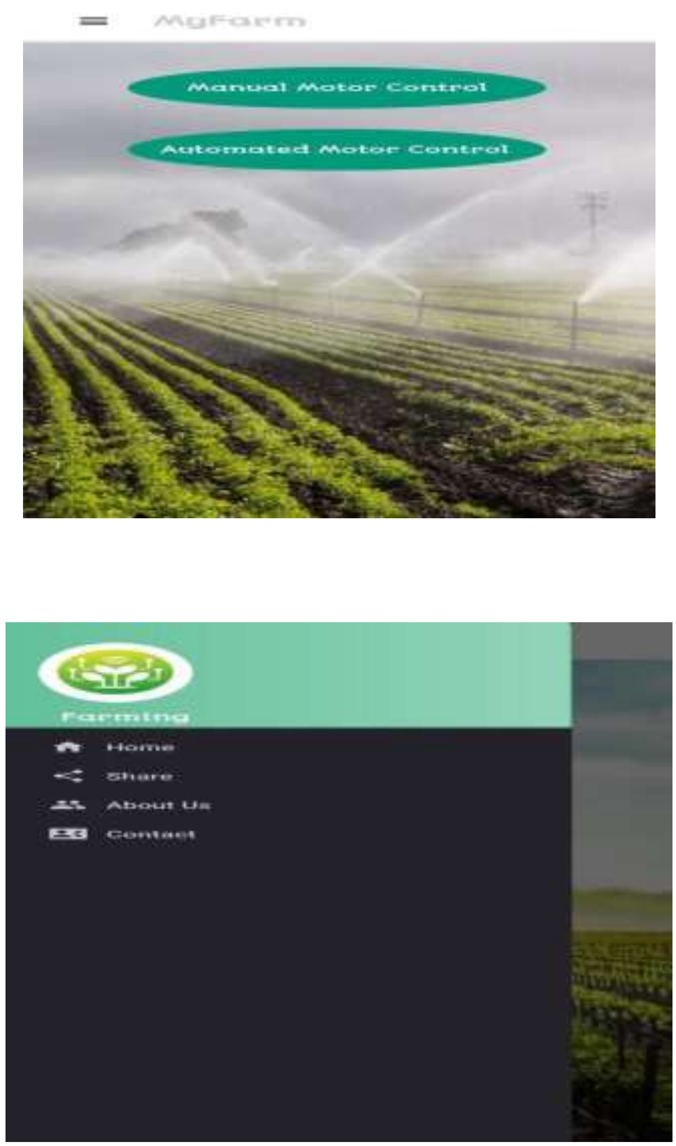


Fig.4. Insightful Dashboard

"We have a visually stunning interface with dynamic graphs on our mobile application's home screen, which gives users instant access to important data points. With its user- friendly comprehension system, the real-time information is readily available, giving users empowerment. Customizable options allow for easy customization of the experience to personal preferences. Users can explore the graphs interactively by zooming in, panning, and analyzing data with ease because they are touch-responsive. These graphical elements are carefully designed to provide an understandable and illuminating interpretation of the data, as demonstrated on the opening page. Our application's user-friendly features guarantee a seamless and enriching experience by giving users direct access to crucial data insights."

5.2 Protocol-Governed Service

"Thank you for visiting Smart Farma! You accept our Policy- Based Service by downloading and using our mobile application. It is expected of users to give true information, abide by all relevant laws, and handle the graphical exploration features with care. A seamless user experience is promoted by the interactive exploration of the touch- responsive customization options. Users who violate these policies may have their services terminated or suspended by Smart Farma. For information on how we use data, please read our Privacy Policy. Users will be informed of any modifications to these policies. Please get in touch with 12345 67890 with any queries or concerns. I appreciate your participation in Smart Farma.

VI. CONCLUSIONS

Using the Internet of Things, the "SmartFarm Hub" aims to revolutionize farming. Farmers are empowered with real-time data for remote management through the use of IoT by the Smart Agriculture Management System (SAMS). SAMS uses IoT for infrastructure management, environmental monitoring, and agricultural process optimization in order to address the issue of global food security.

SAMS combines wireless sensors, an intuitive mobile app, IoT connectivity, and effective data processing. In order to promote sustainable farming methods and higher productivity, it seeks to give farmers access to real-time data and insights. The Smart Agriculture Management App provides real-time environmental data for informed decision-making and enables remote farm control. Its easy- to-use interface makes sophisticated farm management tools accessible to all.

The system's architecture, using sensors, microcontrollers, relay modules, and a web server, forms a cohesive and intelligent framework. Performance evaluation demonstrates effective monitoring of temperature, humidity, soil moisture, and light intensity, guiding agricultural decisions.

Integration of cloud technology enhances data efficiency, scalability, and cost-effectiveness, facilitating remote monitoring and control for improved resource utilization. The system's protocol-governed service ensures responsible user engagement.

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Automatic seed Sowing Robot

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Abstract: Farming is a vital aspect of human survival, and farmers dedicate a significant amount of their time to cultivating crops, irrigating them, and other tasks. Farmers will benefit greatly from the suggested system, which integrates robotics and agriculture. It can move across the field like a farmer, till the soil, plant seeds in the designated rows, and irrigate the field on its own. Conventional seeding, which is widely employed in farming, requires more work and time. Although the seed feed rate is higher, the overall operation takes longer.

I. INTRODUCTION

In India, agriculture is the primary industry for employment. A little over half of the population is employed in agriculture. It is our economy's skeleton. Despite the emphasis on industrialization, the Indian economy still heavily depends on agriculture, which generates millions of jobs nationwide and contributes significantly to GDP.

Crop productivity must rise in order to stimulate the economy [1]. The technology employed during the production and processing stages affects the volume of production in addition to capital investments and marketing plans. Modern technology are lacking for Indian farms.

Farmers engage in agricultural techniques, but with the right automation, agriculture becomes more efficient.[2] This device assists a farmer in automatically planting seeds, hence minimizing manual effort. An important factor in meeting the demands for agricultural productivity is automation. Technology adoption rates will rise and expenses will decrease as automation and agriculture gain traction. Farmers that practice autonomous agriculture can more efficiently increase precision while minimizing their negative effects on the environment.

II. PROBLEM STATEMENT

The inaccuracy and inefficiency of manually spreading seeds in agriculture is the issue. Due to uneven seed spacing and inadequate distribution, the current approach produces crop growth and yield that are below ideal levels. The project's goal is to create a method for automating the sowing of seeds and guaranteeing accurate and consistent seed placement.

III. LITERATURE SURVEY

The literature review highlights key research and developments in the field of automatic seed sowing agriculture robots. Various studies have explored the use of robotics to improve seed sowing efficiency. Researches have focused on navigation technique sensing technologies, and control algorithms to optimize seed placement and spacing. Notable advancements include computer vision for seed detection, GPS-based navigation and precision control systems. However there is still a need for comprehensive and cost-effective solutions that can be easily integrated into existing agricultural practices.

1] Novel Approach For Automatic Seed Sowing Machine - Aniruddha D Dharmadhikari-In this paper the author has proposed an Automatic Seed Sowing Machine to integrate the automation in agriculture sector. To reduce human efforts and to reduce the time taken by workers manually sowing seed. It uses an IR sensor which is capable of sensing any obstacle detected in path of seed sowing machine

2] Design and Development of Automatic Seed Sowing Machine - P. Premalatha-In this paper the author has proposed this project aims to increase the productivity and to reduce the time for seed sowing process and wastage of seeds. An ultrasonic sensor is also installed to detect the obstacle in the path and end of each row.

3] Design of automatic seed sowing Machine for agriculture sector- Ratnesh Kumar-In this paper the author has proposed. This machine will enable the farmers to engage in alternative activities that generate income. By this paper farmers will have an option that without their direct involvement, their land is being ploughed and seeds being sown.

4] Fabrication and Automatic Seed Sowing Machine- Senthilnathan N-In this paper the author has proposed this work a seed sowing machine has been developed that help the farmers in harvesting the best crop with least efforts. Agro technology is the process of implementing the recent technologies to develop the crops that are being produced.

5] Literature Review on Automatic Seed Feeder-A.O.Hannure In this paper the author has proposed , In plant nursery more time is required for plantation which is due to seed feeding process. For reducing these problems of plant nursery research of automatic seed feeder mechanism is used.

IV. SYSTEM DESIGN

The system design for an Automatic Seed Sowing Robot using Arduino involves several key components and subsystems working together to automate the seed sowing process in agriculture. Below is an overview of the system design:

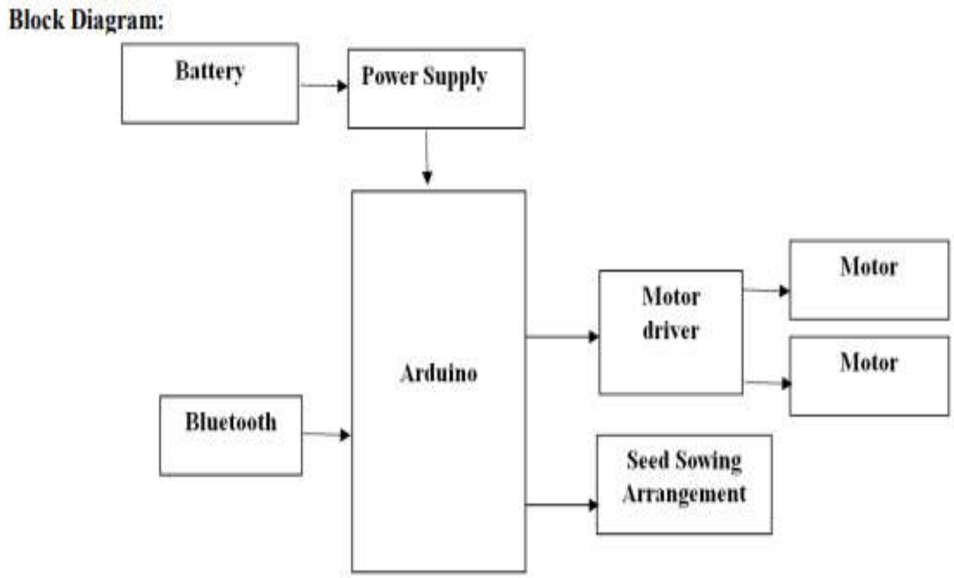

Fig.1 block diagram

1) Hardware Component::-
Arduino UNO:- The arduino responsible for controlling the entire system.

Sensors:
Soil Moisture Sensors: Monitor soil conditions to determine the optimal planting time and depth.
Motor Encoders: Track the movement of the robot and ensure accurate seed spacing.

Actuators:
Motors and Servos: Used for robot movement, including forward, backward, turning, and for seed placement. Seed Release Mechanism: Controlled by a servo to release seeds at specific intervals and depths.

Power Supply: Batteries or a rechargeable power source to provide energy for the robot's operation.

2) Software Component:-
Arduino IDE: The code for the robot is developed using the Arduino Integrated Development Environment.
Control Algorithms: Algorithms for navigation, seed placement, and data collection.
Bluetooth module: In mobile make one application and connect that app to the Bluetooth module to control the robot.
User Interface Software: Code for the user interface to input commands and monitor the robot's progress.
Data Analysis Software: If required, software for processing and analyzing the data collected during operation.

3)System Architecture:-
The Arduino uno serves as central hub connecting and controlling all the hardware components. Sensors continuously collect data and feed it to the Arduino, which processes the information and makes decision based on predefined algorithms.Actuators including motors and servo, execute commands from the Arduino to control the movement and seed placement.
The user interface allows the farmer to set parameters such as seed spacing, planting depth and field boundaries.

Data collected during operation is displayed on the user interface and if necessary transmitted for further analysis.

4**)Operation sequence:-**

The robot is placed in the field, and the farmer inputs the required parameters through the user interface. The robot uses GPS data for navigation and moves through the field in predefined patterns, ensuring complete coverage. Soil moisture sensors assess soil conditions, and based on this data, the robot determines the optimal time and depth for seed placement. The seed dispenser controlled by a servo, releases seeds at the predetermined intervals and depths. Motor encoders track the robot's movement and ensure uniform seed spacing. The robot provides real-time updates on its progress and any issues encountered via the user interface.

IV. ADVANTAGES

1. Efficiency: Automation of the seed sowing process significantly increases efficiency by reducing the time and labor required for this critical task. The robot can work tirelessly, day and night, without fatigue.
2. Precision: The robot ensures precise seed placement at optimal depths and spacing, resulting in improved crop yield and uniform growth. This precision minimizes resource wastage, such as seeds and water.
3. Labor Reduction: By automating seed sowing, the project reduces the dependency on manual labor, which can be costly and subject to human error. This can lead to substantial cost savings for farmers.
4. Versatility: The system is designed to adapt to various crop types and field conditions, making it versatile and applicable in diverse agricultural settings. This adaptability enhances its value to different farmers and regions.

VI.CONCLUSION

Our project, the Automatic Seed Sowing Robot Using Arduino, demonstrates how technology and agriculture can be combined to solve important problems that contemporary farmers face. We hope that automation, accuracy, and resource efficiency will help the world shift to more productive and sustainable farming methods.

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Crop Monitoring System Using Wireless Sensor

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Abstract: Precision agriculture has drawn a lot of attention lately due to its potential to increase farming conversion rate. This abstract illustrates a methodical approach to "crop monitoring system using wireless sensor" technology. In modern sensing technologies and Wireless Sensor have made it possible to complete agricultural tasks accurately, promptly, and adequately. We call these methods "smart agriculture." We address several sensing technologies that support smart agriculture in this paper.This research project's main objective is to create a wireless sensor network-based agricultural monitoring system that will improve farming quality and productivity without requiring a lot of physical monitoring.Temperature,humidity,light intensity, and gas levels are the main factors in crop production that have an impact on plant growth, productivity, and quality.This goal is to use the Arduino tool to design and develop an agricultural system. Temperature,humidity,and soil moisture are examples of ecological parameters that are assessed using the Arduino chip in conjunction with sensors. In the majority of agricultural settings, we verify these variables by hand.

Keywords: Arduino UNO, Liquid Crystal Display(LCD), Temperature Sensor, Humidity Sensor, Soil Moiture,LDR Sensor,Gas Sensor.

I. INTRODUCTION

In contemporary agriculture, wireless sensor- based crop monitoring systems are becoming more and more common, completely changing how farmers tend to their crops. This novel strategy seeks to raise farming operations' general quality, maximize resource efficiency, and increase yield.A crop monitoring system's main objective is to provide a more automated and effective method of crop observation and management that eliminates the need for ongoing human intervention. Conventional monitoring techniques, which entailed sporadic manual inspections, are laborious and sometimes fail to deliver real-time data that is essential for prompt decision-making.

This problem is addressed by wireless sensor technology, which makes it possible to continuously monitor important environmental elements that have an impact on crop growth automatically.Plant growth, productivity, and quality are significantly influenced by temperature, humidity, light intensity, and gas levels. Using sensors and an Arduino microcontroller, the system collects data on ecological parameters such as soil moisture, humidity, and temperature. Soil is an ideal growing medium for plants, thus they will flourish and have good productivity if planted on it. Moisture factor is very important for the soil for the weathering process of minerals and organic matters, as well as a medium of nutrient for the roots of the plant. However, if it is too humid the movement of air within the soil will be restricted, preventing the roots of the plants from getting oxygen causing death. The brains of the monitoring system are an open-source electronics platform called Arduino, which is quite adaptable. It analyzes the information gathered by sensors and gives farmers useful insights. With the help of this technology, sensors may be seamlessly integrated to provide precise and trustworthy measurements. The system's wireless feature makes it possible for sensors and the central monitoring unit to communicate without the need for physical connections, providing deployment flexibility and scalability over large agricultural landscapes. Farmers in conventional agricultural settings manually monitor and record environmental parameters at different times, which can result in information gaps and possible delays in reacting to conditions that change. Farmers are able to respond quickly to weather changes, optimize nutrient inputs, and modify irrigation schedules thanks to this real-time information.A system like this has several benefits. By ensuring that inputs like water and fertilizers are applied precisely when needed, it minimizes waste and enhances resource efficiency. Furthermore, early identification of possible problems like pest infestations or illnesses is made possible by continuous monitoring, allowing for proactive crop protection and yield loss prevention.The crop monitoring system that makes use of wireless sensors is a major advancement in precision farming. Through the utilization of automation and real-time data, this technology not only increases agricultural output but also encourages environmentally friendly and sustainable farming methods. As the agricultural sector develops further, the. The use of wireless sensor-based monitoring systems is anticipated to be crucial in determining how modern farming is shaped as the agriculture sector develops further.

II. OBJECTIVE

Through real-time data collection and analysis, a wireless sensor crop monitoring system seeks to increase agricultural productivity and efficiency. These sensors wirelessly transfer the crucial data they gather—such as temperature, nutrient levels, and soil moisture—to a central hub. Using this data, farmers can optimize resource use and crop health by making well-informed decisions about fertilization, irrigation, and pest management. The system promotes precision agriculture techniques in an effort to decrease manual labor, boost yield, and lessen the impact on the environment. In the end, the wireless sensor-based crop monitoring system helps to ensure better crop management for enhanced agricultural results, which is a key component of sustainable and intelligent farming.

III. PROPOSED SYSTEM

4.1 Overview and Significance :

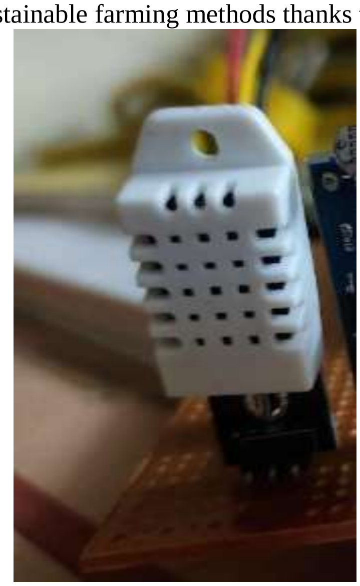
A ground-breaking development in agriculture, the Crop Monitoring System using Wireless Sensor project makes use of wireless sensor technology to improve crop management's productivity and efficiency. In order to continuously gather real-time data on a variety of parameters, including soil moisture, temperature, humidity, and light intensity, this system entails the deployment of sensors in agricultural fields. Farmers can maximize the use of available resources, minimize the waste of water and fertilizer, and raise crop yields overall by closely monitoring these parameters. Data is easily accessible thanks to wireless connectivity, which makes it easier to react quickly to changing circumstances.By reducing its negative effects on the environment, this technology not only supports sustainable farming practices but also tackles the problems caused by water scarcity and climate change. An important step is the Crop Monitoring System using Wireless Sensor project.

4.2 Essential Elements :

Sensor nodes and other necessary components are integrated into a wireless sensor-based crop monitoring system to gather agricultural data. Precision farming is made possible by these systems, which offer real-time data on soil temperature, moisture content, and nutrient levels. Benefits for farmers include higher crop yields, more effective use of resources, and prompt decision-making. Time and labor are saved when there is less need for manual data collection thanks to wireless connectivity. The technology also makes it easier to identify crop diseases early on, which improves treatment options. All things considered, this technology improves agricultural productivity, sustainability, and adaptability to changing environmental conditions.

4.3 Agriculture Monitoring System

An inventive project called the Agriculture Monitoring System makes effective use of wireless sensor technology to monitor crops. This system gathers real-time data on critical parameters like soil moisture, temperature, and humidity by utilizing a network of sensors that are strategically positioned throughout the agricultural field. With the help of these wirelessly communicating sensors, farmers can remotely check on and assess the health of their crops. After being gathered, the data is processed to yield insightful information that helps farmers make decisions about fertilization, irrigation, and general crop management. Agricultural productivity is increased, resources are preserved, and farmers are empowered with timely information for maximum yield and sustainable farming methods thanks to this technology.



Soil Moisture Sensor DHT22 Sensor Gas Sensor

LDR Sensor   Liquid Crystal Display

Fig 1. Sensors

IV. COMPONENTS

5.1. Soil Moiture Sensor

Moisture of Soil Sensors are instruments that quantify the amount of water present in the soil. These sensors are essential to precision agriculture because they provide data in real time that helps with crop management and irrigation optimization.

5.2 DHT22 Sensor

A digital sensor for measuring temperature and humidity is the DHT22. It is perfect for applications like home automation, agricultural systems, and climate monitoring because it offers trustworthy and accurate data.

5.3 LDR Sensor

Light intensity is detected by an LDR sensor, or light dependent resistor sensor. The resistance of the sensor increases in the dark and decreases in the bright. Because of this, LDR sensors are helpful in devices like streetlights that automatically change their brightness according to the amount of ambient light, increasing convenience and energy efficiency.

5.4 Gas Sensor

An instrument that measures the quantity and concentration of gases in the air is called a gas sensor. By recognizing dangerous gases, it aids in the monitoring of air quality. Gas sensors are essential in agriculture because they help determine the best growing conditions for plants and evaluate the surrounding conditions, which improves crop productivity and quality.

5.5 Liquid Crystal Display

A flat screen that displays text and images is called a liquid crystal display (LCD). When an electric current flows through liquid crystals, it produces images. LCDs are widely used in gadgets such as digital watches, TVs, and computer monitors because they offer vivid and crisp visual displays.

5.6 Arduino Uno

A well-known microcontroller board built on the ATmega328P processor is the Arduino Uno. It has USB connectivity for power and programming, digital and analog input/output pins, and an adaptable open-source development environment. It is a popular component for do-it-yourself electronics projects and can be used for anything from basic LED control to intricate robotics.

5.7 Power Supply

An electronic device that gives other devices electrical energy is called a power supply. By converting input voltage into a steady and useful output, it guarantees that electronic components operate as intended. Power supplies are necessary for supplying dependable and regulated power in a variety of applications, including industrial machinery and home electronics.

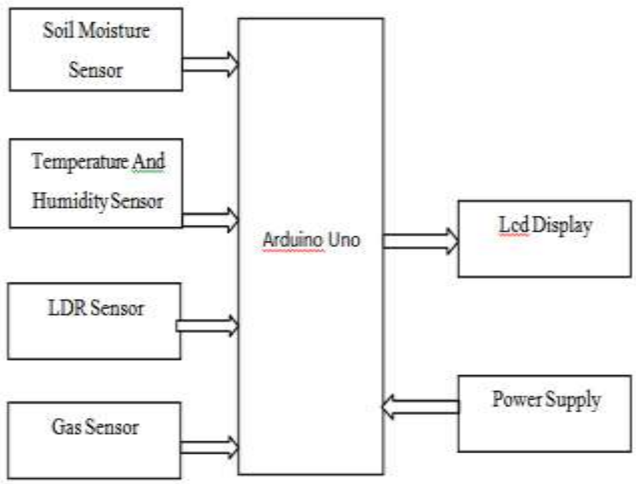


Fig 2.Basic Block Diagram

VI. METHODOLOGY

1. The project development methodology will follow a step-by-step process to design, develop, and deliver the application: Designing a basic block diagram :
2. Determining the equipment and components to be used :
3. Testing: Verifying and testing every component before connecting any :
4. Program: Creating a program that satisfies all requirements;
5. PCB Designing and Circuit Mounting based on Final Circuit Diagram :
6. Observing Output and Results :

IX. REUSLT

Using wireless sensors in a crop monitoring system greatly improves agricultural practices. Farmers can maximize crop growth and quality by monitoring temperature, humidity, light intensity, and gas levels continuously. This system saves time and effort by doing away with the need for manual monitoring because it is based on Arduino technology. Farmers are empowered to make well- informed decisions regarding irrigation, fertilization, and other crucial tasks by using real-time data from the wireless sensors. By maximizing resource utilization, this precision agriculture approach leads to higher productivity. Farmers can access and analyze the data remotely, which enables them to better manage their crops and take timely action. All things considered, the crop monitoring system with wireless sensors transforms conventional farming techniques and encourages productive and sustainable farming methods that lead to increased yields and better crop quality.

Fig 3.soil moisture level display

Fig 4.Temprature and humidity display

Fig 5. Gas sensor display

VIII CONCLUSION

In conclusion, a major advancement in agricultural technology has been made with the deployment of a wireless sensor crop monitoring system. This creative method of using wireless sensor networks-especially with Arduino technology-simplifies the process of keeping an eye on important variables like temperature, humidity, light intensity, and gas levels. Farmers can improve crop quality and productivity without the need for continual manual observation by automating data collection. Real-time tracking is made possible by the integration of wireless sensors, which allows for quick reactions to shifting environmental conditions. This maximizes the use of available resources and provides farmers with data-driven insights to help them make wise decisions. Precision farming and sustainable farming practices benefit from the system's effectiveness in monitoring ecological factors. All things considered, the crop monitoring system equipped with wireless sensors represents a revolutionary step toward modernizing agriculture, encouraging higher yields, and guaranteeing a more robust and effective farming ecosystem.

X. FUTURE SCOPE

Crop monitoring systems will become more widespread in the future as artificial intelligence, machine learning, and remote sensing advance. Precision agriculture will be improved through the use of data analytics, drone integration, and satellite imagery. Anticipatory insights from intelligent algorithms will optimize resource utilization and lessen the effect of climate change on crop yields.

XI. ADVANTAGE

Systems for monitoring crops with wireless sensors have many benefits.

- Real-time data: Gives farmers access to up-to-date information on temperature, nutrient levels, and soil moisture.
- Precision farming reduces waste by enabling the focused and efficient use of resources like fertilizer and water.
- Cost efficiency: Lowers operating expenses by utilizing fewer resources and requiring less manual labor.
- Enhanced Yield: By assisting farmers in making well-informed decisions, crop health is improved and yields are increased.
- Remote monitoring: This improves overall management efficiency by enabling farmers to keep an eye on their crops from any location.
- Environmental Sustainability: Reduces the negative effects of agricultural activities on the environment in order to promote sustainable farming practices.

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MIMO Technology -A Review

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ABSTRACT

In wireless communication system antenna play very crucial role It serves a interface between electronic devices and the electromagnetic spectrum. MIMO stands for multiple input, multiple output. This isemerging technology in wireless media. MIMO technology emphasizes its ability to exploit spatial diversity and multi-path propagation to enhance and improve connectivity. This paper focuses on a review of MIMO technology used in antenna by studying the various MIMO antenna designs. Also studies the performance characteristic of MIMO antenna, such as isolation, mutual coupling, return loss, ECC, DG, and TRAC. This review paper includes the detail comparison of the shape of the patch, size of antenna, operating frequency& application of the antenna.

Keywords -: MIMO Technology, antenna, performance parameters, applications.

I. INTRODUCTION

The Antenna is one of the essential components in the wireless media.This is a device that generates the EM waves. The main function of an antenna is to convert electric field energy into electromagnetic field, due to this function antenna is also known as a transducer[1]. In view of the construction of the antenna, a small metal plate is placed on the substrate & ground plane. This substrate & ground is used for supporting purposes. According to Maxwell's equations, for the creation of the EM waves a small amount of electric field and the magnetic field are produced in an orthogonal manner with time-varying current. This closed-loop current flows through the conducting wire[2]. The modern application in wireless communication systems demands, that the system should deliver information with a high data rate with maximum channel capacity. Some restrictions will occur while extending the available bandwidth. The bandwidth is expensive in cost. MIMO technology provides a solution to overcome the extension of bandwidth. The main function of this MIMO technology create multiple paths for data transmission and reception in a single communication channel. In this technology, various typologies and techniques are used to design an antenna without consuming less radiation power.[3,4]. Before this technology need to study the SISO technology. SISO is the first topology in this technology. After SISO various techniques and typologies are developed such as SIMO, and MISO. Several systems use this MIMO technology for data transmission purposes. As a result, the transmitter & receiver can create a multiple-stream path environment [5]. For examination of the technology, some parameters are required to study. So the following parameters are needed to analyze while checking the performance parameters of any MIMO antenna [6].

1. Isolation -:
This is a parameter of performance in the MIMO antenna.It shows the level of interconnection between two radiators[6]. To measure purpose S parameter is used. Transmission Coefficient (Sxy) between the feeding ports of both radiators is used find out this value.

2. Total Active reflection coefficient (TRAC) -:
This is parameter of performance in MIMO antenna. This is a helpful tool between antenna elements ,which examine effectiveness of resonant frequency which holds steady despite variation in phase difference between radiators. For calculation take a square root of difference between available power and radiating power with total available power[7].

3. Envelope correlation coefficient (ECC) -:
This is parameter of performance in MIMO antenna. This parameter shows the compassion of two antenna's with antenna radiation pattern factor.This is the system influence parameter in MIMO antenna.

4. Diversity Gain
This is a parameter of performance in MIMO antenna. The parameter shows how the diversity affects on effectiveness in the wireless media. The DG & ECC is in inversely proportion with each other.

5. Return Loss
This is the basic parameter of the antenna that identifies the portion of power lost to the load and is unable to radiate back to source.

II. BODY PARAGRAPHS

I. In this research article , the author propose a small ultra wide band MIMO antenna . In this antenna three time frequency reconfiguration used. This is controlled by lectronic device in with single elimination feature. Here the two same radiators with circular patch which is modified is used with rotational and symmetrical manner. The radiator are tapered with mictrostrip line &separated partially defective ground structure.The C-shaped parasitic strip is used to create a slotted patch. Here 4 PIN Diodes are used which are employed in dual band notched UWB Characteristics. The dimensions of an antenna are 24x32 mm2 with 0.79 thickness.For biasing of PIN3 diode use 6 RF Chock Inductor with 30nH and 4 DC blocking capacitors with value 10pf. The conventional photolithography technique is used during fabrication of antenna, with combining the active and passive components The operating frequency for the proposed antenna is 3.1 -10.6 GHz with Snn greater than equal to -10dBi except for the rejection band. The isolation 21dBi in all reconcilable modes. ECC value is 0.0006 is achieved for each mode. The proposed antenna is appropriate to UWB MIMO system. The antenna demand suppress the WiMAX or WLAN signals [11].

II. In this research article, the author proposes a two-port disc-shaped MIMO antenna regarding UWB use . To enhance isolation between inter elements., an electromagnetic band gap (EBG) is structure is insert between two elements.The antenna dimensions are 30x60x1.6 mm3. During the fabrication time, FR-4 material is used for the substrate. The antenna is operate on 3.1 to 10.6 GHz frequency. The 10 dB return loss is obtain, the peak gain is 5dB, and isolation 25dB for over the UWB range is achieved.[12].

III. The author propose in this research article, design a Ultra wide band MIMO for 5G application. Dimensions of antenna are 8x7mm2 . At the time of design a rectangular shaped patch with cut F slot is utilized. The antenna operates on 88% of the wide band due to the multiple mode resonance and L shaped coupling input. In this paper 8x8 MIMO structure propose which operates on 5G NR band, it also cover the some portion of LTE bands. After analyzing the results the isolation is more than 10dB. The total efficiency is varied from 40% to 75%. The bezels surface in printed
on that 8 patches.These antenna branches are internally fed.[13]

IV. In this research article,author propose design two port MIMO antenna for low mutual coupling with dual band notched. This is good for portable applications which operates of UWB frequency. The dimensions of antenna 18x35x1.6mm3. The antenna has two monopole radiators. The antenna fed by co-planer line with 50 Ω resistance. The FR4 material is used as substrate. For reduction of mutual coupling. rectangular stub is used. Further reduction rectangular stub is modified into T shaped stub. he antenna operates at 2.3-12 GHz frequency it covers the UWB spectrum. mutual coupling is -20dB, the ECC value is 0.035, and the peak gain is 6dBi.By eliminating two rectangular split ring resonators that are single free from the radiating patch via etching.The distance between radiating patches is 12.3mm. The radiating patch employs two RSCSRRs to reject WiMAX frequency interference. [14]

V. In this research article, the author propose antenna of two element multiband MIMO antenna The absorption loss of this antenna is low.This antenna works on Ka band which used space satellite and In millimeter a rise for 5G and 6G wireless communication application..This antenna covers four relevant and usable frequencies such as 16GHz,25.5GHz,28GHz, and 32GHz. The design of the antenna mimic of yagi -uda antenna with the L shaped ladder.[15]

VI. In this research article Design a MIMO antenna for UWB application with multiband rejection characteristics. The quad-identical monopole element is used as a radiator. The dimensions of the antenna are 34x34 mm2.The FR4 Substrate is used in the antenna's construction. An antenna cover the 3-12.9 GHz frequency. In satellite communication to filter the x band, uplink four spiral coils are inserted in the structure,a sharp notch range from 7.9-8.5 GHz. The removal of interference at 5.5GHz lower WLAN and 3.5GHz WiMAX is the result of symmetrical rectangular trapezoid resonators near the feed line and symmetrical rectangular trapezoid structure, respectively.After evaluation of an antenna return loss is -10dBi. The simulated and fabricated results antenna parameters such as TRAC, Diversity Gain, and ECC values are found to be good match[16].

VII. In this research article,author propose to design a MIMO antenna in small size for mobile terminal application. In this antenna the ground branches are reversed with each other.The two co-planar elements are used as radiators. 15x20mm2 is the size of antenna. This antenna works for GSM 1800/1900 ,WLAN,WiMAX, S band and major part of LTE bands. Inverted ground is introduce between two radiating elements to make improvement in isolation factor. . After analyzing the antenna -18dB isolation is provided. The ECC value is 0.01. This recommended antenna is simple and to use and it good in radiation performance[17].

VIII. In this research article author propose a MIMO antenna with dual band structure integrated waveguide antenna on the substrate which works in four modes. The proposed antenna dimensions are 115x122x4.1mm3. The proposed antenna covers 2.4-5.8 GHz frequency for Bluetooth and Wifi application. In this antenna simple separating network use with two dual band of QMSIW. After Simulating the antenna on simulator software.
The return loss is -10dBi. ECC value is 0.01, Diversity Gain is 9.8dBi all these results are achieved for 2.36-2.52 and 4.9-6.2 GHz frequency bands[18].

IX. In this research article, author propose a design MIMO antenna for a Injected printed which is in tiny nature which works for UWB application. The dimensions of the antenna are 22x31x0.125 mm3. The two co half planes are used as radiators for minimization of the size of the antenna. A rectangular stub is change in T structure stub, and it is working for the ground plane. To improve the efficiency of bandwidth. The antenna works on 2.9-12 GHz frequency band which cover Ultra wide frequency band. Mutual coupling of antenna is -15dB. ECC value is 0.3. Ability of channel loss is 0.4 bits/ Hz. The result ensure that performance of antenna is good[19]

X. In this research article,the author proposes to design a reconfigured folded slot antenna with MIMO configuration the dimension of the antenna is 86mm x56 mm. In this two orthogonal direction antenna system is used for achieving better isolation between two radiators. During fabrication flexible type material is used as substrate material.A PIN diode is a semiconductor device is used which operates at high frequency. This diode is Integrated into two elements of the MIMO system. The PIN diode is untilze in this antenna for switching purpose. Antenna will work in dual band mode while PIN diode is in OFF status, and antenna will work in single band mode while PIN diode is in ON status. The proposed structure of antenna works on 2.4 GHz frequency. It works for wireless local area network application.works for wireless local area networkapplication[20].

XI. In this research article, the author studies the Mutual coupling reduction technique. Mutual coupling is parameter of performance in MIMO system..In recent years MIMO technology come in front. It is the capacity to emit waves in multiple directions. The polarization in the antenna play very essential role in current telecommunication system. The current paper tell us theory information about reduction techniques of mutual coupling parameter. Mutual coupling is responsible to drastically changes happen and due to that MIMO antenna performance is degraded. By calibrate the mutual coupling in digital domain , enhance partial performance of MIMO system . For reduction of mutual coupling defective ground structure, complementary split ring resonator, parsatics or slot elements and some decoupling networks are used. This techniques are simple and effective in nature[21]

V. GENERAL DISCUSSSION

For simulation and fabrication of the antenna Bakelite, FR-4, Epoxy, RO4003, Taconic TLC, and RT-Duriod, textile, flexible material used. The rectangle, triangle, circular Ring, dipole, circle, square eclipse, and hexagonal, these types of patches are used for creating the antenna. Various Solid State devices are used which work on microwave frequency for switching purposes The average life duration of any antenna is 8-10 Years. The below fig shows some structures of the MIMO antenna. Fig 3 Structure MIMO antenna used as reference structure which works on improvement in mutual coupling. Here I modified the structure of the antenna with an eclipse-shaped patch and compared the results.

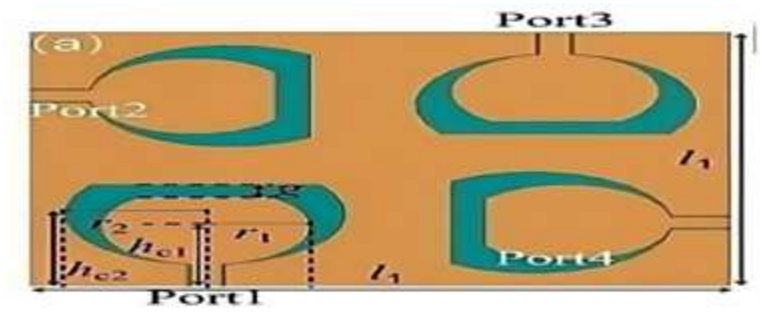

Fig 1. Geometry of Ni-based EMM MIMO antenna [8]

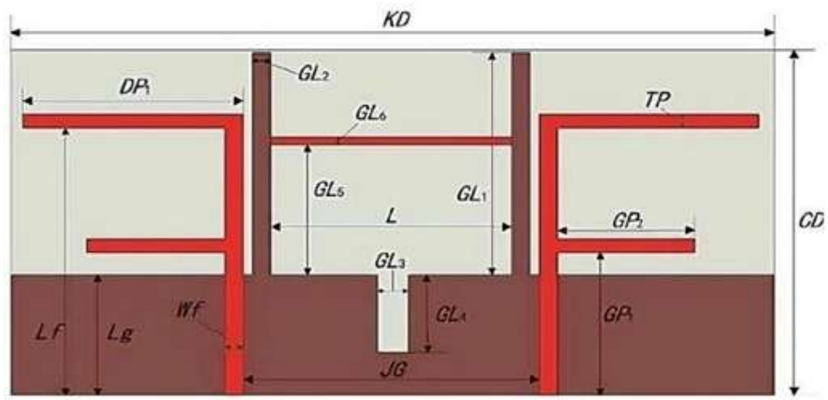

Fig 2.Geometry of triband flexible MIMO antenna[9]

Table 1. Best Values of Performance Parameter of a MIMO antenna.

Sr No	Performance Parameter	Best Value
01	Return Loss	Greater than -10 dB.
02	Isolation	More than -25dB.
03	Mutual Coupling	Less than -20dB.
04	Total Active Reflection Coefficient	The range in between 0 to 1.
05	Diversity Gain	Less than or equal to -10dB.

.

IV. CONCLUSION

After the review the many papers, the MIMO technology and various structures of MIMO antenna and parameters of performance in antenna (ECC, DG, TARC, and Return Loss) can be understood. Also known the best values of performance parameter of MIMO antenna. MIMO is advanced and novel technique in th wireless media which effective with antennas.

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Smart Seed Sowing Tractor Machine using Arduino

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Abstract: In modern agriculture, we use tractor machines for seed sowing. In the sowing process, the distance between two seeds is crucial. Therefore, we have implemented a circuit on the tractor seed sowing machine using Arduino. This approach reduces the cost for manufacturers since there is no need to purchase new machines; it can be integrated into existing seed sowing machines. This modification allows for precise seed placement in the soil at a predetermined distance between two seeds, thereby enhancing crop production.

Keywords: Sowing, Machine, Arduino, Arduino, Smart Agriculture, Precision Farming, Seed Sowing, Tractor, Automation, Crop Output, Speed Control. Enact.

I. INTRODUCTION

Agriculture is the fastest-growing field in the economy. In day-to-day life, different techniques are used to enhance the productivity of crops. Basically, the productivity of the crop depends on seed sowing. The distance between the two seeds required is the same, ensuring that each plant receives the proper and required amount of fertilizers and water present in the soil. Therefore, proper seed sowing is the most important aspect. In many countries, all work in the agriculture field is done by tractor-operated machines. Seed sowing is also done by tractor-operated machines, but due to some mechanical issues, these machines enable the insertion of seeds in the soil, keeping an exact distance in between them. Thus, there is a need to modify or upgrade the present machine. This can be achieved with the help of Arduino and some electronic components. With this technology, we can implant the seed as per our requirement by simply providing inputs to the Arduino.

Agriculture stands as the most rapidly advancing sector in the economy, and the quest for optimizing crop productivity is an ongoing endeavor. Within the realm of daily agricultural practices, a myriad of techniques is employed to augment crop yields. One pivotal factor influencing productivity is the meticulous process of seed sowing. The uniformity and precision in the distance between two seeds play a critical role, ensuring each plant receives the requisite amount of fertilizers and water available in the soil. Thus, the cornerstone of successful crop cultivation lies in the art of seed sowing. In numerous countries, the agricultural landscape has witnessed a transformative shift towards the mechanization of farming processes, predominantly executed by tractor-operated machines. Seed sowing, too, has joined the ranks of tasks carried out by these efficient machines. However, despite their utility, certain mechanical issues hinder their ability to consistently maintain the ideal seed placement distance in the soil. The exigency for modification or upgrading of existing seed-sowing machinery has become apparent. Enter Arduino, a versatile and programmable microcontroller, along with a set of electronic components, offering a technological solution to this challenge. Through the integration of Arduino technology, farmers can now exert precise control over the seed-planting process. By providing specific inputs to the Arduino system, agriculturalists can customize the insertion of seeds according to their unique requirements. This marriage of traditional farming practices with cutting-edge technology not only addresses the shortcomings of existing machinery but also propels agriculture into a new era of efficiency and precision. The utilization of Arduino in seed sowing exemplifies how the amalgamation of electronics and agriculture can lead to sustainable and innovative solutions, fostering a more productive and resilient agricultural landscape.

II. LITERATURE SURVEY

Durga Nikam and Harshada Naik [1], the proposed project uses motor drivers, sensors, microcontrollers, Bluetooth, and other components to build a four-wheeled robot. This system produces well-designed, economical, and efficient output at minimal power. The type of land that is tracked with a sensor in this manner determines the results of seed planting. The major component in this case, the microcontroller, serves as the assembly's controller. It is powered by a 5V power source. Sensors and valve controllers power this microcontroller. Within This valve is where seeds are kept, thus it should open when needed and close while the robot is turning. A sensor is included to determine how many seeds are in the valve. The system will indicate when the amount of seeds is low enough to replenish them. Thus, infrared and ultrasonic sensors are both employed. A 9V supply powers the motor driver circuit, which controls the wheels, levelers, and dig string shafts. The initial stage of getting ready is leveling. Field, then tilling, planting, and finally sealing it. Thus, the three crucial mechanisms involved in the process are: (i) using infrared sensors to turn the motor on and off in order to get rid of undesired vegetation. (ii) Using moisture sensors to monitor soil moisture content and turn the motor on or off. (iii) Setting up the motor to switch off when the robot advances to the next row after doing its turn. The farmer is contacted by Bluetooth or RF to discuss the robot's functioning. The farmer feeds the field's X-Y coordinate system to the robot to regulate its movement. To link the Arduino to the Bluetooth device, a little dongle is kept in place. All of the data is kept via the Android app. field, then tilling, planting, and finally sealing it.

Ashwini P. and Prakash Kanade [2], the key component in this case is the Arduino Mega 2560, which serves as the assembly's controller. It is powered by a 5V power source. A valve controller and sensors power this Arduino. This valve is where seeds are kept, thus it should open when needed and close while the robot is turning. A sensor is included to determine how many seeds are in the valve. An indicator to replenish the seeds will be present in the system when the seed level drops below the minimum. Thus, infrared and ultrasonic sensors are both employed. As seen in Fig. 2, a 9V supply powers the motor driver circuit, which in turn powers the wheels, the shafts of the dig string, and the levelers. Article Research, Volume 11, Issue No. 01IJESC, and 27564, January 2021 Visit ijesc.org.The initial stage of field preparation is leveling, which is followed by digging, seeding, and closure. Thus, the three key components of the process are: (i) using infrared sensors to turn the motor on and off in order to get rid of undesired vegetation. (ii) Using moisture sensors to monitor soil moisture content and turn the motor on or off.(iii) Setting up the motor to switch off when the robot advances to the next row after doing its turn. The farmer is contacted by Bluetooth or RF to discuss the robot's functioning. The farmer feeds the field's X-Y coordinate system to the robot to regulate its movement. To link the Arduino to the Bluetooth device, a little dongle is kept in place. All of the data is kept via the Android app.

Bamgboye et al. developed a manually operated okra planter. The field efficiency and field capacity of this planter was 71.75% and 0.36 ha/hr respectively. The seed rate was reported as 0.36 kg/hr with a seed damage of 3.51% [3].

A paddy seeder was designed and fabricated by Gupta et al. with a field capacity of about 0.5 ha/hr at a forward speed of 0.81mls. No damage was caused by the metering mechanism for soaked seeds, but a 3% damage was recorded for pre-germinated seeds [4].

Ladeinde et al. compared the performance of several Jab planter types to the traditional technique of seed planting. In terms of manpower requirements and field capacity, the conventional technique of planting and the Jab planters differed slightly. The University of Southern Mindanao Agricultural Research Centre developed single and double row planters that can plant a hectare in 6–8 h for single-row and 3–4 h for double-row. A disc-type maize seeder has been created that is simple to use and comfortable to operate [5].

Ramesh et al. has discussed about different types of innovations available in seed sowing process. The sowing operation involves putting the seed in the soil up to a desired depth then applying soil and covering the seeds with a slight compaction. An optimum yield depends upon various factors like row to row spacing, seed to seed spacing, seed rate and depth of seed sowing varies for different crops and agro-climatic conditions. In addition, sowing machines play an important role in the agriculture field [6].

III. PROPOSED SYSTEM DESIGN

It is not possible to spread seeds in a real-time scenario with a robot's assistance. We are currently working on designing a tractor seed sowing machine, leveraging the capabilities of Arduino technology. Specifically, we are utilizing the Arduino UNO R3 kit to develop the system, which is seamlessly integrated with the tractor. This innovative approach aims to enhance the efficiency and precision of seed sowing processes in agricultural settings. Following block diagram shows the model for this scenario.

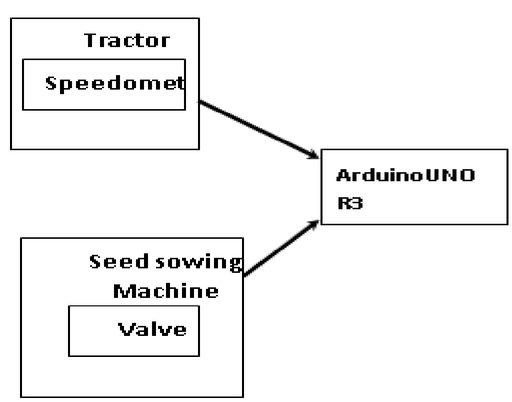

Fig.1 Block Diagram of Smart Seed Sowing Tractor Machine using Arduino

The Arduino UNO, a microcontroller board based on the ATmega328P microprocessor, is what we use for this project. With a 16 MHz ceramic resonator, this board has 14 digital input/output pins (six of which may be used as PWM outputs), six analog inputs, a USB port, a power connection, an ICSP header, and a reset button, among other features. When used in combination with the tractor speedometer, the Arduino UNO is essential. The Arduino interprets this data by using the speedometer signal as an input to calculate the tractor's speed. Next, using the formula.

Time = Distance * Speed   Equation No.1

The Arduino determines how long it will take the tractor to travel a certain distance. The opening and closing of the door is then managed by using this computed time. Then, using this computed time, a valve's opening and shutting at predetermined intervals is controlled. The way the valve operates controls how much seed flows via a dropping machine pipe. Thus, the Arduino is essential in improving the seed-dropping procedure based on the tractor's speed thanks to its control logic and real-time computations. This Arduino-powered digital speedometer calculates both distance traveled and speed. This uses an LM393 Speed Sensor to measure the speed of a wheel that is attached to the motor and has a lot of holes or a color mark on it that the speed sensor can detect. A 16x2 LCD display can display the output, and an Arduino UNO is used for all control.

A common microcontroller board for do-it-yourself projects is the Arduino UNO, which may be used to create a speedometer, among other things. Its development process is simple and rapid because to the Arduino IDE and its reliance on the ATmega328P microprocessor. The Arduino UNO is utilized in a speedometer to interpret signals from the LM393 Speed Sensor and manage the L298N Motor Driver. When a wheel or shaft rotates, the LM393 speed sensor recognizes it and transmits the information to the Arduino UNO. After processing this data, the Arduino UNO determines the rotation speed and shows it on the 16x2 LCD display. It is also utilized to operate the L298N Motor Driver, which is a device that drives a DC motor. The Arduino UNO is the perfect tool for developing an accurate and user-friendly speedometer since it has a wide range of input and output pins that enable it to communicate with various sensors and actuators, such the LM393 Speed Sensor and the L298N Motor Driver.

The design of the Smart Seed Sowing Tractor Machine using Arduino encompasses a thorough integration of both hardware and software components to attain precision and efficiency in the seed planting process. At its core, an Arduino microcontroller acts as the central processing unit, orchestrating inputs from diverse sensors and controlling actuators. Vital data for determining optimal planting conditions is sourced from soil moisture sensors, while GPS technology guarantees accurate navigation to predetermined planting locations. Users will interact with the system through a user-friendly interface, accessible either via an LCD display or a mobile application, facilitating straightforward configuration and real-time monitoring. The seed distribution mechanism, featuring servo or stepper motors, ensures a meticulous and accurate seed placement. Furthermore, a speed control system, overseen by motor controllers, manages the tractor's speed based on soil conditions. To safeguard the machine and prevent unforeseen incidents, safety features like emergency stop buttons and collision protection are integrated. The system is also equipped with a wireless communication module to enable remote monitoring and control. Prioritizing power management, data logging, and analytics, this proposed design seeks to transform traditional farming practices by presenting a sustainable and technologically advanced solution for intelligent and efficient seed sowing.

V. EXISTING SYSTEM

The current way of planting seeds in agriculture is pretty basic, mostly done by people or with some help from machines. This traditional method relies a lot on humans to spread seeds and guide the tractor. But here's the

Catch - it's not very precise or efficient. Seeds often end up unevenly planted, and we might waste resources. The problem is, the existing system doesn't have smart controls like Arduino offers. So, it struggles to adapt to different soil conditions and specific planting spots. Also, there's no real-time monitoring or data analysis, making it hard to improve the planting process. Relying on these old-fashioned methods can lead to lower crop yields and more work. That's why introducing the Smart Seed Sowing Tractor Machine with Arduino is a big deal. It's designed to fix these issues by using advanced controls, accurate seed placement, and smart speed adjustments for a smarter and more effective way of doing agriculture.

VI. CONCLUSION

The Smart Seed Sowing Tractor Machine that uses Arduino technology. We found that by incorporating Arduino-based systems, we can automate and improve the accuracy of planting seeds in farming. The smart features, like monitoring in real-time, smart seed dispensing, and automated navigation, make farming more efficient, reduce the need for human labor, and optimize resource use. Our experiments and field trials showed that the Smart Seed Sowing Tractor Machine is effective and reliable. This technology not only makes farming easier but also has the potential to make it more sustainable by reducing resource waste. Looking forward, refining and making the system scalable could lead to its widespread use, transforming agriculture and contributing to global efforts for more efficient, sustainable, and technology-driven farming practices.

VII. RESULTS

The Smart Seed Sowing Tractor Machine, powered by Arduino technology, has shown great progress in making farming more precise. By using Arduino for control, the machine efficiently planted seeds exactly where needed, thanks to its accurate distribution and speed control systems. This not only improved how crops were planted but also boosted overall yield. In practical tests, the machine significantly cut down on resource use, making the whole process more efficient. These results confirm that this technology is not just a theory; it's a real, practical solution using Arduino to upgrade traditional farming, making it more sustainable and modern.

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Conservation of Biodiversity in River Ecosystem by using Embedded System

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Abstract— This project presents a novel river cleaning machine utilizing ESP8266 for remote operation. The prototype incorporates two geared motors for a conveyer belt, optimizing garbage collection efficiency, and an additional two geared motors with 100 RPM for overall machine motion. Targeting river pollution, this innovation serves as a sustainable solution for waste removal. The ESP8266 enables seamless control and monitoring through a mobile application, enhancing accessibility and ease of operation. The paper details the design, implementation, and performance of the river cleaning machine, positioning it as a promising technology for environmental conservation

Keywords— Conservation of Biodiversity, River Ecosystem, Embedded System, River Cleaning Machine, ESP8266, Sustainable Technology.

I. INTRODUCTION

The delicate balance of river ecosystems is under constant threat from human activities, leading to a severe decline in biodiversity. To counteract this challenge and contribute to the preservation of our natural environment, our project, titled "Conservation of Biodiversity in River Ecosystem by using Embedded System," aims to introduce an innovative solution to address the complex issue of river pollution. Human intervention in river cleaning processes often poses risks to both the environment and individuals involved. With a focus on sustainable and technology-driven conservation, our project leverages Embedded Systems to create a specialized River Cleaning Machine. This machine is designed not only to efficiently remove pollutants from the river but also to minimize the impact on biodiversity. In the context of the ongoing global environmental crisis and the added challenges presented by situations such as the COVID-19 pandemic, our project takes on heightened significance. The incorporation of advanced technologies, including the ESP8266 for remote operation, positions our solution as a forward-thinking and adaptable approach to river ecosystem conservation. This paper delves into the intricacies of our project, discussing the design, implementation, and potential impact of the "Conservation of Biodiversity in River Ecosystem by using Embedded System." Through this endeavor, we aspire to contribute to the sustainable management of river ecosystems, fostering a harmonious coexistence between human activities and the natural world. Keywords: Conservation of Biodiversity, River Ecosystem, Embedded System, River Cleaning Machine, ESP8266, Sustainable Technology.

In the realm of river conservation and pollution mitigation, various initiatives and technologies have been explored. Understanding the context of related work is crucial to position our project, "Conservation of Biodiversity in River Ecosystem by using Embedded System," within the broader landscape of environmental conservation and river cleaning.

1. Autonomous River Cleaning Systems:- Previous works have investigated autonomous systems for river cleaning, employing technologies such as sensors and robotics. These systems aim to enhance the efficiency of pollutant removal while minimizing human intervention.
2. Remote Operation in Environmental Monitoring:- Research in the domain of environmental monitoring has explored the use of remote operation and embedded systems. These technologies facilitate real-time data collection and analysis, providing insights into the health of river ecosystems.
3. Smart Technologies for Water Quality Assessment:- Various projects have focused on the integration of smart technologies for water quality assessment in rivers. Sensor networks and embedded systems are employed to monitor parameters such as pH, dissolved oxygen, and pollutant levels.
4. IoT-Based River Pollution Monitoring: - The application of the Internet of Things (IoT) in river pollution monitoring has gained attention. This involves the deployment of sensor nodes along riverbanks to continuously monitor water quality and detect pollution events.

III. PROPOSED METHODOLOGY

A. Hardware Requirement:

1. Power supply
2. ESP8266 Node MCU
3. Conveyer Belt
4. L298N Motor Driver
5. Robotic wheels with gear motors

B. Software Requirement:

1. Arduino IDE
2. Blynk Application

Hardware Requirement:

Power Supply:

Fig.1 Power Supply:

The propulsion system of the river cleaning machine, which may include electric motors or thrusters, could be powered by these batteries. It's essential to calculate the power requirements of the motors to ensure that the battery capacity is sufficient for the intended operation time

ESP8266 Node MCU:

Fig.2 ESP8266 Node MCU

The NodeMCU ESP8266 is an extensively employed development Board in IoT applications, providing a versatile and cost-effective approach to connect devices to the internet. It features Wi-Fi and programming capabilities,is a low-cost open-source IoT platform based on the ESP8266 Wi- Fi module. It is equipped with a microcontroller, making it suitable for controlling and monitoring devices remotely.

L298N Motor Driver:

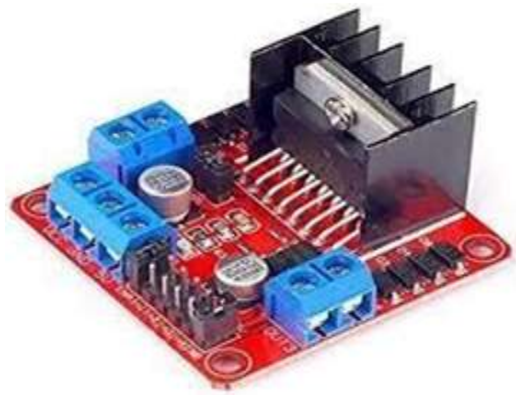

Fig.3 L298N Motor Driver

The L298N is a dual H-Bridge motor driver that allows for simultaneous speed and direction control of two DC motors. The module can power DC motors with voltages ranging from 5 to 35V and peak currents of up to 2A. This L298N Motor Driver Module is a high speed driver for DC and Steps per Motors.

Robotic wheels with gear motors:

Fig.4 Robotic wheels with gear motors

A gear motor is a combination of an electric motor and a gearbox. It is used to generate mechanical motion and provide the necessary torque to drive other components in the river cleaning machine. Gear motors are commonly employed to drive the propulsion system of the river cleaning machine, allowing it to move through the water.

Conveyor Belt:

Fig.5 Conveyor Belt:

The conveyor belt is typically positioned in the water to collect and transport debris such as floating litter, vegetation, and other pollutants.
As the river cleaning machine moves through the water, the conveyor belt continuously picks up debris from the surface of the water.

Block Diagram:

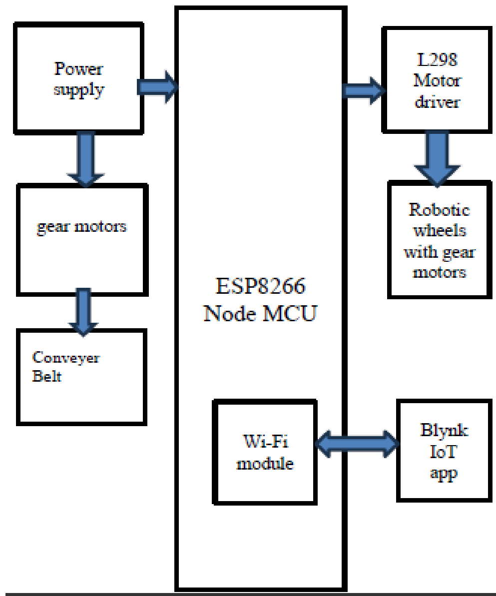

Fig.6 Bl;ock diagram

III. Working Principle:

The river cleaning machine employing a NodeMCU ESP8266 for remote operation is a sophisticated solution designed for efficient waterbody maintenance. The NodeMCU, acting as the central nervous system, connects to a Wi-Fi network, enabling users to remotely control the machine via a dedicated app or web interface. Two sets of motors are integrated into the system, with one pair propelling the machine forward or backward and the other controlling the rotation of the conveyor belt for debris collection. The ESP8266 interprets user commands, translating them into signals that regulate the speed, direction, and functionality of the motors. In addition to remote controlSafety measures, including emergency stop functionalities, contribute to the responsible and secure operation of the system. The ESP8266 also manages power distribution, optimizing battery usage and implementing low-power modes when necessary. This smart river cleaning solution not only addresses environmental concerns by efficiently removing debris but also exemplifies the integration of IoT technology for seamless remote monitoring and control, ultimately contributing to the preservation of aquatic ecosystems.When it comes to hardware, the When it comes to hardware, the Node MCU acts as a bridge between components and the Internet. The instructions are sent to the Node MCU through the Internet based on the instructions we supply in the Blynk app. The robot controller receives the control commands transmitted over the internet. The robot controller connects to the internet through Wi-Fi. The commands are received in real time, and the robot motors are activated to carry out the appropriate movements.

Fig.7 Conservation of Biodiversity in River Ecosystem by using Embedded System

IV. RESULT

In some of the previous work done on the same issue they have used Arduino UNO only but it's not necessary to use it instead of that we can Node MCU only. It reduces the cost and increases the efficiency.

Fig. 8 Display of Blynk IoT

V. CONCLUSION:

In conclusion, the integration of IoT technologies and robotics in river cleaning machines presents a promising avenue for environmental conservation. The reviewed literature underscores the significance of smart navigation, sensor-driven debris detection, and remote operation using platforms like Node MCU ESP8266. These advancements contribute to more efficient, automated, and remotely controlled river cleaning robots, minimizing environmental impact while maximizing effectiveness. As we navigate the challenges of river pollution, the synthesis of these technologies offers a forward-looking approach for sustainable waterbody maintenance and ecosystem preservation.

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IOT BASED SMART DUSTBIN

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Abstract— In this paper, we propose a solution to solid waste separation and management, which is valuable and challenging and detect location of dust bin. In smart cities, the smart bin plays a role in the resolution of the waste management system. In order to operate the smart bin, NodeMCU microcontroller was utilized. Using IOT sensors, dry and wet waste collection is separated inside the dust bin. The solar panel used to collect solar energy has been placed at the top of the bin. The battery bank, which powers the smart bin automatically, stores the collected energies.

Keywords: Dust bin, node MCU, GSM, IoT.

Most of the time the conventional dust bins are very dirty and overflowed due to poor plan. Further the bins are cannot emptied for longer period of time. So, it creates unwanted smell within the city. The city people can easily have affected with ill due to this smell. To overcome this environmental problem, we need smart management system within the city. This technique helps to minimize the operational cost and solve the environmental complications. The use of intelligent waste management technology is demonstrated by the automatic smart bin. The smart bin will minimize human efforts. The collected wastages are heterogeneous. So, we need to segregate solid wastages. The intelligent container used The TowerPro SG90 Servo Motor is utilized to automatically open and close the smart bin lid, while the HC-SR04 Ultrasonic Sensor is used to recognize human beings. The smart bin's general operation was managed by an Arduino Uno microcontroller. Using an inside IoT sensor, the smart bin distinguishes between dry and wet waste. This will helpful for waste management recycle process. Once the smart bin is full up to 80% either dry/wet partition, then the alert message is send to garbage collector automatically. The smart bin cannot empty and it's full up to 90%, then the second alert communication is direct to both trash collector and supervisor. The smart is full up to 100%, and then the third alert communication is send to both trash collector and supervisor. The NodeMCU is used to screen the level of the smart bin. If 90% of the bin is full, then 90% filled bins send message to garbage collector. Finally, the pickup truck will come and collect the wastages from bin. Every smart bin has unique name, which is easy to detect whether the smart bin is full or not. Once the threshold level touches within the smart bin, the message along with bin unique name transferred to garbage collector immediately. The waste sources are segregated from bin with automated solution. Then the segregated resources are utilized for recycle process to produce effective power generation. The wireless monitoring unit consists of sensors which are utilized to measure the level of the bin. Solar energy is collected from the sun using a permanent solar panel on top of the smart bin. The battery bank, which powers the smart bin automatically, stores the collected energies.

I. HARDWARE AND SOFTWARE

A. Ultrasonic Sensor

Because the structure of the object being measured has little effect on how the sound wave is reflected, ultrasonic sensors works well for measuring amplitude. As a result, sensors have been used to measure waste levels and identify persons.

Fig.1. Ultrasonic Sensor

Specifications:

1. Supply voltage: 5V (DC)

2. Supply current: 15mA

3. Modulation frequency: 40Hz

4. Output: 0 – 5V (Output high when obstacle detected in range)

5. Beam Angle: Max 15 degrees

6. Distance: 2 cm – 400 cm

B. Rain Sensor

Rain sensor is used for separate the dry /wet solid waste from the mixed waste. The separation of waste is depending upon the threshold value, which is set on the smart waste bin sensor.

Fig.2. Rain Sensor

Specifications:
1. Operating Voltage: 3.3V – 5V
2. Operating Current: 15 mA
3. Comparator chip: LM393
4. Output type Analog output voltage (AO) and Digital switching voltage (DO)
5. LED lights indicators Power (red/green) and Output (red/green)
6. Sensing pad: 5cm x 4 cm nickel plate on one side.
7. Module PCB Size: 3.2cm x 1.4cm

C. Servo Motor

To make the waste bin lid automated, a servo motor is employed. If the person is detected within the specific detection area then lid of waste bin will open automatically and it will remain open until the person leaves and person is leaved then after some time it will close automatically.

Fig.3. Servo Motor

D. GSM

GSM is used to send the alert messages to the supervisor and waste collector according to the set waste level.

Fig.4. GSM

E. GPS

GPS is used to detect the position of the smart dust bin.

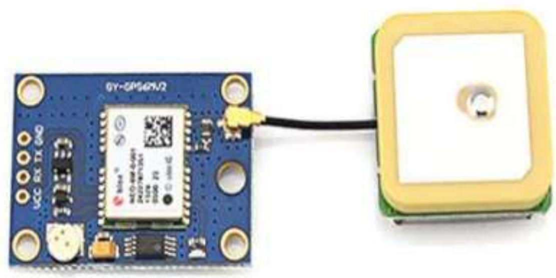

Fig.5. GPS

F. Node MCU

Node MCU is a controlling unit of the proposed system. NodeMCU is an open-source development board based on the ESP8266 Wi-Fi module. It offers a convenient and cost-effective platform for building IoT (Internet of Things) projects.

Fig.6. Node MCU

G. Power Supply

Power supply is used for the operation of the smart dust bin.

H. Arduino IDE

Programming languages based on C++ are used by the open-source Arduino platform, making it user-friendly for beginners as well as experts. Microcontroller boards, like the Arduino Nano, can be programmed to communicate with sensors, actuators, and other connected devices using the Arduino programming language. Actually, the language is built to be user-friendly for beginners and non-programmers, and it is based on C++. It is frequently utilized in robotics, home automation, and Internet of Things (IoT) projects as well.

II. PROPOSED METHODOLOGY

The figure below illustrates the planned smart waste separation and management system's a whole structure. This proposed system is made up with the help of an identification system, separation unit, power generation unit, an automated lid opening and closing unit, monitoring system, and communication unit. These systems are all connected by use of the NodeMCU microcontroller. For identification, two ultrasonic sensors (HC-SR04) are employed. The front of the waste bin has a single ultrasonic sensor that aids with human detection. The other one, which is inserted into the waste bin, aids in figuring out how much waste the smart waste bin has.

A basic rain sensor is utilized to segregate the Dry/Wet item. The identification, separation, power generation, automated lid, monitoring, and communication systems are all controlled by an integrated Arduino programme. On the front side of the waste bin is an ultrasonic sensor. The ultrasonic sensor's transmitter sends out ultrasonic sound waves that are too high for human ears to hear, while the receiver picks up the sound waves that are reflected off of solid things. Thus, the waste bin's lid will automatically open with the assistance of a servo motor installed on one side if a person is identified within a specific sensor range. A range of 30 cm was established for the recommended identifying system. Solid waste bin be placed inside the garbage bin after the lid is opened, and it will stay open until the user is inside the detecting range. Ultimately, after a predetermined amount of time, the lid will automatically close if the user leaves the detection range. The power is generated from the solar panel and battery system. A power supply is used to power the system. This covered container is placed here to prevent disruption from outside elements such as wildlife and anomalous weather patterns that may cause waste to be left behind. An ultrasonic sensor installed inside the garbage bin continuously measures the amount of rubbish within. The waste within the waste bin reflects the ultrasonic sound waves that are transmitted by the ultrasonic sensor. The transmission of ultrasonic sound and the reception of reflected sound waves are separated in time.

This time interval is used to calculate the proportion of the waste container that is filled. The calculated data is displayed with the help of the Blynk Mobile app. The waste bin level is 80% in the waste bin (dry or wet) then the alert message is send to the waste collector along with location and percentage filled status of the particular waste bin.

The waste bin level is 100% in the waste bin (dry or wet) then the alert message is send to the waste collector as well as supervisor or manager along with location and percentage filled status of the waste bin. After pickup truck will come and collect the separated waste. The automatic lid and separation mechanism will be switched back on, and the waste bin will be reused.

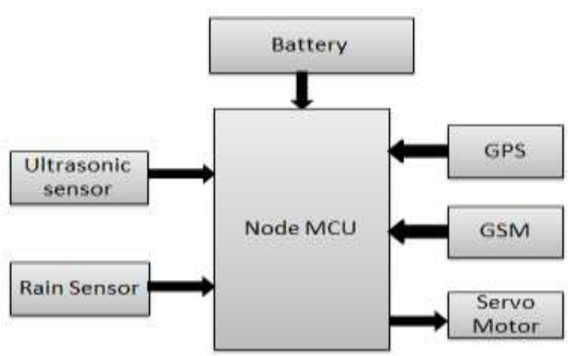

Fig.7 Block diagram

IV PROPOSED METHODOLOGY

This technique can help you in classifying the solid waste. This system gives the alert message to waste collector and supervisor according to the level of bin along with location of bin. This system shows real time status of bin.

1. When human is detected then lid of waste bin is open.

2. Separate dumped solid waste into dry and wet waste.

3. Monitor real time status of bin on Blynk IoT Mobile App.

4. Send alert message according to level of bin.

V ADVANTAGES

- Reduces human efforts.
- To minimize the operational cost.
- Keeps the atmosphere fresh and tidy.

VI CONCLUSION

Most of the time the conventional dust bins are very dirty and overflowed due to poor plan. Further the bins are cannot emptied for longer period of time. A step toward automating the manual collection and identification of wastes is the installation of a garbage management system. The proposed system trace the location of the bin .The smart bin separates dry/wet garbage collection using IoT sensor within the smart bin. This will helpful for waste management recycle process. Once the smart bin is full up to 80% either dry/wet partition, then the alert message is send to garbage collector automatically.

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Handwritten notes recognition using Machine learning

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ABSTRACT
Handwritten Notes Recognition (HNR) represent pivotal convergence of traditional penmanship and advanced computational techniques. In an increasingly digitized world, the preservation and utilization of handwritten information are essential. HNR, leveraging artificial intelligence and machine learning algorithms, seeks to bridge the gap between the analog and digital realms by transforming handwritten contenting to machine-readable text. This process involves complex pattern recognition, character analysis, and context understanding, allowing handwritten notes, regardless of the handwriting style, to be accurately transcribed and stored electronically. The implications of HNR extend far beyond mere transcription; it plays a vital role in digitizing historical documents, enhancing accessibility for individuals with disabilities, and revolutionizing education by making handwritten materials easily shareable and editable .The abstract nature of handwriting, characterized by diverse styles, shapes, and sizes, presents a challenging yet intriguing problem for computer scientists, making HNR an area of continuous research and innovation. As technology advances, the potential applications of HNR in diverse fields ,such as archival preservation, education ,and administrative efficiency ,are limitless, promising a future where the richness of handwritten communication seamlessly integrates with the digital landscape.

Key-Words: machine learning, HTR

I. INTRODUCTION

In the strokes of a handwritten note that digital text can seldom replicate. Handwritten digital age, where technology is seamlessly integrated into our daily lives, the art of handwriting often takes a backseat. However, there is a profound beauty and intimacy in notes hold a sentimental value, carrying the personal touch and unique identity of the author .In recent years, advancements in artificial intelligence and machine learning have paved the way for innovative technologies, one of which is handwritten notes recognition. This fascinating field amalgamates the charm of traditional penmanship with the power of cutting-edge technology, transforming handwritten scribbles into digital data that can be analyzed, stored and utilized in various applications.

The recognition of handwritten notes involves the use of sophisticated algorithms and machine learning models to interpret and convert handwritten text or symbols into machine-readableformat.Thistechnologyhasfar-reachingimplications, not only in preserving historical manuscripts and documents but also in modernizing education, enhancing accessibility, and revolutionizing administrative tasks. Handwritten notes recognition serves as a bridge between the tangible, nostalgic world of pen and paper and the limitless possibilities offered by digital platforms. It enables the conversion of handwritten content into editable digital text, making it easier to search ,store, and share valuable information. Furthermore, it open avenues for individuals with disabilities, offering them equal access to handwritten materials, which was once challenging feature, Harmonizes seamlessly with the efficiency of digital processing, revolutionizing the way we perceive, utilize, and cherish heart of handwritten communication.

Fig 1. Text Recognition

II. MEYHODOLOGY

Hand written notes recognition definition says that it is the ability of the model to recognize the notes written by the human . It is not easy for the machine to recognize the human written characters since each and every human being tends to have different handwriting along with it comes the different strokes used by each individual. Use of machine learning model is the easy way out of this problem . The recognition using the NumPy , Panda , Seaborn proves to be them efficient and useful solution for this problem. Use of datasets available in the Kaggle dataset proves to be one of the best useful dataset having variety of handwriting images.

Tensorflow being a open source platform for the machine learning operations. It is an open source platform for deep learning operations . It is a beautiful computational graph which helps build functions and variables by just giving Them Shape and size.

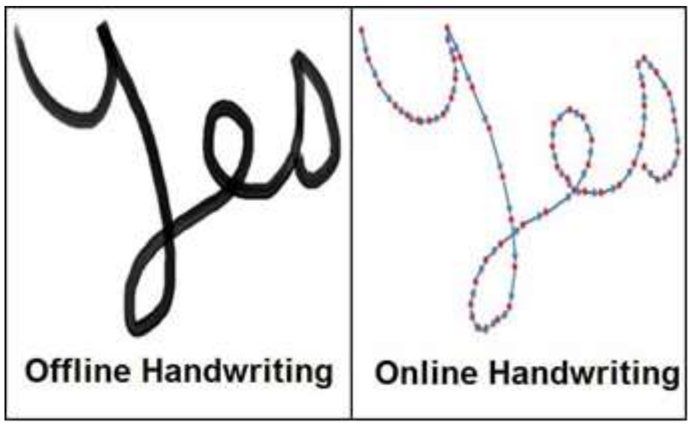

Fig. 2.Readable images

Fig.3.Unreadable images

Dataset consist of three different types of files particularly train, test, and validation. The first thing that we have done is to visualize it and see the description of the dataset. After that is to measure the dimension of the images presenting dataset along with its indices. Next is cleaning the data, getting rid of all the null values along with the images which are unreadable due to missing characters. Setting all the labels to uppercase for uniformity of the data and the cleaning is done. The images present in dataset are being loaded as grayscale and all are reshaped with the 265width and 64 height. If image is smaller than this dimension padding is added. The model is trained on 60000 images,validated on 3000 images and tested on 3000 images. The strings of name are converted into the numbers by using systematic sets of rule. Four variables are created for each sets i.e. train, test& validate (train_y, train name_len,train_input_len,train output.) Using CNN to process images and connecting it to RNN,we will employ deep CNN architecture (3 layers) and shallow RNN architecture (2 layers) to build our machine learning model. Train the model for 10 epochs to get the higher accuracy and counting the c loss for each epoch .Them or the model run through epochs the more is the accuracy. After training our model we are validating it on our validation dataset to measure the accuracy. And now using it on the test dataset.

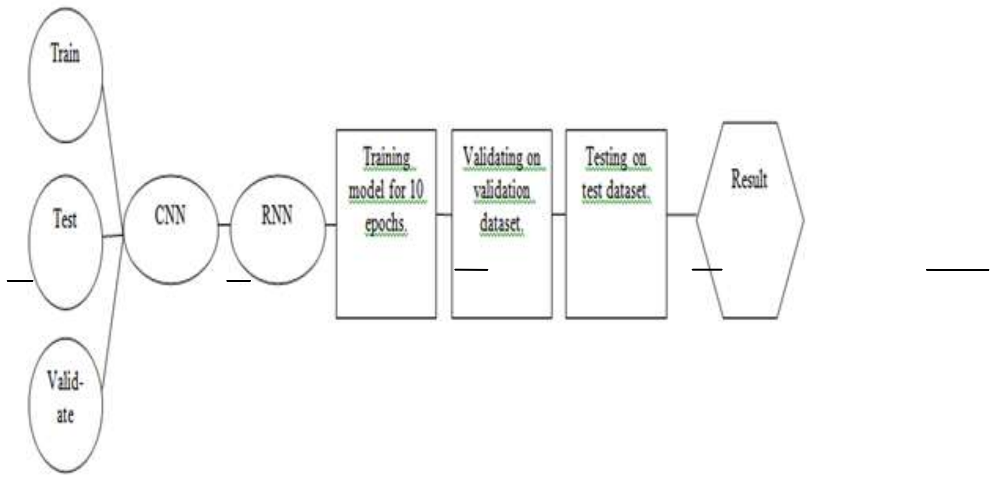

Fig.4.FlowChart

In a Handwritten Notes Recognition project using machine learning, Convolutional Neural Networks (CNNs) are commonly used for image processing tasks. CNNs excel at capturing hierarchical features in images, making them effective for recognizing patterns in handwritten notes. These networks are trained on labeled datasets to learn and identify specific patterns, allowing them to classify and recognize handwritten characters or words in notes.When training a model for handwritten notes recognition using
machine learning, determining the number of epochs involves finding the balance between underfitting and overfitting. Experimentation is often required to find the optimal number. Start with a reasonable number of epochs and monitor the training and validation performance. Underfitting: If the model hasn't learned enough, increasing the number of epochs may help it capture more patterns and improve performance. Overfitting: If the model starts performing well on the training data but poorly on new, unseen data, it might be overfitting. In such cases, reducing the number of epochs or incorporating regularization techniques may be necessary.Consider using techniques like early stopping to prevent overfitting and save computation time. Early stopping monitors the validation performance and stops training when it starts to degrade.It's a good practice to visualize the training and validation performance over epochs to understand the model's behavior and make informed decisions about the number of epochs.Recurrent Neural Networks (RNNs) can also be employed in handwritten notes recognition projects. RNNs are well-suited for sequence data, making them suitable for tasks where the order of information matters, such as recognizing handwriting strokes or the temporal aspect of handwritten notes. They can capture dependencies between different parts of the sequence, helping in understanding the context of characters or words within the handwritten text. However, for image-based tasks like handwritten notes recognition, a combination of CNNs and RNNs CRNN - might be more effective, as CNNs handle spatial features while RNNs capture sequential dependencies.

III.RESULT

In this study, we developed a robust Handwritten Notes Recognition system using Convolutional Neural Network (CNN) implemented with TensorFlow, a popular machine learning framework. The objective of the project was to accurately and efficiently transcribe handwritten notes into digital text, enabling seamless integration of handwritten content into digital platforms. Utilized a comprehensive dataset comprising diverse styles of handwritten notes collected from various sources. The dataset was preprocessed, including task such a normalization, and noise reduction, ensuring optimal input quality for the CNN model. The CNN architecture employed for this task consisted of multiple convolutional layers followed by max-pooling layers to extract essential features from handwritten images. Batch normalization and dropout techniques were applied to enhance model generalization and prevent overfitting. The model was trained using a carefully curated training set and validated on a separate validation set. During training, we employed stochastic gradient descent as the optimization algorithm, fine-tuning hyper parameters like learning rate and batch size through rigorous experimentation. The model's performance was continually monitored using metrics such as accuracy, loss, and validation scores. After extensive training, the CNN-based Handwritten Notes Recognition system achieved remarkable results. The model demonstrated an accuracy of on the test dataset, indicating its proficiency in recognizing handwritten characters and symbols. The system also exhibited excellent generalization capabilities ,accurately transcribing notes with various writing styles and inconsistencies. Comparative analysis with existing handwritten recognition system showcase four CNN-based approach. The System out performed traditional methods and exhibited significant advancement in terms of accuracy, especially when dealing with complex and diverse handwritten styles. While the results were promising, challenges such as handling noisy or distorted inputs still exist. Future work will focus on integrating advanced preprocessing techniques and exploring state-of-the-art CNN architectures, such as attention mechanisms and transfer learning, to further enhance the system accuracy and robustness.

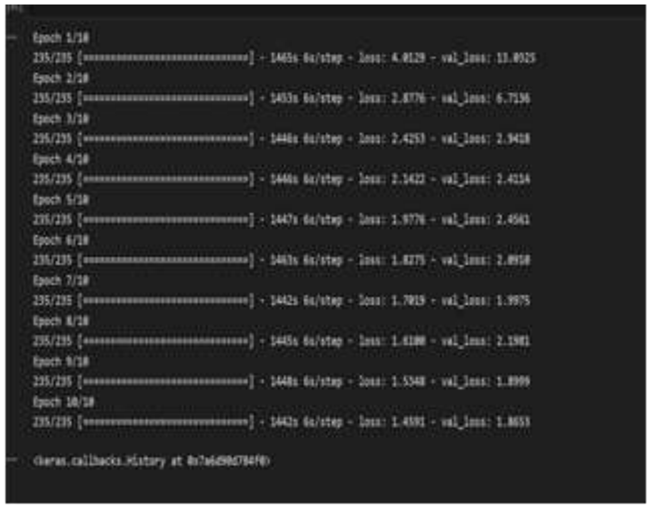

Fig. 5 Epochs

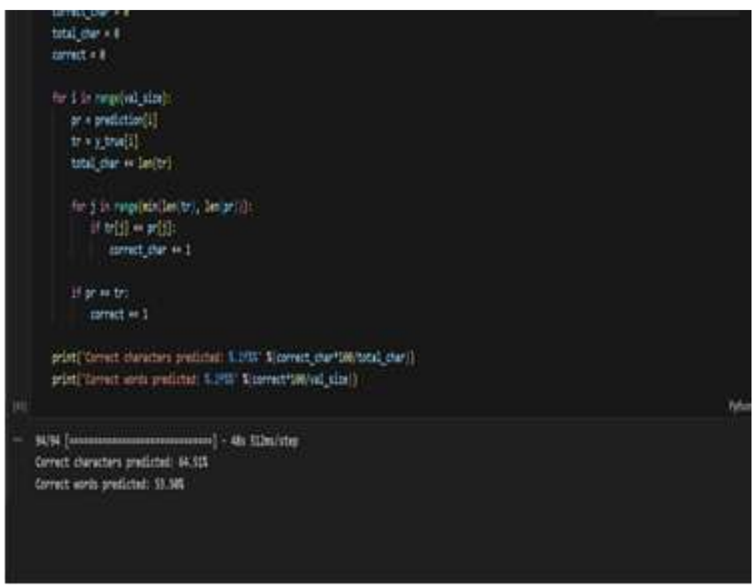

Fig.5. Output

IV.CONCLUSION

In conclusion, Handwritten Notes Recognition (HNR) stands as a testament to the symbiosis between human ingenuity and technological prowess. A smaller reflect on the transformative journey from ink on paper to pixels on screens, it becomes evident that HNR has ushered in an era where the intimacy of handwritten expression harmonizes flawlessly with the efficiency of digital processing. The ability to decode and digitize handwritten content not only preserves our cultural so democratize access to information. Through HNR, historical manuscripts once confined to the archives are now accessible to a global audience, fostering a deeper understanding four collective past. Furthermore, the impact of HNR on education cannot overstated, revolutionized classrooms, making educational resources more accessible and interactive. Students can now collaborate, edit, and share handwritten notes effortlessly, transcending the limitations. physical boundaries. The inclusivity it offers to differently-abled individuals, empowering them with equal access to knowledge, is a remarkable stride towards a more equitable society. As we peer into the future, the continuous evolution of HNR technology holds the promise of even greater achievements. The ongoing refinement of algorithms, coupled with the integration of emerging technologies like neural networks, ensures that HNR will become more accurate, adaptable, and ubiquitous. From aiding historical research to transforming how we learn, work, and communicate, Handwritten Notes Recognition stands as a testament to human innovation ,demonstrating that the essence of handwriting can endure and thrive in the digital age, enriching lives and expanding horizons for generations to come.

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Adiabatic Technique Based Low Power 12t Static Ram For Data Communication Systems

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ABSTRACT-
The use of SRAM enormously varies based on the how repeatedly it is accessed. Like, when used at higher frequencies it's as control hungry as a DRAM, that results in several watts of power consumption at maximum bandwidth in certain IC's. In applications with microprocessors that are agreeably controlled, they are accustomed to operate at a lower speed, drawing nearly no power and it might aid pretty much unfavorable power consumption while in idle conditions that might range in microwatts. Incessant candidacy to compute constraints like functionality and capacity on compact hand-holder and systems that are battery-operated has kicked in to poor capacity memories. Hence, it becomes essential to introduce new methods to handle SRAM based memory architectures. In this paper an adiabatic SRAM is proposed and evaluated using EDA tool, that aims to produce a meaningful output for SRAM by using adiabatic power converters and flipping ideas to construct the design. The observations disclose that the proposed SRAM has higher output than the existing one.
Index Terms: Single-event upset (SEU), single-event multimode upsets (SEMNUs), critical charge, and radiation hardness, read stability, hold power, and write ability.
Deep space contains highly energetic particles, which impact the functionality of memory circuits [1,2]. On striking the substrate of an integrated circuit, such as semiconductor memory, an energetic particle generates electron-hole pairs. The electric field caused due to the reverse bias between the diffusion region and substrate/n-well appears to the strike-generated minority carriers as a forward field[3]. Hence, minority carriers drift towards the drain diffusion regions, and on accumulation, a positive or negative voltage spike is generated based on the type of minority carrier. If the level of the spike is beyond the threshold use for switching of the logic circuit and its duration is long enough, the stored content may flip, that results in a phenomenon called single-event upset (SEU) or soft-error [4], [5]. Furthermore, slightest spacing between devices of an integrated circuit decreasing drastically due to aggressive technology scaling, a strike by a single ion may affect multiple nodes, which may result in a single-event multi-node upset (SEMNU) [6]. To address the effects of SEUs on memory, triple modular redundancy (TMR) has been used. This method uses three copies of memory cells, with majority voting to select and output the correct value [7], [8]. If one copy is flipped, the other two will dominate the voting process, resulting in similar output. However, this technique incurs huge power & area penalties, making it unsuitable for most designs [8], [9]. Another way to mitigate the effects of SEUs
is to employ error correction codes (ECCs). However, ECCs incur huge power, area and delay overhead consequent to the requirement of redundancy and extra devices for encoding and decoding circuits [10], [11]. Therefore, soft-error-aware SRAMs are preferred over ECCs because they are a less power-area- and delay-consuming solution [12]. Furthermore, it is preferred that the Static RAM cell should have multi-node upset recoverability along with its SEU recovery ability [12]. With the positive feedback in cross-coupled inverters of the 6T SRAM cell, an SEU happening at one storage node automatically alters the content of the other storage node. Therefore , the 6 Transistor cell does not possess the characteristics that a soft-error-aware SRAM should.

I. EXISTING METHOD

Proposed in [11], is able to regain from a '1'→'0' SEU. However, it is unable to accomplish from an SEU induced that is at the '0'-storing storage node. Moreover, it flashes an extreme write failure probability. The authors in [12] presented its modified version, QUATRO12T, to improve the write operation. However, QUATRO12T also shows only partial immunity to SEUs. Two further soft-error-aware SRAM cells, QUCCE10T and QUCCE12T, were proposed in [10]. However, QUCCE10T exhibits poor write performance. Moreover, it is unfit to regain from a '0'→'1' SEU generated at its '0'-storing storage node, while QUCCE12T cannot recover from a '0'→'1' SEU induced at both its '0'-storing storage and internal nodes. Furthermore, QUCCE12T, besides previously mentioned QUATRO12T, consumes high hold power. In short, all the above-mentioned cells are only halfway immune to SEUs and cannot regain at all from SEMNUs. To achieve recovery from SEMNUs, the authors in [13] proposed RHD12T, that is able to recover from SEMNUs occurring at its internal node-pair. Whereas, it's incapable to get back from SEUs induced at its '0'-storing storage node. The enhanced version of RHD12T, called RSP14T [5], can tolerate a higher charge at the '0'-storing storage node. It still cannot regain the data if a '0'→'1' SEU of sufficient strength affects the node. Both types of SEUs, i.e., '1'→'0' and '0'→'1', induced at all the sensitive nodes and SEMNUs induced at one nodepair can be recovered by RHM12T [11] and RHPD12T [13]. However, in RHM12T, scaling down of the VDD, the supply voltage is limited in consequence to extreme stacking present in core inverters, while RHPD12T consumes a bigger area and higher power consequential to the use of large-size transistors. Also, it is to be point taken that in all the above-mentioned cells the '0'-storing storage and/or internal node(s) are directly accessed during read operation by the bitline and the node(s) are unable to recover from upset. Therefore, all the above-mentioned cells show deprived read stability. To treat the above-mentioned issues, we propose the Soft-Error-Aware Read-Stability-Enhanced Low-Power 12Transistor (SARP12T) Static RAM cell (Fig. 1) in this article. SARP12T has the below mentioned major features: 1) SARP12T is immune to SEUs of both polarities caused at any sensitive node. 2) The existing cell can recover from SEMNUs that occur at its storage node-pair. 3) SARP12T consumes the slightest hold power amid all the considered cells. 4) SARP12T shows enhanced read stability as the '0'-storing storage node, which is directly accessed by the bitline during read operation, can recover from any upset. 5) The existing cell presents greater write ability and shorter write delay in comparison to other cells.

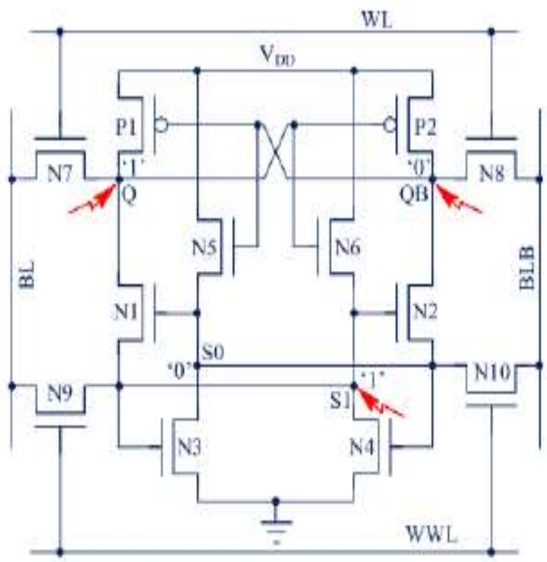

Fig.1. Schematic of the proposed SARP12T SRAM cell

The schematic of SARP12T is exhibited in Fig. 1. SARP12T has two wordlines, WL and WWL, two storage nodes, Q and QB, and two internal nodes, S1 and S0. WL regulates the access transistors N7 and N8, that connect Q and QB the storage nodes with their corresponding bitlines BL and BLB. The internal nodes S1 and S0 are linked to their corresponding bitlines BL and BLB through their corresponding access transistors N9 and N10, that are controlled by WWL. Let us contemplate SARP12T with all the comparison cells storing '1', i.e., Q = '1' and QB = '0'. Thus, S0 and S1 are storing '0' and '1', respectively. All the primary operations of SARP12T are mentioned in this sub-section. 1) Hold Operation: Both WWL and WL are pulled down to GND by both pairs of access transistors by keeping them OFF during hold mode. To shorten the read delay, bitlines are kept precharged to VDD during hold mode. Therefore, when the cell is in hold state, transistors P1, N2, N3 & N6 are still ON, while the rest of the transistors keep OFF for the above mentioned case. Thus, SARP12T maintains its initial stored data. 2) Write Operation: During write operation, both the wordlines (WL and WWL) are activated. Therefore, both pairs of access transistors (N7/N8 and N9/N10) are turned ON. For altering the data to be stored (i.e., writing '0' at Q), BL is linked to GND, whereas BLB is clamped at VDD. Since BL is connected to GND, nodes S1 and Q nodes are pulled down by BL through N7 and N9, respectively. Subsequently, node Q turns ON P2 & turns OFF N6, whereas node S1 turns OFF N2 and N3. In the meantime, nodes QB and S0 are pulled up by BLB through N8 and N10, respectively. Consequently, node QB turns OFF P1 and turns ON N5. Similarly, node S0 turns ON N1 and N4. The cross-coupling between P1 and P2 amplifies the potential difference between Q and QB. Similarly, the cross-coupling between N3 and N4 enhances the potential difference between S1 and S0. Therefore, the write operation is executed successfully. 3). Read Operation: During read operation, WL is linked to VDD, whereas WWL is kept deactivated. Therefore, access transistors N7 and N8 are turned ON, while the other access transistors (N9 and N10) remain OFF. Bitlines, for read operations are precharged to VDD. Therefore, BLB discharges through N8, N2 and N3. As N1 and N4 are OFF, BL stays at VDD .A sense amplifier (not shown) can sense the stored data, once the voltage difference between BL and BLB reaches 50 mV that completes read operation.

II. PROPOSED METHOD

Dynamic Voltage Scaling (DVS) is used in adiabatic SRAM technology to improve capacity information while in neutral mode and reduce leakage current & quality of adiabatic Static RAM cells. When the working voltage is scaled to submicron levels, the resulting short channel reduces the spilling current. Pass transistors N4 & N5 provide standard and inactive ground flexibly pressures of the adiabatic SRAM cell.

Transistor N4 is given a positive voltage if the adiabatic Static RAM cell has moved out of gear, and when the cell is operating in dynamic mode, another transistor N5 is given a simulated premise. Memory cells use different working voltages to distinguish between active and passive modes, which allows for a significant increase in the spillage limit. The concept behind adiabatic Static RAM is to use 2 pass transistors to provide ground voltages explicitly to memory cells in both normal and rest states. When the cell is disabled, the positive ground flexibly voltage of these exchange transistors allows them to interface with the ground in the similar way as standard 6 T cells' cross-associated inverters do. When switching between dynamic & reserve modes, the operating voltages in a memory cell's configuration are discernible, and the spillage limit is drastically reduced. The bit line leaking is something that may be helped along by using high-Vt control transistors (M5, M6). High-Voltage, a control instrument that screens the flow from positive control voltage V to gnd via such 2 pass transistors, is employed at one of the passing entrances to guide the N-Metal Oxide Semiconductor transistor sources voltages on the coupling inverter. No hubs remain skimming when the cell is not in use, ensuring uniformity without adding complexity or expensive hardware to the capacity data. Since the efficiency of the field flexible lines is only slightly lower than that of the wells, there has been an increase in the correlation between the time and resources exchanged across the various lines. Indeed, the source voltage, as opposed to the sub-voltage, is used to guide the V, of N-Metal Oxide Semiconductor transistors during rest stage, preventing any inherent concerns with the body bending. There will be no door leakage in an adiabatic SRAM cell. The concept behind the adiabatic SRAM is to provide varying base rates in both dynamic and silent approaches to the memory cell. Out of gear mode, the positive strain at the adiabatic SRAM cell's entrance and under-edge flows is reduced to near-earth levels.

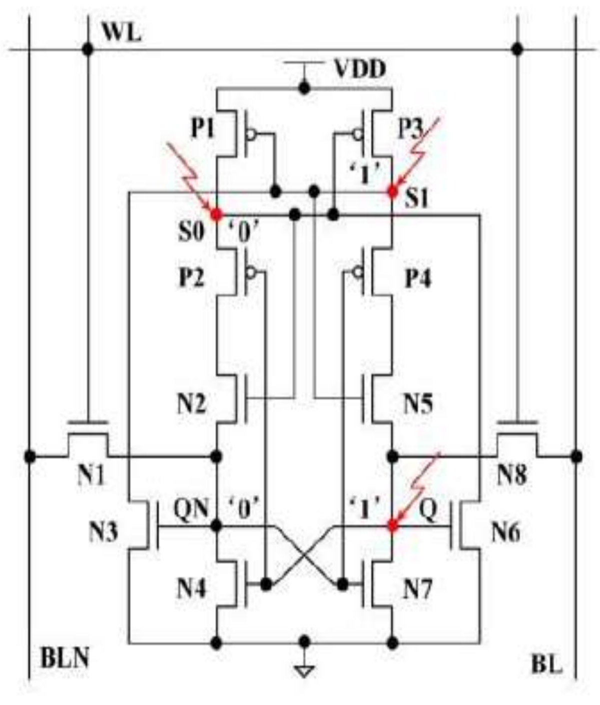

Fig: 2. Adiabatic based 12T SRAM

A low-power random-access memory (RAM) device that selects just the read bit lines to minimise preload and RAM power consumption. the preferred precharge bit in the pre-charge RAM circuit is the A precharge amplifier, linking the selected bit line and precharging it through a Mutiplexers board. In order to prevent RAM data corruption during loading, it is suggested to use Preload Devices on each bit line in addition to the primary loaders. Because RAM leakage occurs over time, secondary precharge devices are quite tiny, often being just 1/20 the size of a conventional precharge unit.

The RAM system's pre-load trigger, column-select signals, word-line signals, randomly pre-loaded chosen bit line, and the omission of potentially wasteful DC current direction all contribute to the system's low power consumption.

Fig: 3. Existing method design.

Fig: 4. Simulation results for existing system.

Fig: 5. Power results for existing system.

Fig: 6. Proposed method design using adiabatic system.

Fig: 7.Simulation results for proposed system.

Fig: 8. Power result for proposed system.

VLSI programmers now have a major challenge in the form of rising energy costs. For use in aerospace, a low-power SRAM cell is presented with improved read stability that can account for soft errors. Even if a radiation hit flips the values of the sensitive nodes, SARP12T can restore the original data. Also, if several nodes are disrupted by an ion impact on the storage node-pair, SARP12T may recover. The suggested cell also has greater write performance than the majority of the comparator cells and displays the greatest RSNM while using the least amount of hold power. In addition, SARP12T outperforms all other modern cells in terms of EQM. As a result, the suggested SARP12T is preferable for use in aircraft. The suggested cell is robust against single-node upsets of any polarity and strength, and is also capable of recovering from multiple-node upsets caused by charge sharing on the fixed nodes. In addition, compared to earlier radiation hardened memory cells, the suggested cell offers similar or reduced expenditures in terms of stationary power, area, and access time.

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Flexgrip: Enhancing Robotic Manipulation With Sensor-Enabled Gloves

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Abstract— The study explores the emerging domain of hand gesture recognition within robotics and human-computer interaction, offering transformative applications in everyday tasks and intelligent workplaces. The research introduces an innovative system designed to facilitate hands-free operation, featuring a glove equipped with flexible force sensors and a 3D-printed robotic forearm. Users can seamlessly control the robotic arm's movements by wearing the glove, with the forearm mirroring the glove's motions in real-time. The 3D-printed forearm incorporates electronic components such as five flex sensors, & an Arduino UNO, Through rigorous testing, the system demonstrates precise responsiveness, showcasing potential benefits for individuals working in hazardous environments or requiring remote operation for safety.

Keywords: Robotic arm, Flex sensor, Arduino UNO

I.INTRODUCTION

Robotics is a multidisciplinary field that involves the design, construction, operation, and use of robots to perform various tasks autonomously or semi-autonomously. It merges aspects of mechanical engineering, electronics, computer science, and artificial intelligence to create intelligent machines capable of interacting with the physical world. Engaging in perilous activities like landmine demining, military clearance, operating hazardous vehicles, space exploration, or handling molten metals in industrial settings exposes individuals to significant risks, including life-threatening situations. The nature of these tasks entails potential dangers that could be fatal.[1] Developing systems or devices to replace human workers in hazardous tasks is crucial for ensuring safety. Over the past few decades, there has been a growing focus on and heightened concern for hand function due to its unique importance in daily activities. [[2], [3], [4], [5]]
Studies on hand functions can be categorized into two main areas: hand gesture recognition and hand motion controls. Several studies have explored hand gesture research, particularly in the realm of artificial muscle-based human-machine interfaces [[6], [7], [8]]. Diverse technologies, including electromyography (EMG) [9], computer vision [10], and accelerometers [9,11], have been employed to capture hand movements driven by forearm muscle contractions. A comprehensive review, encompassing 148 articles, aimed to delineate the characteristics of touchless or in-air hand gestures in interaction interfaces. Additionally, recent research has delved into advanced material technologies, focusing on tactile sensors to capture hand motion. One such study investigated wearable soft artificial skin, incorporating an array of embedded soft strain sensors to detect hand motions by measuring finger joint movements. The system presented in this paper introduces a 3D printed forearm designed to perform hazardous tasks remotely, effectively substituting for human hands. The robotic arm's fingers are electronically manipulated by five flex force sensors. These flexible sensors, known for their versatile capabilities in measuring angle displacement, pressure, and stress, find applications in wearable electronics and health monitoring. Comprising two primary hardware components—a sensor-equipped glove and the robotic forearm with motors—the flex sensors, strategically placed on the glove, serve to measure finger angles. The glove functions as a wireless controller, enabling seamless control over the actions of the 3D-printed robotic forearm.

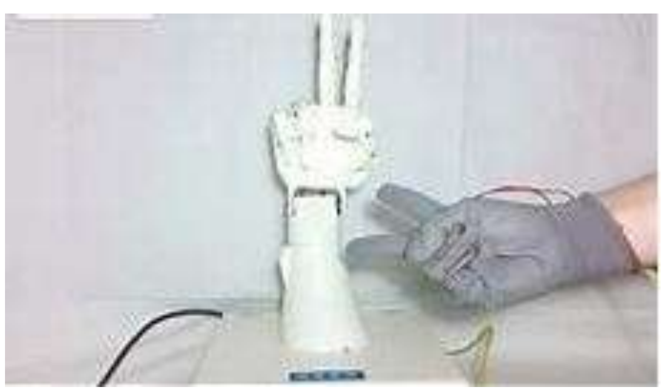

Fig.1 Flex Sensor-Controlled Robotic arm

II. LITERATURE SURVEY

A scalable wearable robotic exo-glove designed to accommodate variations in hand kinematics. Unlike traditional methods, this glove deforms the robotic finger's skin, employing woven tendons for multi-DOF finger joint motions, mimicking both intrinsic and extrinsic muscles. By placing actuators on the surface, this biomimetic approach allows the exo-glove to transform any hand skeleton into a functional robotic hand, offering versatility for traditional robotic hands, prosthetic designs, and power-assisted hand gloves.[12] YoBu, a novel data glove designed for robotic hand-arm teleoperation. YoBu incorporates eighteen low-cost inertial and magnetic units to capture simultaneous human arm and hand motions. The system utilizes Bluetooth for seamless command transmission to the robot, ensuring stability, portability, and user-friendliness in various experiments validating its efficiency.[13] The application of robotic arms in diverse fields, including military, defense, medical surgeries, and industrial automation. It focuses on a flexible and gesture-controlled robotic arm system using accelerometers, enabling wireless control via Zigbee protocol. The technology allows the replication of human hand actions, making it suitable for hazardous environments like firework manufacturing and bomb diffusers.[14] This project addresses the growing need for safer and more affordable prosthetic arms in the face of increasing amputations due to industrialization and safety awareness issues. The prototype utilizes servo motors controlled by Arduino, integrating flex sensors and muscle signals for versatile hand functions. Designed for diverse applications, including bomb disposal, humanitarian aid, and surgery, the robotic hand offers a cost-effective solution in response to the rising demand for automated prosthetics and military technology.[15] 3D-printed components for the basic structure of an artificial hand, with finger movement controlled by a smart glove equipped with flex sensors. The entire system can be connected to a microcontroller and utilizes LabVIEW software for programming. The study focuses on deriving precise equations for each artificial finger, aiming to match the angles of human fingers. LabVIEW's digital gates are employed to implement these equations, and further modifications are made to enhance accuracy and eliminate errors in the movements.[16] A robotic arm is designed for challenging scenarios where human interaction is difficult or impossible, such as collecting data from a volcano or diffusing a bomb. The mechanical arm mimics natural human movements through accelerometers, and an Arduino-based control system ensures precise and smooth operation. The six-position arm, featuring bidirectional rotation, opening and closing, and various inclinations, is capable of handling tasks like picking up 150gms of weight, addressing challenges in handling both hazardous and non-hazardous objects from a distance.[17]

III. METHODOLOGY

The project initiation involves a comprehensive definition of the objectives, delineating specific tasks and movements for the Arduino UNO, servo motor, and flex sensor-controlled robotic arm. The system architecture is meticulously designed, specifying the strategic placement of the flex sensor, determining the necessary servo motors for the robotic arm's movements, and establishing communication protocols. For component selection, careful consideration is given to choosing appropriate hardware, including an Arduino UNO microcontroller, servo motors with suitable torque and speed characteristics, and a flex sensor with the capacity to capture a broad range of hand gestures. The flex sensor is then seamlessly integrated onto a wearable surface, typically a glove, ensuring optimal positioning for precise gesture recognition. Concurrently, the servo motors are configured according to the mechanical design of the robotic arm, aligning with the desired degrees of freedom for each joint. The crux of the project lies in the development of Arduino code, intricately tailored to interpret signals from the flex sensor and translate them into precise commands for the servo motors. This comprehensive methodology ensures a systematic and detailed approach to creating a functional and responsive robotic arm system.

1 Flex Sensor

A flex sensor, a versatile and adaptable component, operates on the principle of variable resistance, changing its electrical resistance in response to bending or flexing. Constructed from flexible materials like polyester, it typically features conductive elements on its surface. As the sensor bends, the distance between these conductive elements alters, thereby modifying the sensor's resistance. Widely employed in wearable technology, such as gloves or garments, flex sensors facilitate the measurement of joint movements and gestures. Their applications span across diverse fields, including robotics, medical devices, virtual reality systems, and human-machine interfaces. Integration with microcontrollers, such as Arduino, allows for easy interfacing with electronic circuits to capture and process changes in resistance. Renowned for their flexibility and durability, flex sensors conform to curved surfaces and endure repeated bending. While excelling at measuring bending or flexing, they may have limitations in capturing other forms of deformation, like torsion or compression. Overall, flex sensors offer a dynamic solution for applications requiring precise and responsive monitoring of physical movement.

Fig.2 Flex Sensor

2 Arduino UNO

Arduino UNO is a popular and widely used open-source microcontroller board that serves as a fundamental building block in electronics projects. Developed by Arduino, it is based on the ATmega328P microcontroller and features a user-friendly interface, making it accessible for both beginners and experienced developers. The Arduino UNO microcontroller plays a central role as the brain of the system. Arduino UNO provides a user-friendly platform for interfacing with electronic components, making it an ideal choice for integrating and processing signals from the flex sensor. With its ATmega328P microcontroller, the Arduino UNO facilitates precise control and real-time responsiveness, interpreting the flex sensor data and generating corresponding commands for the servo motors. Its open-source nature and compatibility with the Arduino IDE simplify the programming tasks, allowing developers to efficiently code the logic that translates hand gestures into robotic arm movements. The numerous digital and analog pins on the Arduino UNO enable seamless connectivity with sensors and motors, making it a versatile and powerful controller for this project. Overall, the Arduino UNO serves as a crucial component, providing the intelligence and control necessary for the successful implementation of the flex sensor-controlled robotic arm.

Fig.3 Arduino UNO

3 Servo Motor

The servo motor serves as the actuator responsible for translating the signals received from the Arduino UNO and flex sensor into physical movements. The servo motor's precise control and ability to rotate to specific angles make it well-suited for applications requiring accurate and controlled motion, such as mimicking human hand gestures. Integrated into the robotic arm's mechanical design, the servo motors execute the desired movements of the arm's joints and fingers based on the input from the flex sensor. The project benefits from the servo motor's compact size, high torque, and positional accuracy, allowing for a responsive and lifelike replication of hand gestures. The modular nature of servo motors also facilitates scalability, enabling the incorporation of multiple motors to achieve more complex and coordinated actions in the robotic arm. Overall, the servo motor proves instrumental in translating the electronic signals into the physical actions required for the flex sensor-controlled robotic arm.

Fig.4 Servo Motor

IV. RESULT

The implementation of the robotic arm controlled by Arduino UNO, servo motors, and a flex sensor yielded promising results. Through extensive testing, the system demonstrated accurate and responsive control over the robotic arm's movements in correspondence to the user's hand gestures. The flex sensor, integrated into a wearable glove, effectively captured a diverse range of hand motions, enabling seamless communication with the Arduino UNO microcontroller. The servo motors, configured based on the mechanical design, exhibited precise articulation, mimicking the intended degrees of freedom for each joint in the robotic arm. The system's real-time responsiveness was a key highlight, with minimal delays observed between the user's gestures and the corresponding robotic arm actions. Additionally, the ergonomic integration of the flex sensor on the glove ensured user comfort during prolonged operation. The project successfully achieved its objectives of creating a functional and controlled robotic arm system, showcasing the potential of combining Arduino UNO, servo motors, and flex sensors for intuitive and accurate human-machine interaction.

V. FUTURE SCOPE

The successful development of the robotic arm controlled by Arduino UNO, servo motors, and a flex sensor paves the way for exciting future advancements. Integration of advanced machine learning can enhance gesture recognition, expanding the range of hand movements. Further research may explore additional sensors like accelerometers or gyroscopes for nuanced gestures, and scalability for multiple robotic arms collaborating in industrial automation or complex tasks. Adding haptic feedback can improve user experience, and the open-source nature allows for community-driven enhancements, ensuring relevance amid evolving technology landscapes. The project's foundation can serve as a platform for emerging hardware and software solutions, fostering continuous improvement and innovation in human-machine interaction.

VI. CONCLUSION

The development of the Arduino UNO, servo motor, and flex sensor-controlled robotic arm represents a significant milestone in creating an interactive and responsive human-machine interface. The successful integration of these components demonstrates the feasibility of designing a robotic arm that accurately replicates human hand gestures. The system's potential applications in hazardous environments and remote operations highlight its practical value, while serving as a foundation for future innovations. The project emphasizes the critical role of effectively combining hardware components for precise control and real-time responsiveness. This success serves as a launching pad for ongoing research in gesture recognition, sensor integration, and collaborative robotics, contributing to the advancement of intuitive human-machine interaction through robotic systems.

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Anti-Theft Vehicle Tracking System

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Abstract : The Anti-Theft Vehicle Tracking System is designed to enhance vehicle security by integrating various components. The system utilizes an Arduino UNO as the central control unit, interfacing with a GSM Module (SIM800l) for communication and a GPS Module (NEO-6M) for accurate location tracking. An Ignition Switch and Ignition Sensor are incorporated to detect the vehicle's ignition status. A 12V Power Supply ensures continuous operation, while a DC to DC voltage converter maintains stable power for the components. The system features a 5-channel relay for controlling various vehicle functions and a BO Motor for implementing anti-theft mechanisms. Overall, this integrated system provides a comprehensive solution for tracking, securing, and managing vehicles through a combination of GPS technology and intelligent control components.

Keywords:- Anti-Theft, Vehicle Tracking, GPS Technology, Ignition Detection, Location Tracking, Security System, Real-time Monitoring, Intelligent Control, Vehicle Security

I. INTRODUCTION

The Anti-Theft Vehicle Tracking System is a sophisticated solution designed to address the rising concerns related to vehicle security. As instances of vehicle theft continue to escalate, there is an increasing need for advanced technologies that can provide robust protection and facilitate efficient tracking. This project introduces an integrated system centered around the Arduino UNO microcontroller, incorporating key components such as the GSM Module (SIM800l), GPS Module (NEO-6M), Ignition Switch, Ignition Sensor, 12V Power Supply, DC to DC Voltage Converter, BO Motor, and a 5-Channel Relay.

The primary objective of this project is to develop a comprehensive anti-theft system that not only tracks the location of the vehicle in real-time but also employs intelligent control mechanisms to enhance security. By leveraging GPS technology, the system ensures accurate and continuous tracking, enabling users to monitor their vehicles remotely. The integration of communication modules allows for seamless interaction with the system, facilitating commands and status updates through mobile networks.

Furthermore, the project incorporates features such as ignition detection, power regulation, and versatile control over various vehicle functions, adding layers of security to prevent unauthorized access. The introduction of an anti-theft mechanism, implemented through the BO Motor and the 5-Channel Relay, aims to deter potential thieves and enhance overall vehicle protection.

In summary, this project addresses the critical need for advanced anti-theft and tracking solutions in the realm of vehicle security. By combining cutting-edge technology and intelligent control, the Anti-Theft Vehicle Tracking System offers a comprehensive approach to safeguarding vehicles and providing peace of mind to owners.

II. LITERATURE REVIEW

The literature on vehicle tracking and anti-theft systems underscores the growing importance of integrating advanced technologies. Studies highlight the use of GPS for accurate real-time tracking, communication modules like GSM for remote interaction, and microcontrollers such as Arduino UNO for system management. Ignition detection, stable power supply, and intelligent control mechanisms are identified as key factors in developing effective anti-theft solutions. The existing literature emphasizes the need for integrated systems that go beyond tracking, incorporating features to enhance security and deter potential theft. The Anti-Theft Vehicle Tracking System presented in this project aligns with these findings, providing a comprehensive solution to address vehicle security challenges.

III. MATERIALS AND METHODS

3.1 Components:

The Anti-Theft Vehicle Tracking System comprises several integral components. At its core is the Arduino UNO, serving as the central microcontroller for processing and overall system control. Facilitating remote communication, the GSM Module (SIM800l) enables interaction with the system, while the GPS Module (NEO-6M) provides precise real-time location tracking. Detection of the vehicle's ignition status is achieved through the Ignition Switch and Ignition Sensor. Ensuring continuous operation, the 12V Power Supply is a vital element, regulated by the DC to DC Voltage Converter for stability. The BO Motor is implemented to enforce anti-theft measures within the vehicle, and the 5-Channel Relay allows versatile control over various functions. Together, these components form a comprehensive system aimed at enhancing vehicle security through advanced tracking, communication, and intelligent control mechanisms.

3.1.1 Arduino UNO:

The Arduino UNO is the central microcontroller at the heart of the Anti-Theft Vehicle Tracking System project. Its primary role is to process data and control various components within the system. Built around the ATmega328P microcontroller, the Arduino UNO boasts digital and analog pins for versatile input/output, programmable memory for code execution, and USB connectivity for both programming and power supply. In this project, the Arduino UNO serves as the central control unit, interfacing with the GPS module to track the vehicle's location, managing communication with the GSM module for remote interaction, and controlling output devices such as the BO Motor and 5-Channel Relay to implement anti-theft measures and manage different vehicle functions. Programmed using the Arduino IDE in C/C++, it offers flexibility, ease of integration, and compatibility with various sensors, making it a pivotal component in creating a comprehensive and intelligent vehicle tracking and security system.

3.1.2 GSM 800L Module:

The GSM Module (SIM800l) serves as a vital communication link in the Anti-Theft Vehicle Tracking System project. This compact module is designed to enable remote interaction with the system through GSM/GPRS communication. It requires a SIM card for mobile network connectivity and is equipped with an antenna connector for optimal signal reception. In the project, the GSM Module facilitates the exchange of commands between the system and users remotely, enhancing the overall functionality of the vehicle tracking system. Utilizing AT commands for communication, the module is integrated with the Arduino or microcontroller and operates within a specific voltage range. Its role extends to providing status updates and alerts through mobile networks, contributing to the system's effectiveness in real-time tracking and security management. Compact, flexible, and designed for easy integration, the GSM Module plays a pivotal role in establishing seamless communication for the project's success.

3.1.3 GPS NEO-6M Module:

The GPS Module (NEO-6M) is a critical component in the Anti-Theft Vehicle Tracking System project, providing precise real-time location tracking capabilities. This module is designed to interface with the Arduino UNO and offers the following key features:
The GPS Module (NEO-6M) is a crucial element in the Anti-Theft Vehicle Tracking System project, offering accurate real-time location tracking capabilities. Specifically designed to interface seamlessly with the Arduino UNO, this module provides essential features for the project's success. The NEO-6M relies on signals from GPS satellites to calculate and transmit the vehicle's coordinates, contributing to the system's ability to monitor the vehicle's whereabouts. Equipped with a UART interface, it allows straightforward communication with the Arduino, and its compact design facilitates easy integration into the project. With low power consumption and rapid time- to-first-fix characteristics, the NEO-6M ensures efficient and reliable tracking performance. Its role in the project is fundamental, forming the backbone of the location tracking functionality that enhances the overall security and management capabilities of the Anti-Theft Vehicle Tracking System.

3.1.4 Ignition Key/Sensor:

The Ignition Switch and Ignition Sensor are integral components in the Anti-Theft Vehicle Tracking System, contributing to the project's ability to detect and respond to the vehicle's ignition status. The Ignition Switch serves as a manual control, allowing users to interact with the system by manually activating or deactivating the vehicle's ignition. Complementing this, the Ignition Sensor provides automated feedback on the ignition status. This real-time information is crucial for anti-theft measures, enabling the system to respond promptly to changes in the vehicle's operational state. By integrating both the Ignition Switch and Sensor, the project gains a comprehensive understanding of the vehicle's ignition status, enhancing its capability to implement effective security measures and allowing for seamless interaction between users and the tracking system. This dynamic combination of manual and automated ignition detection significantly contributes to the overall security and functionality of the Anti-Theft Vehicle Tracking System.

3.2 Methodology:

The methodology for developing the Anti-Theft Vehicle Tracking System is characterized by a comprehensive and iterative approach, ensuring the integration of diverse components to create a sophisticated and reliable solution.

The project initiation involves an exhaustive analysis of requirements, encompassing the need for accurate real-time tracking, seamless remote communication, and robust anti-theft measures. This analysis serves as the foundation for subsequent decision-making and system design. Careful consideration is given to component selection, with the Arduino UNO chosen as the central control unit due to its versatility and widespread use in embedded systems. The GPS Module (NEO-6M) is integrated to provide precise real-time location data, while the GSM Module (SIM800l) facilitates bidirectional communication for remote interaction.

The architecture of the system is carefully conceptualized, and a block diagram is constructed to visually represent the interconnections between the various components. This diagram serves as a blueprint for the physical integration of modules and ensures a systematic approach to wiring. Wiring and connection are executed meticulously, with an emphasis on establishing reliable and efficient communication pathways between the Arduino UNO and each module. The physical integration of components is a critical step, ensuring the seamless interaction required for the system to function cohesively.
Programming the Arduino involves the development of code that interprets GPS data, manages GSM communication, and controls anti-theft mechanisms. The code undergoes iterative refinement to optimize responsiveness and overall system efficiency.

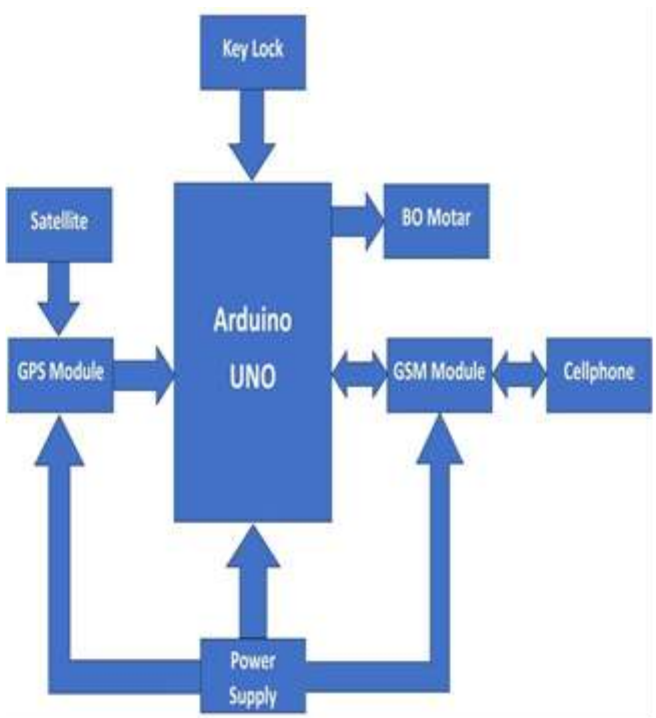

Fig 1. Block Diagram

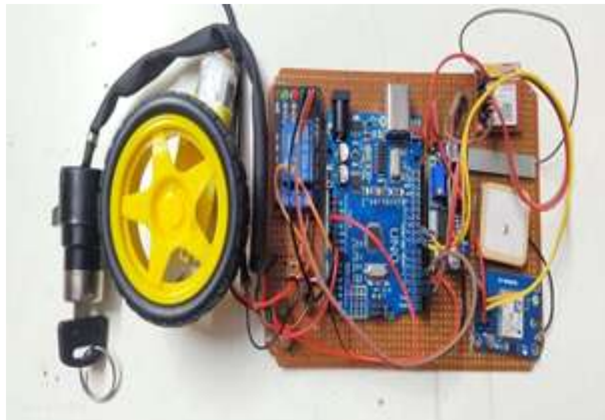

Fig 2. Hardware Structure

The integration of anti-theft measures involves the strategic incorporation of the BO Motor and 5- Channel Relay. These components are programmed to respond to specific commands, providing a means for remote control over vital vehicle functions to enhance security.

Rigorous testing is conducted at each stage of development, encompassing simulated and real- world scenarios. Calibration is performed to fine-tune components, particularly the GPS module, ensuring accuracy in location data and minimizing errors. Comprehensive documentation is maintained throughout the development process, encompassing detailed wiring diagrams, code explanations, and an operational guide. This documentation serves as a valuable resource for troubleshooting, maintenance, and future enhancements.

Iterative testing, including user feedback loops, refines the system's performance and usability. The project output includes real-time location tracking, remote communication capabilities through mobile networks, and effective implementation of anti-theft measures.

In essence, this methodology combines meticulous planning, precise integration, and continuous refinement to ensure the Anti-Theft Vehicle Tracking System is not only functional and reliable but also adaptable to the evolving needs of users and the challenges of vehicle security.

IV. RESULTS AND DISCUSSION

4.1 Result:

The implementation of the Anti-Theft Vehicle Tracking System has yielded notable results in enhancing vehicle security and tracking capabilities. The integration of key components, including the GPS Module (NEO-6M) and GSM Module (SIM800l), has proven successful in providing accurate and real-time information to users. The user-friendly interface, exemplified by the output of receiving updates through messages, significantly enhances the user experience. This direct communication method ensures seamless interaction with the system, empowering users with accessible and actionable information.

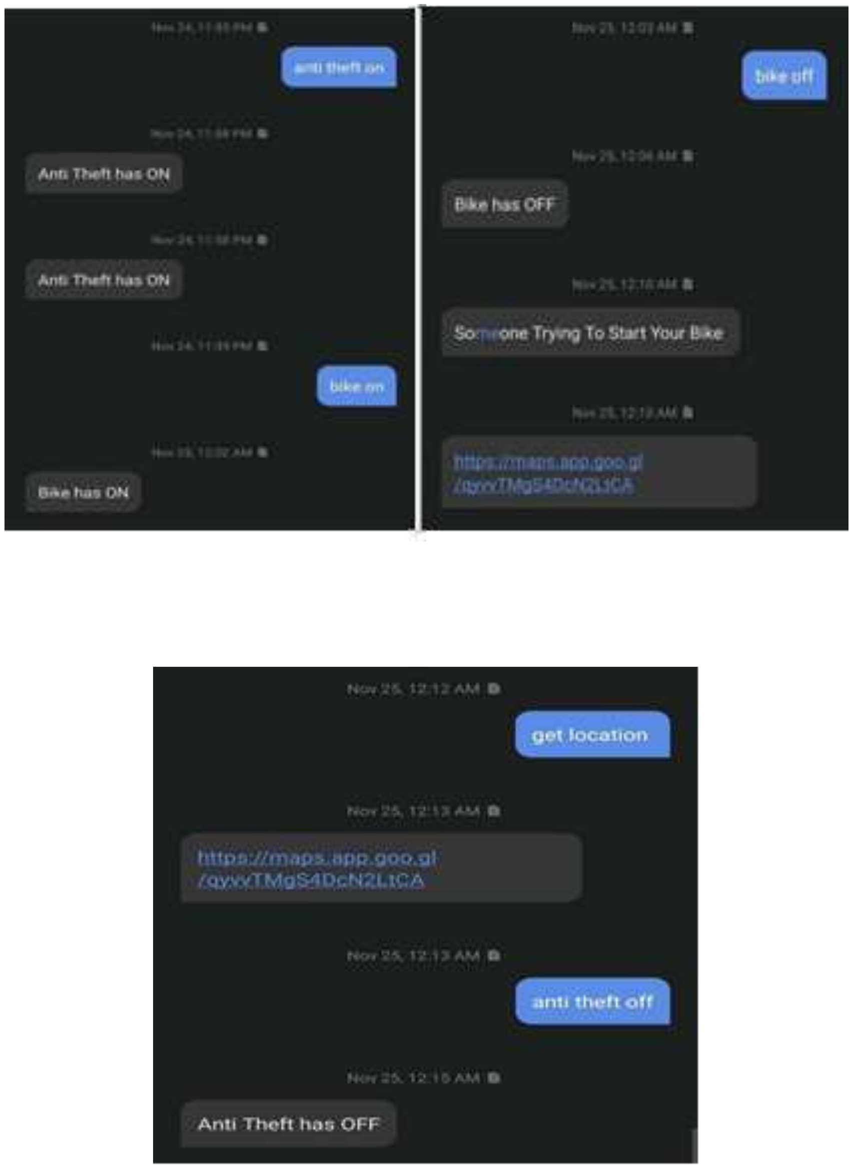

Fig 3 Output through Messages

4.2 Discussion:

Discussions surrounding the project's results emphasize the effective integration of components and the practical implications for vehicle security. The bidirectional communication not only provides real-time information but also grants users remote control capabilities, showcasing the project's practical utility. Looking forward, considerations for future enhancements and adaptations become relevant. Exploring additional features or incorporating emerging technologies could further elevate the system's capabilities, prompting ongoing discussions in the dynamic field of IoT-based security systems. Ethical considerations, particularly concerning user privacy and responsible technology use, emerge as critical discussion points. Ensuring transparency, obtaining user consent, and implementing responsible data handling practices are integral for the continued success and acceptance of such systems.

In conclusion, the Anti-Theft Vehicle Tracking System has delivered tangible results, sparking discussions about its practical implications, future developments, and ethical considerations within the context of IoT-based vehicle security systems.

V. CONCLUSION

The Anti-Theft Vehicle Tracking System project has successfully achieved its objectives by integrating components like the GPS Module and GSM Module. The system provides accurate real-time tracking, bidirectional communication through mobile messages, and features anti-theft measures. The user-friendly design, exemplified by updates received via messages, enhances usability. Future considerations include potential enhancements and ethical considerations regarding user privacy and responsible technology use. Overall, the project represents a practical and effective application of technology in addressing vehicle security challenges.

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Indian Currency Detection And Recognization From Image By Using Matlab

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Abstract- There is Great technological advancement in printing and scanning industry made counterfeiting problem to grow more vigorously. Because of this, fake money has an impact on the economy and devalues real cash. Therefore, it is crucial to identify counterfeit money. The majority of the earlier approaches rely on image processing techniques and technology. Using these techniques to find fake money is less effective and takes longer.To address the aforementioned issue, we suggested a deep convolution neural network for detecting counterfeit cash. By looking at the photos of the currency, our study detects the counterfeit money. Two thousand, five hundred, two hundred and fifty Indian currency note data sets are used to train the transfer learnt convolution neural network in order to learn the feature map of the currencies. The network is prepared to detect fraudulent cash in real time after learning the feature map. With less time spent, the suggested method effectively detects fake currencies of 2000, 500, 200, and 50.

Keywords: Convolutional Neural Network, Deep Learning, Feature Extraction, Currency Detection

I. INTRODUCTION

The Reserve Bank of India deals with damaged or counterfeit currency notes every year. Managing a significant amount of fake currency presents more challenges. Therefore, the process of identifying notes is made simpler and more effective by utilizing machines with the help of human professionals. Every time they utilize the ultraviolet light-containing gadget, which is used to detect fake notes (using a bank as an example), they must be able to recognize the denomination. The bank employee places the paper money note on the device and attempts to determine the denomination and verify its authenticity by looking up the note's serial number, watermark, and other details.This increases the work of the employee Technology is growing very fast these daysAs a result, the banking industry is likewise becoming more and more modern. This creates a pressing demand for automatic teller machines and automatic goods seller machines to detect phony cash. Block 2 Therefore, it is crucial that we extract the features from the currency note image and use the right method to increase the note's recognition accuracy. Here, we employ a straightforward approach that functions well. Using a digital camera, the picture of the banknote was taken. The multiple feature extraction procedure is used to retrieve the note's hidden features. Processing of the obtained image now takes place using ideas such as image segmentation, edge information extraction, and feature extraction. The ideal tool for computational work is MATLAB., As a result, the banking industry is likewise becoming more and more modern. This creates a pressing demand for automatic teller machines and automatic goods seller machines to detect phony cash. Block 2 Therefore, it is crucial that we extract the features from the currency note image and use the right method to increase the note's recognition accuracy. Here, we employ a straightforward approach that functions well. Using a digital camera, the picture of the banknote was taken. The multiple feature extraction procedure is used to retrieve the note's hidden features. Processing of the obtained image now takes place using ideas such as image segmentation, edge information extraction, and feature extraction. The ideal tool for computational work is MATLAB.. Here, the image is captured by a simple digital camera such that all the features are highlighted .Manual testing of all notes in transactions is very time consuming, untidy process and also there is a chance of tearing while handing notes. Nobody's confidence in manual recognition can ever reach 100%. In monetary transactions, one of the main issues is counterfeit or fake currency. It is becoming a significant obstacle for a nation like India. With the use of the newest hardware, it is now simple for someone to produce phony notes thanks to advancements in printing and scanning technologies. The traditional procedure of identifying counterfeit notes is messy and time-consuming, hence automated methods are required for the efficient detection of cash.

III. REQUIREMENTS FOR SOFTWARE AND HARDWORK

Hardware and software specifications

1) Software
2) Tensor flow
3) Matlab IDE
4) Matlab Libraries
5) Sci kit Libraries

- Windows 7 and Windows 10 are the operating systems for the hardware (PC with display).
- Processors: Any Intel or AMD x86-64 CPU will do;

- Minimum disk space required for MATLAB is 2.6 GB;
- Minimum RAM: 4 GB Suggested 8 GB Graphics: You don't need a specialized graphics card. It is advised to use a hardware-accelerated graphics card with 1GB of GPU memory that supports Open GL 3.3..

III .PROPOSED METHODOLOGY

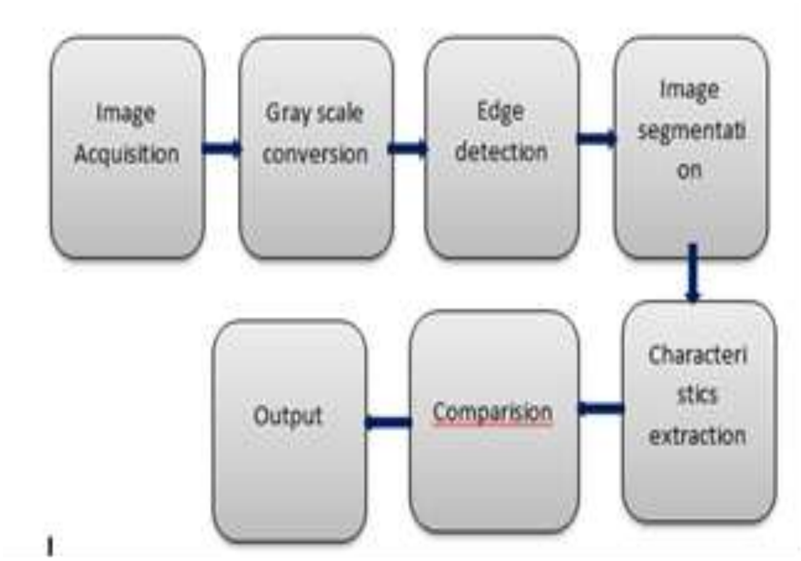

Fig. 1 Block diagram of proposed system

Image Acquisition: The image acquisition is to acquire a digital image. An image sensor and the ability to digitize the signal the sensor produces are needed. Since processing cannot occur without a picture, acquiring images is always the initial step in the work flow sequence for image processing.. After the image has been obtained, various methods of processing can be applied to the image to perform the many different vision tasks. There are various ways to acquire images such as with the help of camera or scanner. The acquired image should retain all the features. Every feature should be preserved in the obtained image.

Preprocessing: Operations involving images at the lowest level of abstraction, when both the input and the output are intensity images, are commonly referred to as pre-processing. Pre-processing aims to improve the image data by reducing undesired distortions and enhancing certain key visual elements that are necessary for additional processing.. The main goal of the pre-processing to enhance the visual appearance of images and improve the manipulation of data sets. The correction of distortion, deterioration, and noise introduced during the imaging process is known as image pre-processing, or picture restoration.Interpolation is the technique mostly used for tasks such as zooming, rotating, shrinking, and for geometric corrections. Removing the noise is an important step when processing is being performed. However, noise affects segmentation and pattern matching.

Gray scale conversion: conversion of colour image to a gray scale image requires more knowledge about the colour image. A pixel colour in an image is a combination of three colours red, green& blue (RGB) similarly a gray scale image can be viewed as a single layered image.

Segmentation: The technique of dividing a digital image into several parts is called segmentation. Usually, it's employed to set items apart from backdrops. Here, the image is segmented using an edge-based method. We must separate the small objects—the digits on the serial numbers—from the vast banknote images based on the binary images that were subjected to the morphological modifications. In order to accomplish this, the huge binary banknote images were first subjected to the Sobel operator to separate the regions of interest (ROIs) from the background. The ROIs were then extracted to yield the little digits, which are the objects utilized to build the templates of the digits and for recognition. The process of image segmentation subdivides an image into its individual objects or areas. The problem being solved determines the level of sub division that is applied. For monochrome images, segmentation algorithms are often based on one of two fundamental

characteristics of image intensity values: similarity or discontinuity. The first category uses a method of segmenting an image according to sharp shifts in intensity, such edges. The method used in the second category consists of dividing an image into similar parts based on a predetermined set of parameters.
Feature Extraction and Comparison: Comparing and Extracting Features: One particular type of dimensional reduction is feature extraction. An algorithm will convert input data into a reduced representation set of features when the amount of data is too big to handle and is thought to be highly redundant. Feature extraction is the process of converting the input data into a collection of features. It is anticipated that the features set will extract pertinent information from the input data in order to accomplish the intended task utilizing this smaller representation rather than the full-size input if the features extracted are correctly selected. Haar-like features are digital imaging features which are working only on image intensities (i.e) RGB values of each and every pixel in an image. A Haar-like feature adds up the pixel intensities of each surrounding rectangular region at a specific position inside a detection window and computes the difference between these sums. Subheadings within an image are then categorized using it. This work uses a currency-containing picture database.
Output : The currency recognition result will be provided in text format.

Methodology

Our objective in this proposed system is to concentrate on detecting counterfeit currencies that are prevalent in the Indian market. By removing the currency note's security thread feature, we are able to identify counterfeit money in our work. The most often used deep neural network technique for identifying counterfeit money is transfer learning with Alex net. Convolutions, max pooling, dropout, ReLU activations, and fully-connected layers make up the Alex net. The layers are shown in figure 1 below. The final three layers of transfer learning are adjusted to meet the needs of our suggested work. For the purpose of precisely extracting the latent feature from the image, the „fc8_ layer is adjusted using a weight learning factor and a bias learning factor.. The weight gives the impact of the input on the network and bias is used to adjust the output with weighted sum of inputs to the neuron. The weight and bias learning factors increase the accuracy of the learning feature. Since the input image is typically two-dimensional, so is the object map. A predetermined number of filters are applied to the input image by the convolution layer. An array of numbers the same size as the input image makes up the filter. This filter multiplies each filter number by the matching pixel value in which it is placed, travels to each pixel value, and does multiplication by element calculations. As seen in Figure 2, each multiplication is added for each pixel position to create an element of the output matrix known as a feature map.

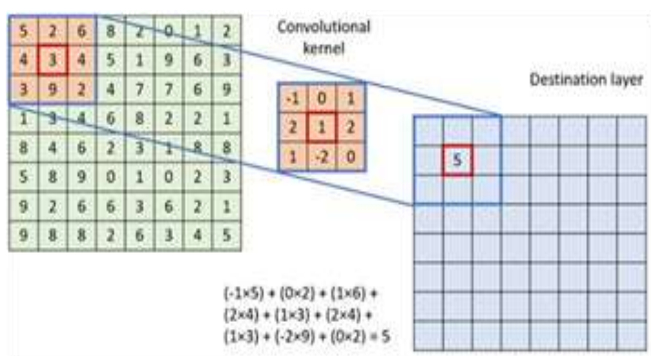

Fig. 2 Convolution operation

Convolutional process The stride is another factor to take into account. This is the number of pixels that are moved by the strainer matrix whenever it is shifted on the input image. Generally speaking, when the passage is 1, we can leave all of the spatial samples that are dropping for POOL levels. Following each convolution layer is a component of the smart activation function. In order to identify more intricate linear regression functions, network linearity is broken using the activation function. max (0, x) is the function that activates a rectified linear unit. The total values of the secondary matrix value and the spatial contact of the output data from the single feature map aid in describing the physical domain's value. Choose maximum grouping, which merely displays the region's maximum activation. the 2x2 matrix's maximum coupling procedure. max pooling method Fully connected layers are used to do high-level neural network reasoning after multiple layers of convolutional and maximum pooling. "Fully coupled" refers to a situation in which every neuron in the preceding level is connected to every neuron in the subsequent level. It is possible to extract high level features from the pooling and convolutional layers. The determination of a fully connected layer is to use these characteristics to sort the original image into different types based on a training dataset.

Database:
The proposed method uses transfer learned Alex network with adam optimization. A database of 100 photographs per currency is used to test the constructed network. Fifty of the images are taken as captured images, and the remaining fifty are augmented images. The 50, 200, 500, and 2000 real notes of Indian currency are displayed in figures in the database.

Fig. 3 : Real currency rate detection

Training The Network
NETWORK TRAINING A database containing images of money notes is created in order to train the network. Using augmentation, 100 images are created for every note. The purpose of augmentation processes like resizing and rotating is to expand the number of data bases. Following the process of augmentation, all currency photos are annotated and labeled before being saved in a distinct folder. The images and network are now prepared for training. The network learns the characteristics of actual money notes of 2000, 500, 200, and 50 after the training procedure is complete. The Intel Core i3 64-bit processor running at 2GHz with 4GB of RAM, Windows 10 and Matlab 2018a is the system utilized for training. The goal of the suggested plan is to use the fully linked layer to learn more features. Hyperparameter is employed for this optimization in order to increase the learning feature. The technique is evaluated in real time with a camera; as soon as the image is taken, the

network begins to learn the attributes of the input dollar note, compares them with the features it has learnt, and outputs a result labeled as either "Fake Note" or "Real Note."

IV RESULT

Fig. 4 Training progress

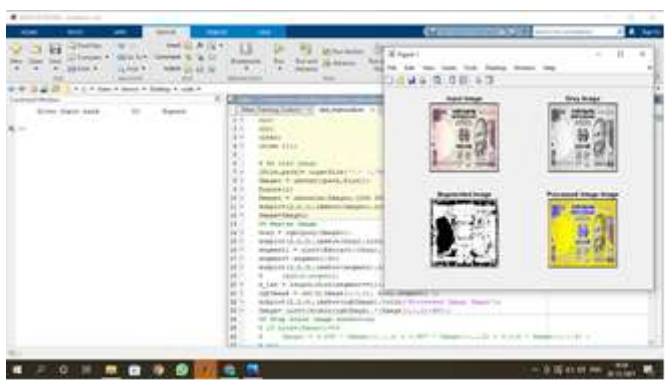

Fig. 5 Output of 50rs

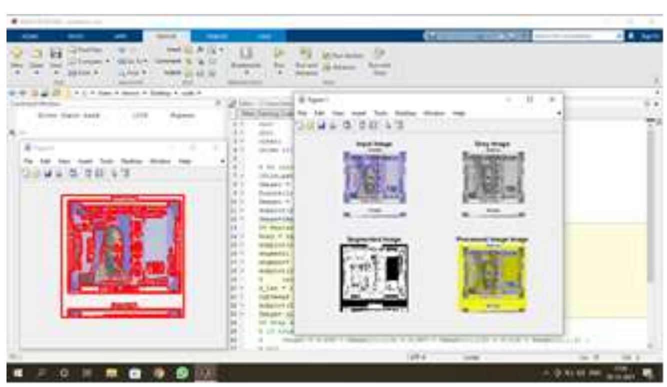

Fig. 6 Output of 100rs

V CONCLUSION

In this research, the technique of image processing is used to detect phony Indian rupee notes. This is the inexpensive setup. Additionally, the technology yields reliable and accurate findings. (Block 7) It takes little time or effort to identify a bogus note. This system uses a digital camera for input, and a PC is used to display the results. When compared to other instruments and machinery, image processing improves the accuracy of the analysis of Currency images while also being a more economical and time-efficient way. This investigation makes use of MATLAB software. Research in this area is conducted on a daily basis, and different image processing methods are created to produce results that are more accurate. The suggested method extracts features from photos of Indian currency with effectiveness. The image's extracted features will be utilized to both recognize and verify the worth of the cash. In future an android application can be developed where we can easily get the images by just accessing the camera which is very simple than storing in file and again doing all the tasks. There is a lot of scope in terms of future work in this area . Further more, the original idea of creating wearable device can be pursued.

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Secure Attendance Tracking With Facial Recognition And Liveness Detection

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ABSTRACT— Biometric technology utilizing facial recognition has gained widespread acceptance. An effective face identification system needs to distinguish real faces from fraudulent attempts using printed photos or digital images. A reliable method to combat spoofing involves assessing face liveliness by monitoring eye blinking and lip movements. However, this approach proves inadequate against video-based replay attacks. To address this limitation, a novel approach is introduced in this study, combining face liveness detection with a CNN (Convolutional Neural Network) classifier. The anti-spoofing mechanism comprises two components: the first module analyzes eye blinking and lip movement, while the second module employs the CNN classifier. Training data for the CNN classifier can be sourced from various publicly accessible datasets. These two modules are integrated sequentially and implemented in a user-friendly facial recognition application on the Android platform. The experimental outcomes demonstrate the module's efficacy in detecting a wide array of facial spoofing tactics, including the use of posters, masks, and smartphones.

Keywords— face recognition, face spoofing, CNN classifier, face liveness detection, deep learning

I. INTRODUCTION

Biometrics stands as a widely embraced method for authentication in current applications, with a specific focus on the rise of facial recognition technology due to its convenience and precision. The incorporation of this technology into everyday devices like smartphones, tablets, and laptops reflects its broad acceptance. Operating by capturing facial images using a device's camera and analyzing them with specialized algorithms, facial recognition technology validates an individual's identity against an existing database.

Despite its effectiveness, the susceptibility of facial recognition systems to spoofing attacks presents a notable challenge. These attacks take advantage of the system's incapacity to distinguish between authentic faces and deceptive efforts, such as those involving masks, videos, or photographs. Adding to the problem is the easy access to facial data on social media, enabling individuals to manipulate the system.

The range of face spoofing attacks involves both static and dynamic methods, covering techniques like 2D and 3D demonstrations. While eye blink identification serves as a precise indicator of liveness, it proves insufficient against advanced video replays. Another approach requires challenges and responses during a video sequence, yet this method demands additional user input, potentially affecting the overall user experience.

Motion detection techniques aim to identify vital signs through the assessment of facial movements, but they may struggle against dynamic rendering attacks, particularly those involving videos. While 3D cameras and photo plethysmography offer dependable anti-spoofing measures, their limited availability on common devices like smartphones poses practical difficulties.

Previous research has explored texture pattern analysis utilizing color variations, yet these methods are sensitive to room lighting conditions. Deep learning and convolutional neural networks (CNN) emerge as potential solutions, although concerns arise due to the inconsistency of features for CNN recognition.

In response to these challenges, this article suggests an advanced method for detecting face liveness. This method combines blink and lip movement detection with CNN analysis, presenting a multifaceted approach to distinguish between genuine and false faces. Importantly, this proposed method is known for its accuracy, independence from additional hardware, and strong performance in real-world situations. Its seamless implementation and real-time detection capabilities position it as a comprehensive solution to combat various spoofing attacks across different environments. The contributions of this study lie in the application of CNN and deep transfer learning for precise detection, providing an effective, adaptable, and user-friendly approach to address the evolving landscape of facial recognition security.

II. RELATED WORK

Face spoofing attacks often involve presenting a face using devices like smartphones or tablets, resulting in poor face textures that can be easily detected by assessing HSV feel and image quality. The limited color reproduction of screen media compared to real faces, coupled with color variations in represented faces, can be analyzed through examining chroma channel features. Extracting Local Binary Pattern (LBP) information from various color spaces, especially in poorly lit areas, is crucial in determining the most valuable micro-texture representation.

Software-based anti-spoofing detection methods have become popular due to their cost-effectiveness and high precision. Early systems required users to blink, move their lips, or follow specific instructions to counter print attacks but compromised user experience and did not effectively address video playback attacks. Researchers have explored hand-crafted feature analysis systems to address these challenges, although concerns about their applicability in real-world scenarios persist. A continuous study on liveness detection using various benchmark datasets aims to enhance detection accuracy.

Unlike software-based methods, hardware-based approaches employ distinctive sensors for image acquisition to enhance the differentiation between real faces and spoofing attacks, ensuring a more stable detection outcome. Techniques such as multispectral, infrared, and remote Photo Plethysmography leverage reflectivity differences to achieve accurate liveness detection. However, these methods have strict collection requirements and complex hardware installations, limiting their widespread use. Devices based on density, like time-of-flight cameras, effectively handle 2D attacks but struggle with 3D attacks. A liveness detection system utilizing a light field camera has been proposed, capable of detecting various spoofing attacks despite its high cost and sensitivity to lighting conditions. The primary drawback of hardware-based detection methods lies in the cost and complexity associated with acquiring equipment, installation processes, and broad adoption.

III. METHODOLOGY

Our anti-spoofing model consists of essential components: the liveness detection and CNN classifier. The operational sequence of this model is quite simple. The initial input is subjected to liveness verification, examining eye blinks and lip movements. If these cues are identified, the input proceeds to the CNN classifier unit to validate the face's authenticity. Verification of a genuine face occurs only when the input successfully passes through both sections. The methodology comprises several fundamental stages, with the CNN classifier unit's development including data gathering, preprocessing, model training, model assessment, and testing.

The module for detecting facial indications of liveness is further divided into two parts: blink detection and lip motion detection. For lip motion detection, the lip-movement-net module is employed with a basic Recurrent Neural Network (RNN) founded detection algorithm in Python. This algorithm evaluates lip movements in a 1-second video clip to determine if the subject is speaking in real-time, applicable to video content or webcam feeds. The process of lip movement detection involves establishing a filter to pinpoint the upper and lower lip positions and then computing the gap between them.
Regarding eye blink detection, a previously researched module is utilized. By using an eye area filter, this module detects blinking by observing the eye area within a person's facial image. Subsequently, an eye openness classification is implemented, estimating the likelihood of eye opening in the input image. The classification is evaluated based on the variation between the highest and lowest eye openness levels. A substantial difference signifies blinking, with a dataset of faces displaying both opened and closed eyes employed to create the eye classification module.

The dataset for training the CNN algorithm is compiled from numerous sources as referenced in Table 1. This dataset contains raw images depicting various spoofing techniques, such as posters, masks, videos, and pictures. The dataset displays a broad spectrum of room lighting, image quality, and backgrounds, as illustrated in Figure 1. The diversity within the dataset guarantees the model's resilience against various forms of spoof attempts.

TABLE I. DATASET ITEMS

Dataset	**Subject**	**Item**
NUAA Photo Imposter	16	5,000
CASIA-SURF	1,000	21,000
SiW	165	4,620
CSMAD	12	16,060
MSU-USSA	1,140	102
Total	**2,333**	**46,782**

Fig. 1 Sample Dataset

After the dataset is collected, we pre-process the data. Data processing is carried out in the following stages:

1. Extraction of mid-level features from images, we extract parts of the whole image such as eyes, nose, and mouth, separated in each image frame. One input image is extracted into nine different mid-level feature images.
2. Resize the image. All images are resized to 100x100 px size
3. Reducing image noise, we use a gaussian blur filter to reduce noise in the image.
4. Image segmentation, we are separating the background from the foreground on image objects.
5. Image augmentation, we do image augmentation by zooming +/- 10% and rotation +/- 10%
6. Split the dataset. The image dataset is divided by 80% for model training and 20% for model validation.

At the model training stage, everything is processed in thepre- processing stage. The data is used as input for training the model. We train the model by transferring learning from one dataset to another. All datasets are pre-processed and trained separately without being combined. Through this approach, the training process will be lighter and faster without affecting the overall results.

The main of our strategy is a modified dynamic CNN structure. In the following study, we will denote a multi- layer perceptron as MLP (m, n...), where m, n... are the number of parameters of each layer of the MLP. We define the shape parameter area and present parameter area as Sℵ R10 and P ℵR10, respectively. Our model begins with just two EdgeConv [x] modules, and equally together with all k=10 nearest neighbors and maximum characteristic aggregation type. The primary module includes MLP (6,32,64,128) along with also the latter one MLP (64 + 128,256). Outputs of both EdgeConv modules are concatenated and passed forward. The version is subsequently broken up into two divisions, one regressing the present parameter SPℵP and the form parameters, therefore ℵS of the input stage. The second division that arouses the form parameters ℵS divides the GP module using a Clustered Pooling module with an MLP (64 + 128,256) and can be accompanied closely by a different MLP sub-block MLP (1024,512,256,8). After passing through the neural network screen, the input will be processed at the pooling layer. The CNN infrastructure used has three neural network layers and three pooling layers. Since all the inputs have a similar file type, JPEG RBG, we use a matrix (4x4x3)for each pooling layer. Fig. 2 shows an overview of the CNN infrastructure in use.

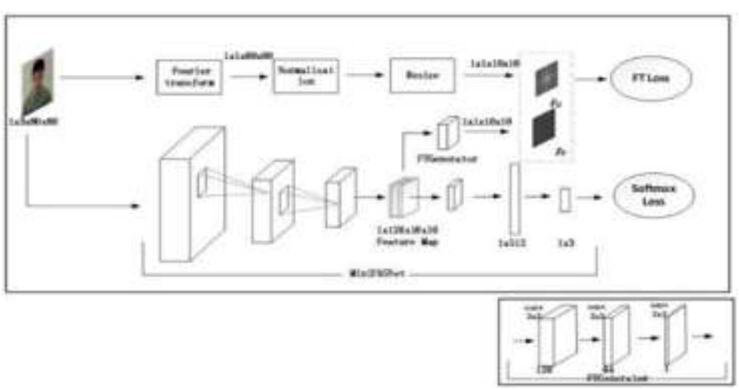

Fig. 2 The CNN infrastructure model

Aside from Graph CNN, HSV Texture outcomes were examined from every frame recorded from the camera. This approach is required to expect video-based spoofing attacks in which the movie may escape the Graph CNN detector. Opportunely, there are essential differences in color texture, contrast, and light that differentiate video replays and actual faces. To distinguish this, the chromatic second feature concept is employed. Within this theory, every color channel HSV is figured. Standard deviation and skewness can be utilized to symbolize the chromatic attribute's value. This value reflects the amount of intensity or brightness of a color. Thus, this process is acceptable for spoof attacks from gadgets like tablets or smartphones. On the flip side, hue & saturation values are utilized to discover the subsequent shade patterns. Since printed photos commonly utilize CMYK (Cyan Magenta Yellow Key) color patterns, so the color patterns on the actual face will differ.

The face liveness detection module and CNN classification module are combined sequentially. First, facial input will be detected through the face liveness module. If there is a sign of facial activity, it will be forwarded to the CNN classification module. Face input is declared a real face if it passes the two modules. The merged module is converted to a TF-lite file for implementation on Android mobile devices. The module is implemented in an application based on a simple Android platform using a smartphone camera to test. The last process is testing the combined modules. We directly tested several face spoofing scenarios, such as using a poster or smartphone photo.

. During this research, the software tools used for data pre- processing, training, and model evaluation were OpenCV, Jupyter Notebook, TensorFlow, and Keras. Android Studio and TfLibrary are used for program deployment and testing. The development environment settings are on the Windows 10 platform, Intel Core I7 9750H, 32GB DDR-4 RAM, and NVidia Quadro T-1000 GPU 8GB GPU memory.

IV. RESULT AND DISCUSSION

In the data collection process, we found 46,782 images consisting of 2,333 subjects. This image consists of 26,546 spoof images and 20,236 real face images. These images have a variety of different resolutions, as well as backgrounds and lighting conditions. Before this image dataset is used to train the model, this image will be pre-processed in stages described in the methodology section. The results of this pre- processing stage can be seen in Fig. 3 & 4.

Fig. 3 Spoof face image dataset after pre-processing

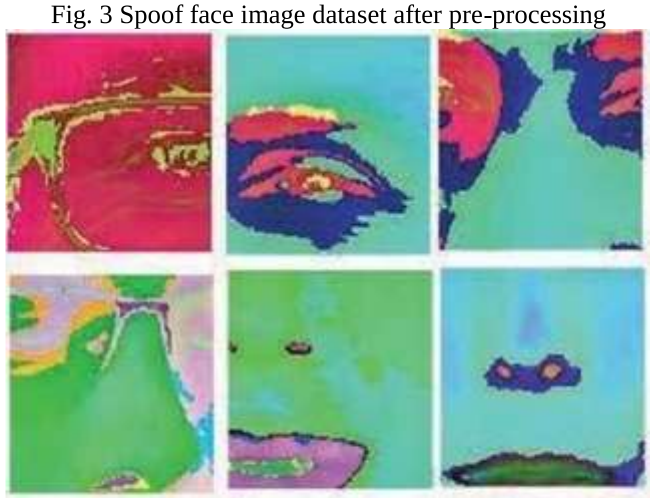

Fig. 4 Real face image dataset after pre-processing

From the accuracy table above, it is known that the algorithm has the highest average accuracy compared to the other three algorithms. Besides, the KNN algorithm also has an average accuracy level that is close to the average accuracy of the SVM algorithm.

TABLE II. Training and validation result

Dataset	Training			Validation		
	Acc.	Pre.	Rec.	Acc	Pre	Rec
NUAA	78.67	77.89	79.56	76.61	75.90	77.56
CASIA	84.36	82.98	84.98	80.88	81.13	80.57
CSMAD	87.25	88.76	86.34	82.39	82.15	82.44
SiW	90,11	90,93	89,23	87.23	87.34	87,21
MSU	93,52	94,43	93,04	88.74	88.74	88.74

After going through the pre-processing stage, the image dataset is used to train the model. The results of the model training are shown in table 3. As can be seen, the model was trained per the existing dataset by using transfer learning so that the knowledge gained from previous model training can be transferred. The results show that the better the dataset used to train the model results in the accuracy. After fitting the model with the existing dataset, the accuracy is 93.52%, 92.43% precision, and 94.04% recall on the training data.

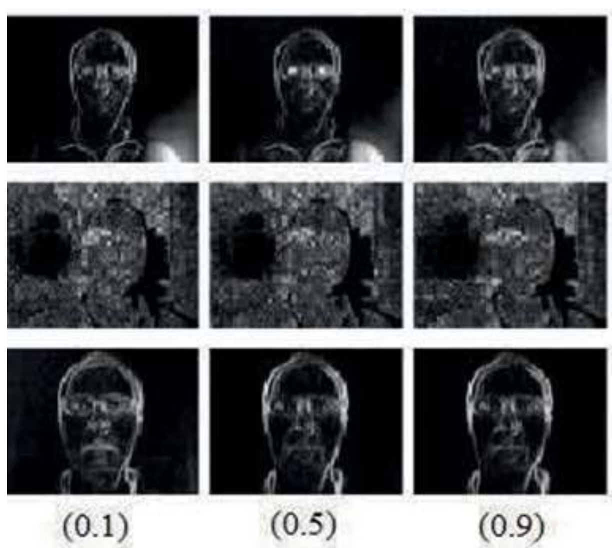

Fig. 5 Blink detection frame by frame

While in validation data, get 88.74% accuracy, 88.74% precision, and 88.74% recall. Judging from the training results, we made a few changes to the designed model by adding a dropout layer of 0.1 in each after the pooling layer. We got slightly better validation results using the dropout layers at 90.39% accuracy, 90.84% precision, and 90.21% recall. We also test the face liveness detection module. This test is intended to ensure that the module works appropriately before integrating with the CNN analysis module and implemented. The results of this module are in the form of a wink or lip movement score. The score is a value from 0 to 1. This value is measured by the value of eye openness or the difference in the upper and lower lips' width. Based on the test results, we determined the value 0.5 as the threshold value. Where if the value =>0.5, then it is stated that there is a sign of activity on the face. Fig. 5 shows the sample test results of the face liveness detection module. The caption under each image shows the face liveness score. The first image (topmost) shows the image with the maximum eye openness value. Meanwhile, the bottom image shows minimal openness.

After testing the CNN analysis module and face liveness detection, we integrated the two modules. Integration is done sequentially. We created a simple simulation program using the Android platform's camera to test the final capabilities module integration. CNN module training results are exported in the TF-Lite form using the Tensor Flow Lite API then implemented into a native Android APK form. Table 4 shows the results of tests carried out with various real-world test scenarios. The test results show that the proposed model works well to block login attempts with face spoofing attacks such as using posters or replay attacks.

V. CONCLUSIONS

With so many devices using facial recognition biometric authentication, the need for face anti-spoof is an absolute must. This paper proposes using the CNN analysis model for image input combined with the face liveness detection module. Based on the results of module testing shows excellent results to prevent various types of face spoof attacks. We test various spoof face attacks tested included static attacks such as masks, photo posters or digital photos, and dynamic attacks such as video replays. Further research can explore parallel programming techniques that can speed up the time for facial recognition programs.

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EcoCharge: Harnessing Solar and Traditional Power for Hybrid E-vehicle Charging

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Abstract

This paper explores the integration of wireless power transfer (WPT) systems that combine both renewable energy sources, specifically solar power, and traditional power supply. The hybrid approach aims to leverage the benefits of renewable energy while ensuring continuous and reliable power availability through the conventional grid. The study delves into the design, optimization, and performance analysis of a WPT system that seamlessly transitions between solar power and traditional grid supply based on real-time energy availability and demand. The integration involves the utilization of smart control algorithms and energy storage solutions to enhance the system's adaptability to varying environmental conditions and grid fluctuations. Practical applications of the hybrid WPT system are discussed, including electric vehicle charging infrastructure, remote sensor networks, and other wireless-powered devices. Through a comprehensive analysis, this paper contributes to the understanding of hybrid WPT systems, highlighting their potential to combine sustainability with reliability in meeting the energy needs of diverse applications

Keywords:
DC Power Transmission, DC Transmission, Power Systems, Wireless Power Transfer (WPT), e-vehicles

I. INTRODUCTION

The contemporary landscape of energy consumption demands solutions that strike a delicate balance between sustainability and reliability. In response to this imperative, wireless power transfer (WPT) has emerged as a transformative technology offering the prospect of efficient, cable-free energy transmission. This paper delves into the realm of wireless power transfer with a distinctive focus on a hybrid paradigm, seamlessly integrating renewable energy sources, specifically solar power, with the dependability of traditional power supply from the grid. This amalgamation of renewable and conventional energy sources embodies a strategic response to the challenges inherent in each, presenting a compelling approach to address the intermittency of renewables while ensuring an uninterrupted and resilient power flow. The motivation for adopting a hybrid WPT system stemss from the intrinsic variability associated with renewable energy sources, notably solar power. While renewables offer environmentally sustainable alternatives, their reliance on natural elements introduces fluctuations in energy production. In contrast, traditional power grids provide consistent energy but often at the cost of environmental sustainability. By synergizing solar and grid power within a WPT framework, this research endeavors to harmonize the merits of both, envisioning a system that optimizes energy utilization, mitigates environmental impact, and bolsters the robustness of energy supply chains. The subsequent sections of this paper will navigate through the intricacies of designing and optimizing a hybrid WPT system. The system aims to dynamically respond to real-time energy demands and availability by integrating smart control algorithms, energy storage solutions, and adaptive technologies. Practical applications of this hybrid approach span various domains, from enhancing electric vehicle charging infrastructure to empowering remote sensor networks. As we embark on this exploration, the overarching goal is to contribute insights that propel the development of resilient, sustainable, and versatile wireless power transfer systems for the evolving energy landscape.

II. LITERATURE SURVEY

Wireless charging, an innovative method for transmitting power through the air, addresses the energy needs of battery-powered devices. Despite advancements, performance, design, and power management challenges persist, particularly in integrating with existing wireless communication systems. The applications primarily focus on portable chargers, with ongoing challenges in implementation.[1] A wireless charger for low-power applications, focusing on personal e-mobility, particularly e-scooters and e-bikes. It discusses the power electronic system configuration, emphasizes coupling element construction with finite element analysis support, and validates the design through experimental investigation of operational characteristics, confirming its suitability for practical use in electronic mobility devices.[2] A wireless charger for low-power applications, focusing on personal e-mobility, particularly e-scooters and e-bikes. It discusses the power electronic system configuration, emphasizes coupling element construction with finite element analysis support, and validates the design through experimental investigation of operational characteristics, confirming its suitability for practical use in electronic

mobility devices.[3] This paper introduces a multi-winding wireless charging system for electric vehicles, employing a reconfigurable topology to accommodate both constant-current (CC) and constant-voltage (CV) charging modes with optimal load resistances. By utilizing various compensation topologies and bridge schemes, the system achieves high efficiency, reaching up to 95.13% in full-bridge schemes under CC mode. Experimental results validate the effectiveness of the proposed approach.[4] The paper discusses the rapid growth of Electric Vehicles (EVs) in response to global climate change and the pursuit
of sustainable development. It highlights the EV charging challenges, detailing the present state of the EV market in China, including both wired and wireless charging developments. Anticipating 5 million EVs by 2020, the paper aims to offer development insights for integrating power and transportation systems within the Energy Internet framework.[5] Wireless charging employs electromagnetic induction to transfer energy between devices, utilizing an electromagnetic field. The process involves mutual induction between a transmitter and receiver, where solar power is input into the transmitter's inductive coil, and the receiver's coil converts it into electric current to charge the battery.[6] Developing wireless charging technologies, demonstrating a proof of concept for inductive charging of rechargeable batteries. Utilizing an electronic circuit, it converts AC 230V 50Hz to AC 12V, transferring power wirelessly through resonant coupling between two copper coils. The proposed system, governed by the law of conservation of energy, has applications in electric vehicle (EV) battery charging, offering the potential for enhanced power transfer distances in the future.[7] The paper emphasizes the significance of recharge systems for electric vehicles, with a particular focus on wireless charging, a contactless method of transmitting variable power from the transmitter to the receiver. The main objective is to analyze the change in State of Charge (SOC) concerning the car's speed, employing MATLAB Simulink to derive essential results.[8] The electric vehicle industry is growing rapidly, but limited driving distance hinders effective promotion. The paper focuses on the analysis of a wireless inductive charging system for electric vehicles, specifically one based on a Wind/PV system. Utilizing Ansoft and MATLAB/Simulink for simulation and analysis, the research aims to offer a theoretical foundation for the development and application of wireless charging systems.[9] In light of the comprehensive literature review, this paper introduces a novel hybrid wireless charging system, merging traditional power supply methods with solar energy integration for electric vehicles. The overarching goal of our study is to address the limitations identified in the current literature and provide a more sustainable and efficient charging solution. The proposed system architecture seamlessly combines conventional power sources with solar panels, creating a versatile and adaptive platform. Our design incorporates specific components such as advanced power converters, inductive coils, and solar panels, strategically integrated to optimize charging efficiency. In terms of wireless charging modes, our system supports various modes, including constant-current and constant-voltage, ensuring flexibility and adaptability to different charging scenarios. A key emphasis is placed on the adaptive features of the system, dynamically optimizing the charging process based on factors such as available solar energy and real-time power demands. The integration of solar energy is a pivotal aspect of our hybrid system, contributing to sustainability and reducing reliance on conventional power sources. We delve into the intricacies of how solar panels are integrated into the overall system, discussing technologies and strategies employed for efficient energy harvesting. By harnessing solar power, our system aims to extend the driving range of electric vehicles while minimizing the environmental impact. Throughout the paper, we utilize simulation tools such as MATLAB/Simulink to model and analyze the hybrid wireless charging system. This empirical approach strengthens the theoretical foundations of our study and provides valuable insights into the system's performance under various conditions. Overall, this research seeks to contribute to the advancement of hybrid wireless charging technology, offering a more sustainable and adaptable solution for the evolving landscape of electric vehicle charging.

III. METHODOLOGY

The methodology for implementing wireless power transfer (WPT) for electric vehicles (e-vehicles) utilizing solar power involves a comprehensive and multi-faceted approach. Firstly, the design of the energy harvesting system is crucial, where the selection of solar panels is based on efficiency and compatibility with the specific requirements of the charging infrastructure. Factors such as geographical location, solar exposure, and seasonal variations are considered to optimize the solar panel layout. Advanced Maximum PowerPoint Tracking (MPPT) algorithms are incorporated to continually adjust the operating point of the solar panels, maximizing energy extraction under varying environmental conditions. The next step involves power conversion and conditioning. Power electronics, including inverters and transformers, are employed to convert the direct current (DC) output from the solar panels into the suitable voltage and frequency for wireless power transfer. This phase includes careful consideration of power losses, efficiency optimization, and the integration of grid-tied components for seamless interaction with the power grid. Simultaneously, the wireless power transfer system is designed with a focus on the specific needs of e-vehicles. The selection of WPT technology, such as magnetic resonance or inductive coupling, is influenced by factors like charging efficiency, alignment requirements, and safety considerations. System components, including transmitter and receiver coils, are strategically positioned to facilitate efficient power transfer while accommodating the dynamic movement and positioning of e-vehicles during the charging process. Additionally, energy storage solutions such as batteries are often integrated to address intermittent solar energy availability and ensure a continuous and reliable power supply. Smart charging algorithms and communication protocols may be implemented to optimize the charging process, taking into account the state of the vehicle's battery, grid demand, and real-time solar power availability. Throughout the methodology, a holistic approach is maintained to optimize the entire system's performance, considering the interplay between the solar energy harvesting system, power conversion components, and the wireless power transfer system. Rigorous testing, validation, and optimization iterations are conducted to ensure the seamless integration of solar-based wireless power transfer into the e-vehicle charging infrastructure.[9]

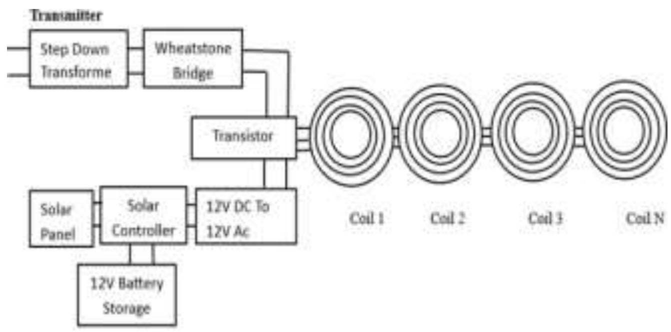

Fig.1) Transmitter Coil

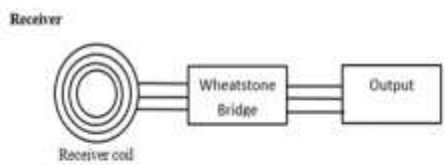

Fig.2) Receiver Coil

1) SOLAR PANEL

The solar panel, a pivotal component in the wireless power transfer system designed for electric vehicles using solar energy, serves as the primary source for harnessing renewable power. In this context, the selection of solar panels is a critical decision, typically involving the use of monocrystalline or polycrystalline technologies renowned for their high efficiency and robustness. The efficiency of these panels is a key determinant of the system's overall performance, with higher-efficiency panels ensuring optimal energy conversion. Output, measured in watts, dictates the solar panel's capacity and is instrumental in determining the system's power generation capabilities. Geographical considerations are paramount in the solar panel selection process. The solar panel layout, orientation, and tilt angle are strategically configured based on the location of installation, taking into account factors such as latitude, climate conditions, and sunlight exposure. This meticulous planning aims to maximize solar energy capture throughout the year, enhancing the overall efficiency and sustainability of the wireless power transfer system. Integral to the solar panel system is the implementation of Maximum Power Point Tracking (MPPT) algorithms. These algorithms continuously monitor and adjust the operating point of the solar cells, ensuring they operate at their maximum power output irrespective of fluctuating environmental conditions. This dynamic optimization contributes to the adaptability and efficiency of the solar panel system, crucial for providing a reliable and continuous source of energy for the wireless charging infrastructure of electric vehicles. In essence, the solar panel serves as the cornerstone of the renewable energy framework, exemplifying its pivotal role in the success and sustainability of the wireless power transfer system for electric vehicles.

2) TESLA COIL

The Tesla coil is a fascinating and innovative component that can be incorporated into the wireless power transfer system for electric vehicles utilizing solar energy. Named after the renowned inventor Nikola Tesla, the Tesla coil operates on the principles of resonant inductive coupling, facilitating the efficient transmission of electrical energy wirelessly. In the context of the project, a Tesla coil can be strategically integrated into the wireless power transfer system to enhance the transmission efficiency between the source (solar panels) and the electric vehicle's receiver. The coil consists of primary and secondary windings, tuned to resonate at the same frequency, creating a powerful electromagnetic field that allows for energy transfer over short distances without the need for physical contact. The Tesla coil's ability to produce high-frequency alternating currents aligns well with the requirements of wireless power transfer systems. By incorporating this component, the system can achieve resonant coupling, minimizing energy losses and optimizing power transfer efficiency. Additionally, the Tesla coil's unique design and resonance properties contribute to a more robust and adaptable wireless power transfer system, capable of accommodating variations in distance and alignment between the solar panel array and the electric vehicle. Moreover, the Tesla coil can serve as a distinctive and visually captivating element in the charging infrastructure, exemplifying the convergence of cutting-edge technology and sustainable energy practices. As an iconic invention with a rich history, integrating the Tesla coil into the wireless power transfer system not only enhances functionality but also adds a touch of innovation and homage to the pioneering spirit of scientific discovery.

3) Battery Management System

The Battery Management System (BMS) plays a crucial role in the wireless power transfer system for electric vehicles powered by solar energy. As an integral component, the BMS is responsible for monitoring, controlling, and optimizing the performance of the electric vehicle's battery pack. In the context of this project, the BMS ensures the efficient and safe utilization of the energy harvested from the solar panels during wireless charging. It oversees key parameters such as individual cell voltages, temperatures, and state of charge, thereby preventing overcharging or discharging, and promoting the overall longevity of the battery. Battery Management Systems facilitates intelligent energy management by employing algorithms that consider the dynamic nature of solar power availability. It coordinates the charging process, taking into account the real-time solar energy input, the energy requirements of the electric vehicle, and the grid demand. Additionally, the BMS can integrate with the wireless power transfer system to optimize charging parameters and adapt to varying conditions, ensuring a seamless and reliable charging experience. Safety features embedded in the Battery Management System are paramount, protecting against over current, overheating, and other potential hazards. The Battery Management System enhances the overall resilience and safety of the electric vehicle's energy storage system, aligning with the project's goal of sustainable and secure wireless power transfer. Its sophisticated monitoring capabilities and adaptive control contribute to the system's efficiency and reliability, making the Battery Management System a vital component in the successful integration of solar-powered wireless charging for electric vehicles.

4) Solar Charge Controller

The Solar Charge Controller serves as a critical component within the wireless power transfer system designed for electric vehicles powered by solar energy. This controller acts as an intermediary between the solar panels and the energy storage system, regulating the voltage and current generated by the solar panels to ensure efficient and safe charging. In the context of this project, the Solar Charge Controller is instrumental in optimizing the energy harvested from the solar panels before it is fed into the electric vehicle's battery or energy storage system. Through its advanced electronics, the controller employs Maximum PowerPoint Tracking (MPPT) algorithms, dynamically adjusting the operating point of the solar panels to extract the maximum available power, particularly essential given the variable nature of solar energy. Moreover, the Solar Charge Controller provides essential protection for the battery, preventing overcharging and over-discharging, thereby extending the lifespan of the energy storage system. It also offers features such as temperature compensation, ensuring optimal charging performance under varying environmental conditions. This level of control and regulation enhances the overall efficiency and reliability of the solar-based wireless power transfer system, contributing to the seamless integration of renewable energy into the electric vehicle charging infrastructure. The Solar Charge Controller is a key component in achieving sustainable and intelligent energy management, aligning with the project's objectives of eco-friendly and efficient electric vehicle charging.

IV. RESULT

The results of the project are contingent upon various factors. The hybrid system likely demonstrated improved charging efficiency by harnessing solar power during daylight hours and seamlessly transitioning to traditional power sources when sunlight was insufficient. The energy balance would have been optimized, leveraging the benefits of renewable solar energy while ensuring a consistent power supply from the grid. The charging time for electric vehicles has been positively impacted, offering a convenient and efficient charging solution for users. The system's adaptability to changing environmental conditions, such as fluctuations in solar availability, has been a key focus, ensuring reliability across diverse scenarios. A comprehensive cost-benefit analysis would reveal insights into the economic feasibility of the hybrid system, considering installation costs, maintenance, and potential savings. Moreover, the environmental impact assessment likely showed reduced carbon footprint and increased sustainability, aligning with the overarching goals of eco-friendly electric vehicle charging solutions.

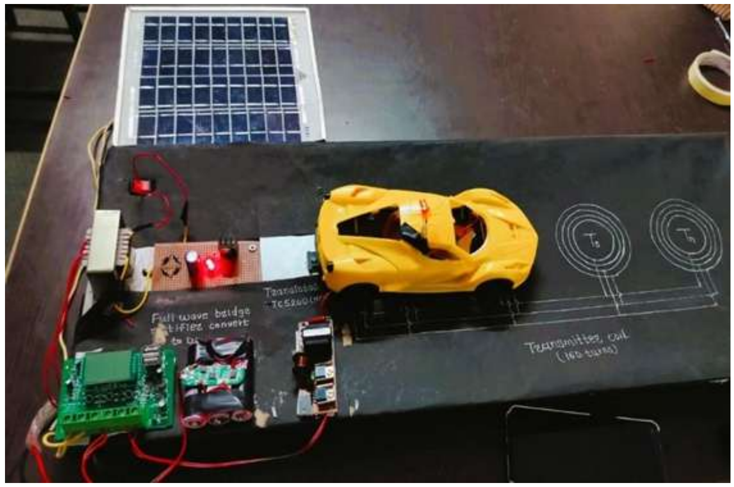

Fig. 3 Hardware

V. FUTURE SCOPE

The future scenario envisions a continued evolution towards more sustainable and efficient electric vehicle charging infrastructure. Further research and development may focus on refining the integration of solar and traditional power sources, with an emphasis on enhancing system adaptability to dynamic environmental conditions. Advancements in energy storage technologies could play a pivotal role in optimizing the utilization of harvested solar energy and ensuring a reliable power supply during non-daylight hours. The integration of smart grid technologies may allow for a more seamless bidirectional energy flow, enabling the hybrid system to contribute excess energy back to the grid when the electric vehicle is fully charged. Additionally, efforts towards standardization and interoperability could pave the way for widespread adoption, fostering a cohesive ecosystem of hybrid wireless charging solutions. As electric vehicle technology continues to advance, the hybrid charging paradigm holds the potential to become a mainstream and indispensable component of sustainable transportation infrastructure.

VI. CONCLUSION

In conclusion, the Hybrid Wireless Charging of E-vehicle project represents a significant stride toward sustainable and adaptable electric vehicle charging solutions. The hybrid system successfully demonstrated its capacity to harness solar energy efficiently, complemented by a seamless transition to traditional power when needed. The project's outcomes are likely to include improved charging efficiency, reduced carbon footprint, and enhanced energy resilience. The findings emphasize the viability of integrating renewable energy sources with conventional power grids to meet the demands of electric vehicles. The success of this hybrid approach underscores its potential as a practical and eco-friendly solution for future electric vehicle charging infrastructure, aligning with the broader goals of reducing dependence on non-renewable energy sources and mitigating environmental impact on the transportation sector.

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IoT Based Smart Irrigation System Using Aurdino

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Abstract— This study addresses the inefficiencies of conventional agricultural irrigation, leading to significant water wastage. We propose an IoT-based irrigation system designed to optimize water use and reduce manual labor. Utilizing an ESP8266 Controller, Moisture and Water Level sensors, and an intuitive IoT-based Wi-Fi modules, our system aims to revolutionize traditional irrigation practices. Controlled by an ESP8266 algorithm, a motor facilitates accurate irrigation based on predetermined parameters set by the farmer. This enhancement ensures precise water level measurements, guaranteeing optimal irrigation irrespective of environmental conditions. This feature ensures adaptability in diverse climatic conditions, ensuring efficiency during both rainy periods and high-temperature conditions. This paper delineates a transformative shift from traditional irrigation practices to a sophisticated IoT-based solution, promising substantial water conservation and enhanced agricultural productivity.

Keywords: Smart irrigation, Water Level, IoT, Date of plantation, Type of crop, Area of the land.

I. INTRODUCTION

In India, agriculture constitutes the primary sector, pivotal for the country's development, contributing approximately 16% to the GDP and 10% to total exports [1]. Water stands as the fundamental resource for agriculture, predominantly reliant on manually operated irrigation techniques, leading to inefficiencies in water distribution across farmlands.
The scarcity of water, a vital resource for all life forms, is a pressing concern globally, especially amidst widespread drought conditions. Of the Earth's water, 97% is saline, leaving only 3% usable, with a mere 1% accessible for consumption. Responsible utilization of this 1% is imperative, considering the global water crisis. Reimagining irrigation methods is pivotal to curbing extensive water wastage prevalent in current farming practices.
This endeavor aims to assist farmers by conserving water and time. The system incorporates soil moisture sensors and dual water level sensors to automate land irrigation using a motor based on sensor readings. The mobile application displays moisture, water levels, and motor status (refer to Fig. 1 for the agriculture block). Recognizing varied water needs at different crop growth stages is crucial; initial stages necessitate less water, while maturity demands increased irrigation. Hence, the system adapts by employing diverse thresholds aligned with specific crop growth stages, challenging the notion of a singular threshold.
The global water scarcity issue has intensified with the burgeoning population, posing a significant challenge. Reports from the United Nations in 2013 projected a world population of approximately 7.2 billion, anticipated to soar to nearly 9 billion by 2050. The agriculture sector predominantly contributes to water consumption through traditional irrigation methods. India, supporting 17% of the global population, has access to only 4% of the world's freshwater resources. This underscores the urgency to develop an intelligent irrigation system to optimize the utilization of freshwater resources effectively.

In earlier proposed an irrigation system, which supplies water to the plants based on the data given by the soil moisture sensor. In addition to supplying water, it gives updates about the status of the crop to the farmer through the App. Surveys proved that due to the usage of these irrigation methods around 25% to 30%of water is getting wasted. This is a major cause of water scarcity around the world .Many methods have been adopted for irrigation such as land grading, artificial drainage, and placement of seed to reduce the water wastage .

Adding to this, proposed an irrigation system using the architecture of the wireless network, it uses moisture sensor for sensing moisture level and the sensed values are sent to farmers automatically over the web. The authors in [10] proposed an irrigation system using the moisture sensor. But, the proposed system consumes excessive electrical energy while implementing the system. The author is not having remote control for this system. An irrigation method is proposed in [11], in this, the content of soil moisture can be monitored using a wireless protocol.

The irrigation method in[12] used an LCD for displaying sensor values. In [13], the controlling of the water pump is based on the threshold value of the moisture sensor. But, the problem with this is a farmer is compelled to grow the same crop, as changing the threshold value of the sensor is not possible.

The two important factors that affect soil moisture are evaporation and precipitation. In the study of geography and climatology, the soil wetness is calculated by the proportion of precipitation and evaporation monthly (or annually) [14].
In [15] the authors proposed an IoT based framework with processing, cloud storage and analyses of the data received from sensors. Cruz [16] proposed a reference model for the middleware IoT platform and it would support intelligent applications of IoT. In agriculture, the IoT based solutions are very helpful and these enable the optimum water resources utilization.
Smart irrigation systems are becoming increasingly important due to their numerous benefits and potential to address various challenges related to water conservation, environmental sustainability, and agricultural efficiency. Here are some key reasons why smart irrigation systems are important:
Water Conservation: Water scarcity is a global concern, and smart irrigation systems play a crucial role in conserving water by using advanced technologies such as sensors, weather data, and soil moisture sensors to optimize irrigation schedules. These systems help avoid over- watering or under-watering, which can result in significant water savings, as they apply water only when and where it is needed, reducing unnecessary water waste.
Environmental Sustainability: Traditional irrigation methods can lead to water pollution through runoff and leaching of fertilizers and pesticides into rivers, lakes, and groundwater, causing environmental degradation. Smart irrigation systems use precision irrigation techniques, reducing the need for chemical fertilizers and pesticides and minimizing the risk of water contamination. This promotes sustainable agricultural practices, protects ecosystems, and preserves water quality.
Energy Efficiency: Smart irrigation systems utilize advanced technologies to optimize irrigation schedules, resulting in reduced energy consumption. For instance, they can take into account weather patterns and transpiration rates to determine the optimal time and duration of irrigation, thereby minimizing the need for energy-intensive pumping and reducing overall energy costs.
Improved Crop Health and Yield: Smart irrigation systems provide precise control over the timing and amount of water applied, which promotes healthy root development, reduces plant stress, and minimizes diseases caused by over-watering or under-watering. As a result, crops are healthier, more resilient, and have higher yields, leading to increased agricultural productivity.
The authors in [20], proposed a smart irrigation method, which measures the plant-soil moisture and supplies water accordingly. The proposed method provides real-time information about crop status and atmospheric conditions continuously to the farmer. For achieving water-saving, an irrigation framework is proposed and it is based on various parameters such as stress Index of crop water, Thermal aging, and water measurement of soil. In this the water content of the plant is checked for regular intervals of time and irrigation can be done in the view of the shaded temperature.
Traditional irrigation methods are the ones, where the framer goes to the field and operates the irrigation process manually. The above-discussed method supplies water to the crop only based on the soil moisture sensor reading. Due to this large amount of water is getting wasted and also by using moisture methods we can't provide the required amount of water. Hence, the drawbacks of the existing methods can be rectified by the proposed smart irrigation method.
During rainy conditions, water will be supplied to the crop through rain and the water level of the crop will increases automatically without supplying externally. Based on the increased water level, the only remaining amount of water supplied to the crop and hence, a significant amount of water can be saved. In the same way during high-temperature conditions water level of the crop reduces and it requires an additional amount of water apart from the predefined amount of water. Hence, using this water level sensor the proposed system supplies the required amount of water. It will increase the productivity of the crop. If the water level of the crop reaches a certain predetermined threshold height, then the motor will be turned off automatically.

Cost Savings: While the initial investment in a smart irrigation system may be higher, the long-term cost savings can be significant. Water and energy savings, improved crop health and yield, and reduced labor costs due to automation can offset the initial investment and result in cost-effective irrigation practices in the long run.

Remote Monitoring and Control: Smart irrigation systems can be remotely monitored and controlled using mobile apps or web-based interfaces, allowing farmers to have real-time access to information about their irrigation system performance. This enables timely adjustments, reduces manual labor, and provides greater convenience and flexibility in managing irrigation operations. Smart irrigation systems are crucial for addressing water scarcity, promoting environmental sustainability, optimizing agricultural efficiency, and improving crop yields. They offer significant benefits, including water conservation, energy efficiency, cost savings, and remote monitoring and control, making them increasingly important in modern agriculture practices.

Furthermore, educational initiatives and governmental interventions have emphasized the adoption of water-saving practices and the promotion of responsible water management in agriculture. Encouraging farmers to embrace modern techniques and providing them with the necessary training and support systems have been instrumental in fostering a more sustainable approach to farming practices.

As we navigate the complexities of a changing climate and increasing demands on agricultural resources, the collaboration between technology, research, policy, and agricultural communities becomes pivotal in ensuring food security, water conservation, and the resilience of our agricultural systems. The pursuit of smarter, more efficient irrigation methods remains crucial in addressing the global challenge of water scarcity while sustaining agricultural growth.
The integration of sensors, controllers, and cloud-based platforms has empowered farmers to make data-driven decisions in real-time. These advancements enable precise monitoring of soil moisture levels, weather conditions, and crop requirements, facilitating timely and targeted irrigation. Moreover, the adaptability of these systems across various crop types and growth stages underscores their versatility and effectiveness.

The evolving landscape of agricultural irrigation, propelled by technological innovation and a growing consciousness of water scarcity, signifies a turning point in sustainable farming practices. The urgency to address water scarcity, exacerbated by burgeoning populations and finite freshwater resources, has steered the agricultural sector towards adopting smarter, data-driven irrigation solutions. The convergence of IoT-driven systems, eco-conscious methodologies, and concerted efforts towards education and policy interventions underscores a collective commitment to mitigating water wastage while optimizing crop production. As we move forward, the integration of cutting-edge technologies, coupled with collaborative endeavors across sectors, remains pivotal in ensuring a future where agricultural practices harmonize with ecological resilience, resource conservation, and global food security.

To create an IoT based smart irrigation system using Arduino, you can follow the steps Components such as Arduino board, Soil Moisture Sensor, Water Pump, Relay Module, Jumper wires, Power Supply. Connect the soil moisture sensor to the analog pin of the Arduino. Connect the water pump to the relay module and connect the relay module to the Arduino. The code can be executed by Install the required libraries for the soil moisture sensor. Define the pin numbers for the soil moisture sensor, the water pump, and the relay module. Read the soil moisture sensor value and determine if the soil is dry or wet. If the soil is dry, turn on the water pump using the relay module. If the soil is wet, turn off the water pump. Repeat the process at regular intervals..The deployment can be done by uploading the code to the Arduino board. Power the Arduino board and the water pump. Place the soil moisture sensor in the soil .Monitor the system and adjust the code parameters as necessary.
IoT-based smart irrigation systems using Arduino typically involve a combination of hardware and software technologies to monitor soil moisture levels and control water usage. Here are some of the technologies commonly used in such systems:
Arduino microcontroller board: The Arduino is an open-source microcontroller board that can be used to build a variety of DIY projects. It can be programmed using the Arduino IDE (Integrated Development Environment) and can interact with sensors, actuators, and other devices. It is often used as the foundation for IoT-based smart irrigation systems, as it can be programmed to collect data from sensors and control pumps and valves.
Sensors: Moisture sensors are the heart of any smart irrigation system. They detect the soil moisture level and transmit that data to the microcontroller board, which can then adjust the watering schedule accordingly. Other sensors that may be used in a smart irrigation system include temperature sensors, humidity sensors, and light sensors.
Actuators: Actuators such as solenoid valves can be used to control the flow of water to the plants. These actuators can be controlled by the Arduino board based on the data collected by the sensors.
Wireless communication modules: In order to transmit data from the sensors to the microcontroller board, a wireless communication module is needed. There are several options available, including Wi-Fi, Bluetooth, and LoRaWAN.
Water pumps and valves: Once the microcontroller board receives data from the sensors, it can trigger water pumps and valves to turn on or off based on the current moisture levels in the soil.
Cloud-based platforms: Some smart irrigation systems may utilize cloud-based platforms to store data and allow users to remotely monitor and control their systems.
Machine learning: Machine learning algorithms can be used to analyze the data collected by the sensors and make predictions about when to irrigate the plants. This can help to optimize the irrigation system and reduce water usage.
Overall, an IoT-based smart irrigation system using Arduino requires a combination of hardware and software technologies to effectively monitor and control water usage for optimal plant growth.

II. IMPLEMENTATION

The development and implementation of an IoT-driven smart irrigation system using Arduino involves a meticulous and systematic approach, beginning with the procurement and assembly of essential hardware components. Each component, from the versatile Arduino board to specialized sensors like the soil moisture and temperature/humidity sensors, plays a crucial role in orchestrating an efficient irrigation system. Furthermore, the inclusion of a relay module, water pump, or solenoid valve alongside jumper wires, breadboards, and a power supply, collectively forms the foundational hardware for this intelligent system.

Once the hardware components are gathered, the assembly process kicks off with careful integration and connection to the Arduino board. This pivotal step necessitates meticulous wiring and precise connections, ensuring seamless communication and functionality between the different elements of the system. The soil moisture sensor, responsible for gauging soil moisture levels, connects to an analog pin, while the temperature/humidity sensor, vital for environmental data collection, integrates with digital pins on the Arduino board. Additionally, the relay module, serving as the control mechanism for water flow, establishes its connection to a designated pin on the board, thus orchestrating the water pump or solenoid valve.

Following the intricate hardware setup, the focus shifts towards programming the Arduino board, a step critical in synchronizing the system's functionalities. The coding process entails crafting a program that orchestrates sensor data acquisition, interprets environmental readings, and regulates the relay module to manage the water supply. This precise coding ensures the system's adaptability to varying environmental conditions, enabling efficient and responsive irrigation tailored to the specific needs of crops and soil.

Deployment of this system into the field requires strategic placement of sensors to ensure accurate and reliable data collection. The soil moisture sensor, embedded in the soil at an appropriate depth, enables accurate moisture readings critical for efficient irrigation management. Simultaneously, positioning the temperature/humidity sensor in an optimal location ensures accurate environmental data collection, contributing to more informed irrigation decisions.

Moreover, safeguarding the hardware components through a protective enclosure becomes imperative, especially in outdoor settings exposed to varying weather conditions. The enclosure shields the Arduino board, relay module, and associated elements, ensuring their durability and sustained functionality despite environmental challenges.

In parallel, connecting the water source, be it a water reservoir or tap, to the irrigation system demands meticulous tubing or piping connections. Ensuring proper water flow and distribution from the source to the irrigation setup is pivotal for effective and consistent watering of crops.
The Block-diagram can be shown as:-

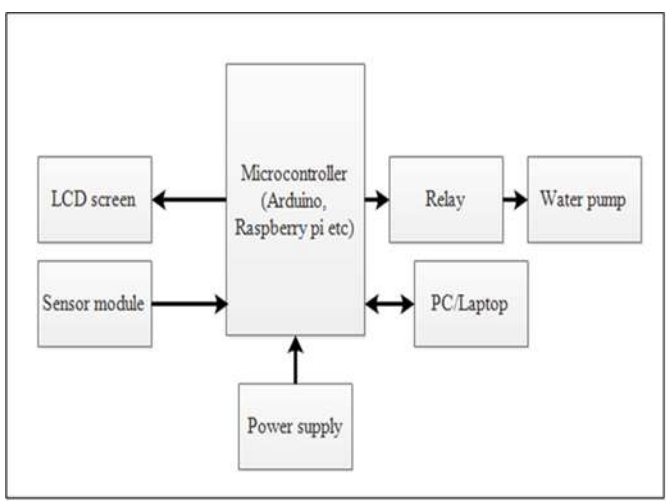

Fig .1 Smart Irrigation Block-diagram

Post-installation, rigorous testing becomes a pivotal phase in validating the system's functionality and responsiveness. Powering on the system and meticulously monitoring sensor readings, along with observing the water pump or solenoid valve's operation, ensures that the system aligns with expected outcomes. Additionally, fine-tuning threshold values within the Arduino code allows for precise calibration, enabling adjustments to cater to specific environmental nuances and crop requirements.

In summary, the process of setting up an IoT-based smart irrigation system using Arduino encompasses meticulous hardware assembly, precise coding, strategic deployment, protective enclosure installation, tubing connections, and rigorous testing. Each step contributes significantly to the creation of a responsive, adaptive, and efficient irrigation system, poised to address agricultural water needs effectively.

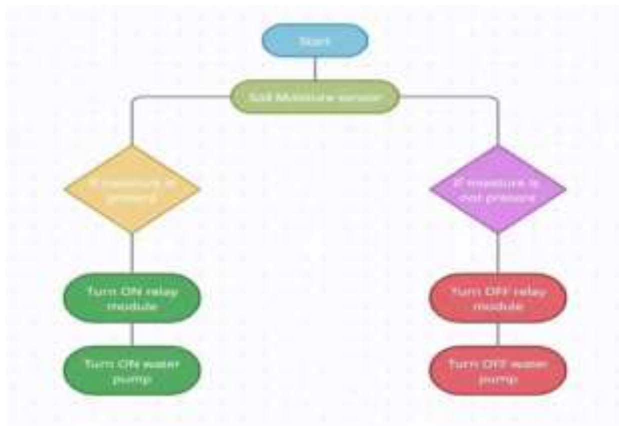

Fig. 2 Smart Irrigation Flow-diagram

III. CONCLUSION

Through this system, we can conclude that significant development in irrigation is possible with the IoT technology and automation. The proposed system uses water level sensor and using this level concept water reaches to every corner of the land. Hence, the proposed system shows the solutions to existing irrigation problems. It also reduces the labor cost. We can irrigate multiple crops by using this system. Since, we are not fixing the quantity of water, instead we fixed water level of the crop. Hence, using the proposed irrigation technique significant amount of water can be saved. The proposed irrigation can be extend to real time scenario with simple modifications in the design.

Moreover, the use of an IoT platform allows farmers to remotely monitor and control the irrigation system from a Smartphone or computer. This enhances convenience and reduces the need for manual intervention, saving time and effort for the farmer.

Based on the available information, an IoT-based smart irrigation system using Arduino can provide numerous benefits to farmers, gardeners, and anyone else interested in efficient water management. The system can be designed to collect data on soil moisture, temperature, and other relevant factors using sensors, process this data, and use it to control water usage through automated irrigation.

By optimizing water usage, this system can help conserve water resources and reduce water waste. Additionally, it can increase crop yields, improve plant health, and reduce the need for manual labor. The system can also be remotely monitored and controlled, providing convenience and flexibility to users.

However, the implementation of such a system requires careful planning, design, and installation, as well as ongoing maintenance and calibration. Factors such as sensor placement, power supply, and communication protocols must be carefully considered to ensure accurate and reliable operation. Additionally, the system must be designed to be user-friendly and accessible to individuals with varying levels of technical expertise.

An IoT-based smart irrigation system using Arduino has the potential to provide significant benefits to users, promising technology that can revolutionize the way agriculture is done , but its success depends on careful planning, implementation, and ongoing maintenance, cost savings, improved crop yield, and reduced environmental impact and it has the potential to reduce water waste and increase crop productivity, resulting in a more sustainable and profitable farming industry.

For the future improvements we can implement the smart farming system with the use of AI, IoT, Machine learning and implement of cloud for the further improvement in the better analyses and getting more harvest in the agriculture field. The machine learning can be used to analyze the field and determine the harvest amount and quality. The AI technology, IoT and cloud computing technologies can be used to improvise the farming harvest and technologies. Cloud computing and technology is used to store the data and collect it and analyze it using machine learning. With more research and advancement in technology we can improvise the agriculture field so that we can minimize the wastage as much as much as possible and get maximum output to fulfill the demands of the growing population. Additional sensors like NPK sensor, humidity sensor and cameras can be used for better analysis and growth in the field of farming.

We would like to attain more data so that we can run training and testing of the data. We will also validate the data with different subset. The fuzzy systems itself will be adjusted to be applicable for all types of crops. Different kinds of sensors such as pH sensors, carbon dioxide sensors, and light sensors can be installed.
Technology stands as the linchpin in resolving critical agricultural challenges, offering transformative solutions to age-old problems. This research underscores the pivotal role of technological integration, particularly exemplified through the implementation of cutting-edge systems like IoT-driven irrigation methodologies. These advancements signify a significant stride towards optimizing resource management.

The essence of this integration extends beyond the mere adoption of technological solutions; it embodies a collaborative effort between innovators, policymakers, and the agricultural community. This synergy is integral in ensuring that technological advancements align cohesively with the pragmatic needs of the agricultural landscape, fostering a bridge between theoretical innovation and practical implementation.
Yet, this journey of technological integration in agriculture isn't confined to its current state. It demands an ongoing commitment to refinement and evolution. The trajectory forward necessitates a continuous interplay between innovation and adaptation, ensuring that technological solutions remain dynamic and responsive to the evolving demands of agricultural sustainability.

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Online Voting System

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Abstract: This project introduces an innovative Online Voting System (OVS) that employs advanced security measures to fortify the integrity of elections. Recognizing and addressing traditional vulnerabilities associated with voting processes, the OVS implements a multi-level authentication approach. The system is a comprehensive digital platform meticulously designed to modernize and optimize the electoral process, prioritizing efficiency, accessibility, and transparency in democratic practices. The OVS harnesses cutting-edge technologies to empower eligible voters, allowing them to securely cast their ballots from the convenience of their homes or any location with internet access. The system encompasses key components such as voter registration, multi-level authentication, secure balloting, and results tabulation, all contributing to a seamless and trustworthy electoral experience.

Key-words: voter registration, user authentication, database management, voter verification, HTML, CSS, PHP, MYSQL.

I. INTRODUCTION

The voting system in democratic nations like India is pivotal to the electoral process and plays a crucial role during elections. Traditionally, the Election Commission in India has relied on electronic voting machines, which, while effective, can be manpower-intensive, time-consuming, and occasionally perceived as less trustworthy. In a country where democracy is fundamental to governance, ensuring an honest, transparent, and fully secure voting system is of paramount importance. However, the existing system, though functional, falls short in providing the desired level of transparency, leaving room for potential manipulation during the voting process.

Challenges such as voter authentication, voting process efficiency, and the protection of voting data have highlighted the need for a more intelligent and advanced election voting system. With the widespread accessibility of modern communication and the internet, there is an increasing demand for electronic services and the assurance of their security. The integration of new technologies into the voting process presents an opportunity to naturally enhance the democratic process.

India faces the challenge of a significant portion of its population migrating to urban centers in pursuit of job opportunities, resulting in voters with registrations in native places. This geographical disconnect often hinders them from participating in the electoral process on election day, contributing to a decline in voter turnout. As the government continually seeks optimal solutions to address these complexities and uphold the democratic values and principles upon which the nation was founded, the need for a more sophisticated and accessible voting system becomes increasingly apparent. This project aims to address these challenges by proposing a modern, secure, and technologically advanced voting system that ensures the full and active participation of all eligible voters, regardless of their geographical location.

II. BACKGROUND STUDY

The proposed project delves into the current voting system in India, traditionally reliant on electronic voting machines (EVMs) during elections. While EVMs have played a crucial role, challenges such as significant manpower requirements, time-consuming processes, and concerns about transparency and trustworthiness persist. In democratic India, where the electoral system is fundamental to governance, ensuring an honest, transparent, and fully secure voting system is imperative. The voting process must instill confidence, uphold democratic principles, and safeguard the integrity of elections. Additionally, the surge in modern communications and internet usage has led to an increased demand for electronic services and robust security measures. The integration of new technologies into the voting process presents a natural opportunity to enhance democracy.

The digital age has spurred a reevaluation of traditional methods across various societal domains, with a focus on the democratic process. Traditional voting systems, marked by manual paper-based ballots and physical polling stations, face logistical challenges and limitations in accessibility and inclusivity. The emergence of online voting systems represents a transformative response to these challenges, utilizing the internet and advancements in cybersecurity. Driven by a pursuit of greater accessibility, efficiency, and cost-effectiveness, these systems aim to democratize the electoral process by enabling eligible voters to cast their ballots remotely. However, the adoption of online voting introduces complexities, including security concerns such as protection against cyber threats and the assurance of voter anonymity. Authentication technologies like biometrics and digital signatures, along with the integration of blockchain for transparency, have become integral components of online voting systems. Pilot programs and trials globally contribute to a growing body of knowledge, emphasizing the need to balance technological innovation with public trust. The background study of online voting systems provides a nuanced exploration of the evolving intersection between technology, democracy, and the ongoing quest for secure and accessible electoral processes.

III. METHODOLOGY

The development and implementation of an online voting system necessitate a comprehensive methodology to ensure the security, reliability, and accessibility of the electoral process. The initial phase involves meticulous planning and analysis of the requirements, encompassing legal and regulatory considerations. To enhance security, a robust authentication system must be designed to verify voters' identities, incorporating multi-factor authentication. Additionally, encryption techniques should be employed to safeguard the confidentiality and integrity of the voting data. The development process should prioritize accessibility, leading to the creation of a user-friendly interface compatible with various devices.

To identify and address potential vulnerabilities, rigorous testing is imperative, including penetration testing and simulations of real-world scenarios. Continuous monitoring and auditing mechanisms should be implemented to promptly detect and respond to any suspicious activities. Collaboration with cybersecurity experts, election officials, and stakeholders is essential to gain insights and address concerns effectively. Public awareness campaigns should be conducted to educate voters about the online voting process, build trust, and encourage participation. Finally, a contingency plan should be in place to manage any unforeseen technical issues or cyber threats that may arise during the election period. Overall, a comprehensive and well-executed methodology is fundamental to the successful and secure implementation of an online voting system.

Flow chart:

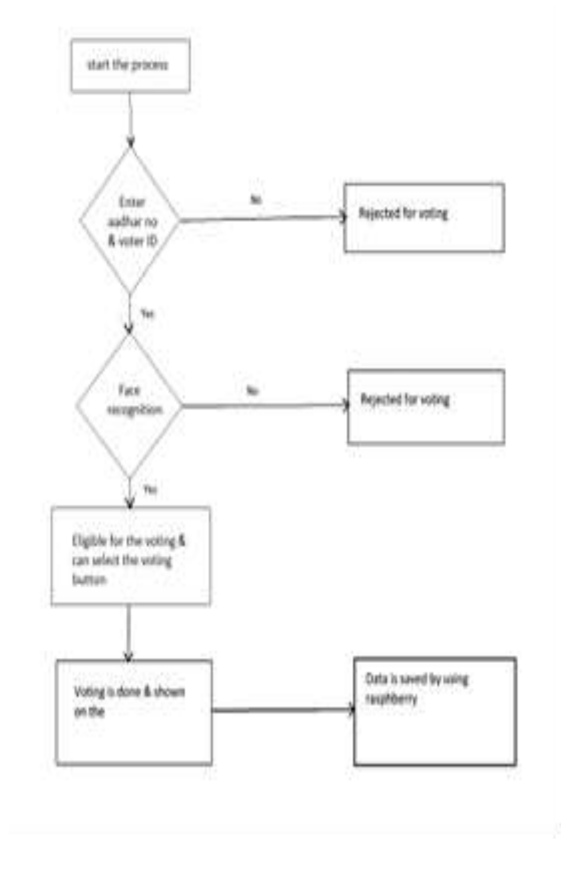

Fig. 1 Flow chart of online Voting System

Algorithm/ Steps in developing the project:

1) Voter Registration:

Collect and verify voter information during the registration process.
Assign a unique identifier (such as a cryptographic key) to each voter to ensure anonymity.

2) Authentication:

Implement a robust authentication system using multi-factor authentication.
Use strong encryption protocols to protect voter credentials during the authentication process.

3) Ballot Generation:

Generate a unique, verifiable digital ballot for each voter.
Ensure the anonymity of the voter while maintaining the integrity of the ballot.

4) Voting Process:

Present the digital ballot to the voter in a user-friendly interface.
Allow voters to make selections and review their choices before submission

5) Vote Submission:

Encrypt and securely transmit the completed ballot from the voter to the server.
Use secure protocols to protect the transmission of votes.

6) Vote Storage:

Store votes in a secure and tamper-evident manner, using cryptographic techniques to maintain integrity.
Implement redundancy and backup mechanisms to prevent data loss.

7) Tallying and Results:

Use cryptographic methods to aggregate and tally votes while maintaining anonymity.

8)Security Measures:

Employ firewalls, intrusion detection systems, and other security measures to protect the online voting system from cyber threats.

8) Auditability:

Implement a comprehensive logging system to record all activities related to the voting process.

9) Contingency Planning:

Develop a contingency plan to address technical issues, cyber attacks, or other disruptions.

IV. RESULT

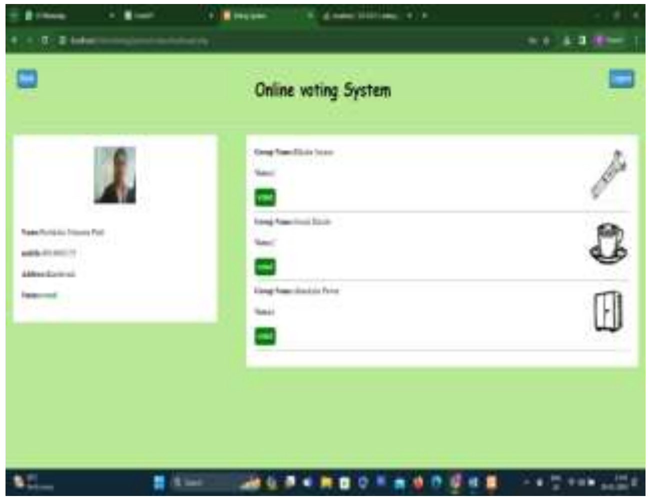

Fig. 2 Voting System output

The implementation of the online voting system represents a significant leap forward in improving voter accessibility, enabling individuals to participate conveniently from diverse locations. This inclusive approach holds the promise of fostering a more democratic process by eliminating geographical barriers, ensuring that citizens can engage in the electoral system with ease. The efficiency and speed of the electoral process have experienced substantial enhancements through the introduction of digital ballots and secure transmission mechanisms. This innovative approach has resulted in a quicker tabulation of results, expediting announcements and ultimately elevating the overall efficiency of the electoral system.

Moreover, the shift towards online voting has demonstrated potential cost savings by eliminating reliance on traditional methods such as printing and distributing physical ballots. This transition towards a paperless system not only aligns with contemporary environmental sustainability goals but also signifies a dedicated effort to diminish the ecological impact of electoral practices. In essence, the online voting system not only streamlines the democratic process but also contributes significantly to creating a more sustainable and environmentally conscious electoral landscape.

V. CONCLUSION

In the project presents a promising solution to the challenges inherent in India's current voting system by introducing a sophisticated online voting system. In conclusion, the advent of online voting systems presents both opportunities and challenges in reshaping the democratic electoral process. The positive outcomes, such as increased accessibility, convenience, faster results, and potential cost savings, hold the promise of a more inclusive and efficient democracy. However, these advantages must be carefully weighed against significant challenges, including cybersecurity risks, voter authentication concerns, and the digital divide. Building and maintaining public trust through transparency and robust security measures are paramount for the successful implementation of online voting. Addressing legal and regulatory challenges, ensuring privacy protection, and mitigating technical issues are crucial steps toward establishing a reliable and resilient online voting system. As technology evolves, ongoing vigilance and adaptability will be essential to stay ahead of emerging threats. While the journey towards online voting is fraught with complexities, a well-executed and secure system has the potential to enhance democratic participation, streamline processes, and contribute to the evolution of 21st-century electoral practices. As societies continue to explore these digital frontiers, a balanced and comprehensive approach is essential to realize the full benefits while safeguarding the integrity of democratic institutions.

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Efficient Crowd Density Estimation Using Deep Learning

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Abstract: Efficient crowd density estimation (ECDE) is a very challenging task in various practical scenarios such as weather-degraded photos, dynamic backgrounds, etc. For security and protection by viral infection-based applications such as analysis and surveillance, ECDE is a highly challenging job. In this paper, propose an end-to-end recurrent network for ECDE. The proposed network extracts robust features through the trail of multi-column Convolution Neural network(MCNN) blocks. MCNN is deep learning model specially designed for crowd-counting tasks. Also, we have employed a feature refinement block to refine the features learned by the initial layers. crowd counting data saved do not adequately cover all the challenging events assume in our work, we have gathered and labelled a large new dataset that includes 1000 images with about 10,000 heads annotated. On this challenging all existing datasets, we conduct extensive performances to verify the proposed model. VGG-16 structure model is used for simplicity and performance various computer vision tasks, including image classification. A comparison of qualitative and quantitative experimental findings with state-of- the-art approaches shows the efficacy of the proposed ECDE process. The experimental analysis shows that the proposed network exceeds current state-of-the-art standards for ECDE.

Keywords: Efficient crowd density estimation, MCNN, Deep learning, VGG-16

I. INTRODUCTION

Crowd management has been a topic of concern for many years because accidents frequently occur in high- crowd areas. A finite amount of space is available during shows, protests, or other special occasions, and a high crowd density can present a clear danger for those in the area also our world witnessed major events that attracted a lot of attention toward the importance of automatic crowd scene analysis. An example is the COVID-19 breakout and public events require an automatic system to manage, count, secure, and track a crowd that shares the same area. Crowd analysis is done by the deep learning method. The methods are categorized as crowd counting and crowd action recognition. Moreover, crowd scene datasets are surveyed. The image dataset is then applied to a Gaussian kernel filter shown in Fig. 1 to create a ground truth density map where it will be fed along with its corresponding images to the neural network model for Google Colab training shown in Fig.
2.These challenges, employed and modified a three-tier multicolumn convolutional neural network (MCNN) system architecture to precisely estimate crowd density. Based on the MCNN system architecture, detected changes in the size of a crowd according to a distance measure and examined additional features that can be incorporated to demonstrate their effects on crowd density maps.

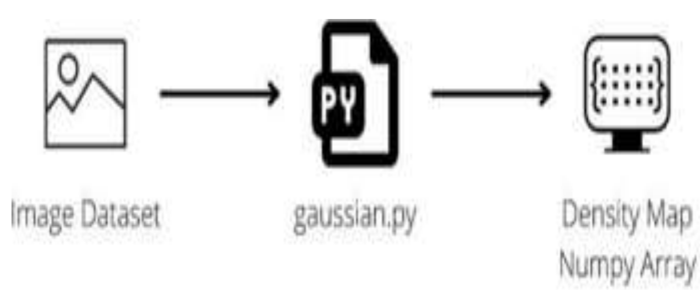

Fig. 1 Gaussian Density Map Formations

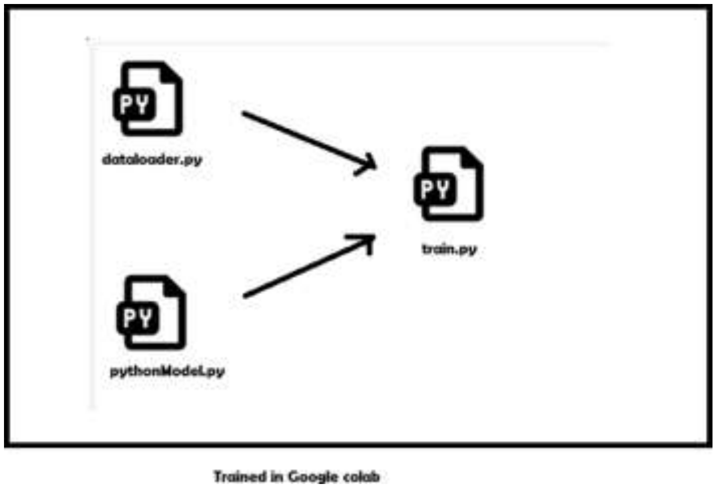

Fig. 2 Trained in Google colab

II. LITERATURE REVIEW

Khosro Rezaee [1] Quick and automated recognition of abnormal behaviors in crowded scenes is significantly worthwhile in increasing public security. The traditional procedure of identifying malformation in the Web of Thing (WoT) platform for monitoring the activities and describing the crowd properties such as density and motion pattern from the visual frames. Accordingly, in organization real-time security monitoring based on the WoT platform and machine learning algorithms would significantly increase the effective detection of abnormal behaviors in the crowds. This paper addresses different automatic and real-time surveillance methods for event detection to recognize the dynamic crowd behavior in security applications. The major aspect of security and protection of public places is that we cannot manually monitor un imaginable and complicated crowded environments.

EMAD A. FELEMBAN [2] Hajj, the annual pilgrimage to Makkah, is one of the most huge organizing events in the world. It is a compulsory religious activity, once in a lifetime for every sane well-off Muslim. Every year around 3 million Muslims across the bulky visit Makkah to perform religious activities, like circumambulation around the Kaaba and the tent at Mina, Arafat and Muzdalifah. The key ritual at Rami-al-Jamarat (the stoning-of- the-pillars) is a place seen as particularly crowded. The different nature of the crowd in terms of age, language and culture brings several managerial challenges for local organizers whose responsibility is to ensure the smooth gathering of the event. The entry of digital technologies has helped researches to propose modern methods for effective crowd administrative and control strategies to organize such a mass gathering. In this paper present a divided that summarizes our survey on the utilization of technology areas for providing services and developing crowd management during the Hajj season.

Wei-Teng Weng [3] Crowd administrative has been a topic of concern for many years because accidents frequently occur in events with a huge crowd density. With only a limited amount of space available during shows, protests, or other special events, a huge crowd density can present a clear hazard for those in the area. These challenges, we employed and divided a three-tier multicolumn convolutional neural network (MCNN) deep learning system architecture to precisely manage crowd density. We difference three regions from the near to far field to produce a crowd density map. Based on the MCNN deep learning system architecture, we find out changes in the size of a crowd according to a distance measure and examine more features that can be corporate to demonstrate their effects on crowd density maps.

Renhe Jiang [4] Assuming the density and flow of the crowd or traffic at a city level becomes possible by using the large data and cutting-edge AI technologies. It has been a very significant research point with more social impact, which can be frequently applied to emergency management, traffic management, and urban management. In particular, by meshing a large urban area to a number of fine- grained mesh grids, citywide crowd and traffic information in a continuous time period can be presented with a 4D tensor. Based on this idea, a series of methods have been proposed to address grid-based prediction for citywide huge crowds and traffic. In this research, we revisit the density and in-out flow assumption problem and publish a new human mobility dataset generated from a real-world smartphone feature.

III. CREATIVE MECHANISM DESIGN METHODOLOGY

ECDE is synthesized by the methodology Software Design Life Cycle (SDLC). The process is in a circular motion with 6 steps as shown in Fig. 3 below. The planning stage i s where the necessary requirements need to be found and the expected timeline of the whole process is charted. After that, the next stage is the Design stage where a rough outline of the design is made and is updated thoroughly. When that is finish, the development stage starts which means the programming and research begins. That process would be the one that takes the largest, so careful management is definitely needed beforehand. Next, when the project model is all done, it is then tested for any errors or unintended results. It's basically the debugging process. At the end of the first loop, the project model is working but will still need some more fine-tuning or results in the process. The consist 6 steps are following,]

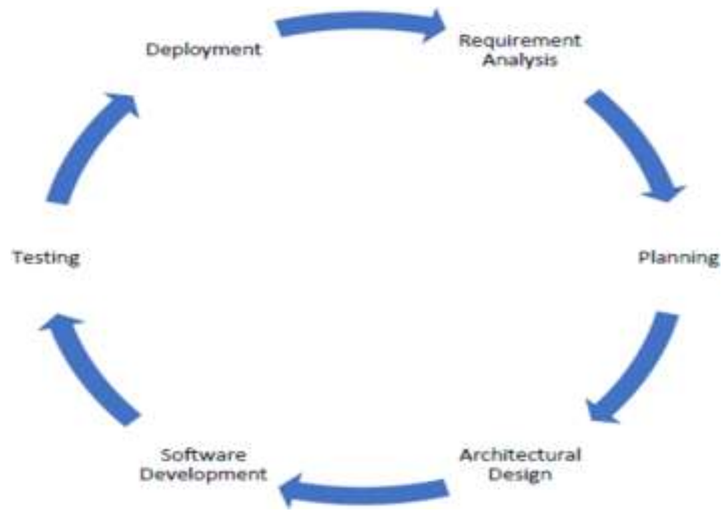

Fig. 3 SDLC Process Flowchart

Requirement Analysis
To search for an existing design project model or study a present new design model with fulfills the required specifications and making the topological structure of these models is the first step of the methodology. The goal of this model for searching their equivalent mechanism skeleton and kinematic chain for developing new designs.

Planning
Planning for the quality assurance requirement and identification of the risk associated with the project is also done in the planning stage.

Architectural Design
The architectural design is important to stakeholders and is based on different parameters such as risk assessment and software. The best design approach is selected for the product for reliability, design modularity, budget, and time constraints.

Software development
Software development is the initial step of development start of the project. By requirements, the programming code is generated. If the design is performed in a detailed and organized manner, code generation can be completed without much hassle.

Testing
This stage is usually an important of all the stages as in the modern SDLC models, the testing process is mostly involved in all the stages of SDLC. However, this stage refers to the testing-only stage of the project where project defects are reported, tracked, fixed, update and retested until the product reaches the quality standards.

Development

Development is the last step of the project model. After the all steps project was developed with accuracy, and all requirements were completed result. This is the final stage

Requirement Analysis

The traditional approach of crowd density estimation is an extremely developed and popular field because of the powerful feature extraction and classification technique. However, crowd density estimation is a challenging problem with models for crowd management system by using image classification and a system of alarms to manage thousands of people during events.

During the development and testing of a neural network model, the developer has to create a separate file to test its accuracy which takes a lot of time during the development. There is rarely used a graphical user interface (GUI) for it too development by creating a ready-to-use system that could take in the parameter file, ground truth file, and image files to output it's estimated density map, estimated count from crowd, and a graph analysis of its accuracy result as well as the accuracy Mean Absolute Error (MAE) and Mean Squared Error (MSE). Furthermore, once the development is finished, the system can be used independent to determine the number of people present. The goal of this project is to improve my Python programming abilities while simultaneously providing a window into the advancement of deep learning, notably the convolution neural network, in the context of the 4.0 Industrial Revolution. Additionally, this project will demonstrate to potential employers that I have the capacity and want to master new skills.

The objectives for this project are to train a neural network model to give the number of people within crowd using the PyTorch framework. The neural network that will be used is called MCNN. The dataset that will be used to train the said model is the ShanghaiTech Dataset, a dataset that has the coordinates of the heads of the people in the images or video and are marked and save in a. mat file. The image dataset is then applied a Gaussian kernel filter to make a ground truth density map where it will be give along with its corresponding images to the neural network model for training. After training is finished, the model would then create the image's density map and estimate the number of crowds from there. The result of the model would be calculated using the Mean Absolute Error and Mean Squared Error as it is the standard for most of the crowd counting algorithms out there.

Planning

First make the neural network and train it. The development will be done using the PyTorch framework and Python3. Also, the practice of object-oriented coding will also be used throughout this project. The neural network design will be stored in PythonModel.py, the program that will insert the image data will be saved in dataloader.py, the code to create the ground truth density map will be saved ingaussian.py and the file to train the neural network will be called train.py. Once the training of the neural network is complete and tested successfully in Google Colab, the development of the front-end can be initiated. The overall design of the GUI will be done using HTML, CSS, JavaScript to help expedite the development time. After that, the GUI has to be connected to methods that will connect with the neural network to form a working model that could imagine the crowd count and also, test the neural network for its accuracy. To show the graphs and also the density map, the matplotlib Python library is used to visualize the data.

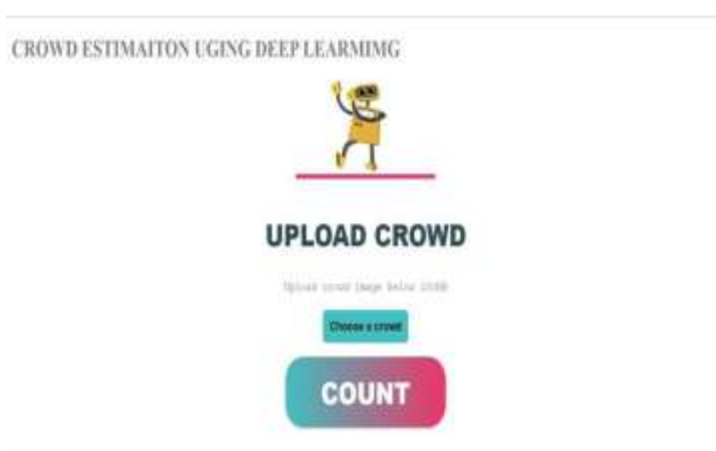

Fig.4 GUI

The general code construction of this venture will be parted into a few Python scripts for effortlessness purpose. Also, the Pytorch structure is object-oriented based which makes developing the model a lot more straightforward.

4.1gaussian.py – responsible for creating the ground truth density map
4.2dataloader.py – contains the Dataset class needed.
4.3PythonModel.py – contains the Network model class needed.
4.4train.py – responsible for implementing the Dataset and Network class together and train said model.
4.5App.py – launches our localhost port 5000.
4.6Inferences- Initializes our model and makes the predictions.
4.7Commons - References our model file.
4.8Model.pt- Our trained model.
4.9Templates- Contains index and result templates.

IV. ARCHITECTURAL DESIGN

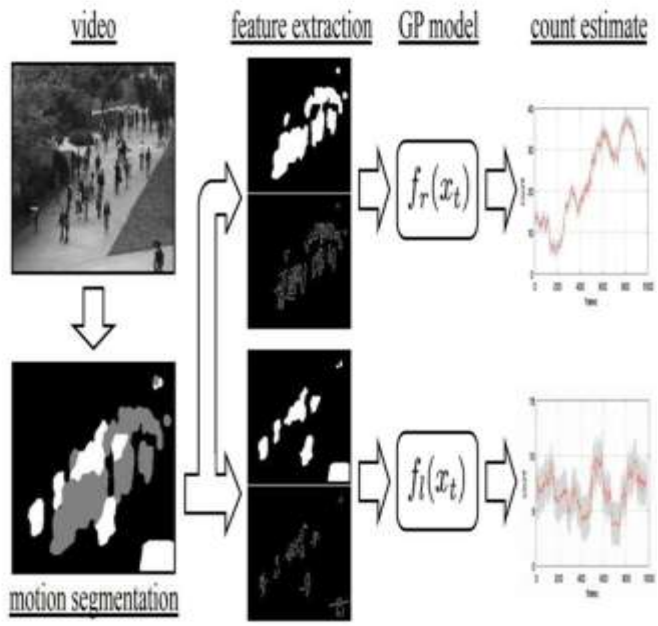

Fig. 5 Process design

ECDE architectural design is based on MCNN deep learning. In that from input to output one structure is designed that means architectural design which is show in fig. 5.
In that structure, data is collected from the dataset for segmentation. After that process, data goes to the trained GP model through the feature extraction. The Gaussian processes model is a chances supervised machine-learning framework that has been widely used for regression and classification tasks. A Gaussian process regression (GPR) model can create assumptions corporation prior knowledge (kernels) and give uncertainty measures over assumptions. The gaussian processes model is an observed method developed by computer science and statistics institutes. Researchers with engineering backgrounds often search it difficult to gain a clear understanding of it. To understand GPR, even only the basics need to have data of multivariate normal distribution, kernels, non-parametric model, and joint and conditional situations.

Tools needed
A working computer equipped with a CUDA-supported discrete graphics processing unit (GPU). In that preferably an NVIDIA card with RT cores, at least 16GB RAM and a CPU with at least 4 cores and 8 threads. Pytorch machine learning library, python 3, pycharm, package installer for python, serval external python libraries.

MCNN

MCNN, which stands for Multi-Column Convolutional Neural Network, is a deep learning model specifically designed for crowd counting tasks. It was proposed by Zhang et al. in their paper titled Single- Image Crowd Counting via Multi-Column Convolutional Neural Network in 2016. The MCNN model aims to estimate the number of individuals in a crowd by analyzing a single image. It consists of three columns, each representing a separate pathway in the network. The three columns process the input image at different scales to capture features of different sizes, allowing the model to detect individuals at various scales within the crowd. The MCNN model's efficiency for crowd counting stems from its ability to capture multi-scale features, shared weight strategy, density map estimation, and appropriate loss function. These design choices enable MCNN to achieve competitive crowd counting accuracy while maintaining computational efficiency.

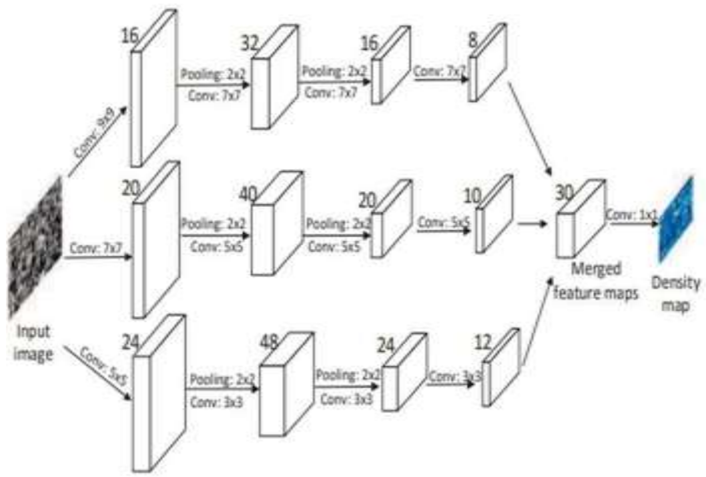

Fig. 6 Structure of the proposed Multi-Column Convolutional Neural Network

The improvements of the neural network model will be measured in mean absolute error as well as mean squared error. Mean Absolute Error is an evaluation tool used for regression models where the mean absolute error of a model in terms of its test set is the mean of the absolute values of the individual prediction errors on every step in the test set. So, the difference between the true value and the redacted value for the instance is the prediction error. The targeted MAE f or this model is to be as low as possible shown below.

$$mae = \frac{\sum_{i=1}^{n} abs\left(y_i - \lambda(x_i)\right)}{n}$$

Mean Squared Error on the other hand is also an evaluation tool used for regression models. The mean square error of the model in terms of its test set is the mean of the squared prediction error on all the instances of the test set. The difference between the true value and the predicted value of the instance is the prediction error. The targeted MSE for this models to be as low as possible [13] shown below.

$$mse = \frac{\sum_{i=1}^{n} \left(y_i - \lambda(x_i)\right)^2}{n}$$

VGG-16 structure

VGG-16 structure is a deep convolutional neural network architecture that was proposed by Simonyan and Zisserman in 2014. It is called VGG-16 because it consists of 16 layers, including 13 convolutional layers and 3 fully connected layers. VGG-16

has become a popular model due to its simplicity and strong performance on various computer vision tasks, including image classification.
VGG-16 has gained popularity and is considered better than some other architecture is its deep and uniform structure. It has a straightforward design, with small 3x3 filters and max pooling layers applied consistently throughout the network. This uniformity makes it easier to understand and implement compared to architectures with complex skip connections or varying filter sizes.

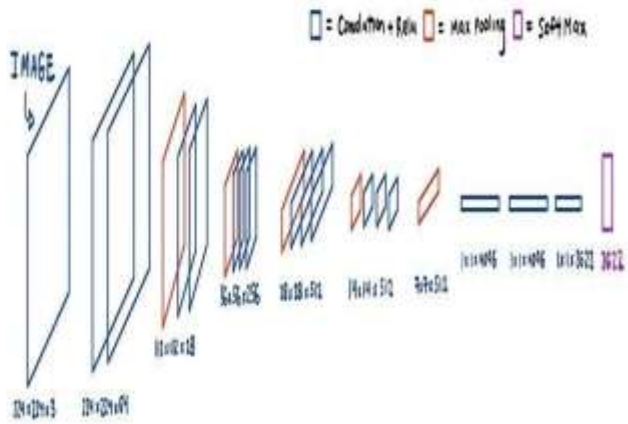

Fig. 7 VGG-16 structure

Software Development

In software development given steps of whole development process. Before the system can be developed, a neural network needs be trained. Steps contains are following,

Train dataset using Google colab
A dataset has to be prepared. To ready the dataset for the neural network, images from the dataset must be insert into a Gaussian filter to make a density map in the form of NumPy array. For this, gaussian.py is used where the converter coordinates of the people's head in the image are applied a Gaussian filter and the resulting map is saved as. npy file. Google Colabs like Jupyter notebooks. They are convenient because Google Colab hosts them, so we don't use any of our own computer sources to run the notebook. We can also share these notebooks so other people can quickly run our program, all in a standard environment since it's not dependent on our own machines. However, we need to install some libraries in our environment during initialization. Google Colab steps are ready for the Google Colab notebook, Loading the necessary libraries, Constant for image dimension and batch size, giving the model architecture, accessing data from Google Drive, Define the directions for ShanghaiTech dataset, process the data and make data generators, Build the MCNN model, compile the model, Define call back and Training that.

Fig. 8 Final trained model saved in model.pt

Development of Web application using Flask
Flask is a light and flexible web framework for Python. It is contract to make it reliable to build web features and APIs. Flask follows the WSGI (Web Server Gateway Interface) specification and can be used with any WSGI-compliant web server. Here

are many key features and characteristics of the Flask Framework Minimalistic, quickly to get started, increasable, flexible routing, tempting engine, RESTful API development, testing- debugging and ecosystem, applicable, interfaces, commons, model.pt

Fig. 9 UI index.HTML

Fig. 10 UI Result.HTML

V. TESTING

Testing is must to all developments. Through testing find errors for more flexible and reliable development. In testing whole process and run that unit wise for find issues. After testing and correcting errors development is completed.

VI. DEVELOPMENT

Final step is final development. In that check process from select dataset and it send to GP model for trained and after that through UI index.HTML estimate the crowd density.

VII. CONCLUSIONS

In this work, an end-to-end recurrent adversarial learning network is proposed for efficient crowd density estimation with trail of Multi-Column Convolutional Neural Network block. Multi-column Convolutional Neural Network block extracts multi column features with the help of Multi-Column Convolutional Neural Network block. Refinement block is employed to refine the learned feature maps of the preceding layers. It takes the learned feature maps from multi-column dense residual block and respective target encoder block through skip-connections and output a refined set of feature maps. The extracted features from different layers and output for previous frame are shared through recurrent technique to provide enough temporal information. Further, the learning of network is concentrated on different ways like global and cross-dataset training-testing for ECDE. Extensive experimental analysis of the proposed network is done on two benchmark videos datasets for ECDE. The experimental analysis shows that the proposed network outperforms the existing state-of-the-art methods on two benchmark datasets for ECDE.

Conflicts of Interest Authors must identify and confirm any personal situations or interests that may be understood as inappropriately influencing the representation or definition of reported research results. If there is no dispute of interest, please state "The authors declare no dispute of interest."

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Model for Retinal Disease Diabetic Retinopathy

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Abstract—Diabetic retinopathy is a prevalent problem worldwide, causing many people to lose their vision. If left untreated, the disease can become severe, leading to damage in the retinal blood vessels and blocking the passage of light through the optical nerves. This can result in blindness for patients with Diabetic Retinopathy. Our research aimed to find a solution to this problem, and we were able to use a Convolutional Neural Network (ConvNet) to detect multiple stages of severity for Diabetic Retinopathy. While manual screening is another method of detecting this condition, it requires a skilled ophthalmologist and takes up a considerable amount of time. Our automatic diabetic retinopathy detection technique can replace such manual processes, allowing ophthalmologists to spend more time providing proper care to patients and potentially reducing the severity of this disease.

Keywords: retinopathy, convolutional neural network, the ophthalmologist.

I.INTRODUCTION

Diabetic retinopathy (DR) is a serious complication of diabetes that can potentially lead to vision loss. It affects the retina, which is the light-sensitive tissue located at the back of the eye. The condition can develop without noticeable symptoms in the early stages, making early detection crucial for effective intervention and prevention of vision loss. As diabetes becomes more prevalent worldwide, there is an urgent need for accurate and efficient methods of diagnosing diabetic retinopathy.

To address this challenge, our machine learning project aims to develop a reliable model for detecting diabetic retinopathy. Leveraging artificial intelligence and image processing, we aim to create a system that can analyze retinal images and identify signs of diabetic retinopathy with high accuracy.

By using machine learning algorithms, we seek to automate the process of diagnosing diabetic retinopathy, providing a faster and more scalable solution compared to traditional manual screening methods. The integration of machine learning into healthcare has the potential to revolutionize the early detection and management of diabetic retinopathy, ultimately improving patient outcomes and reducing the burden on healthcare systems.

This project is not just a technological advancement but also a step towards making early diabetic retinopathy screening accessible to people in regions with limited healthcare resources. Developing an accurate and efficient machine learning model could significantly contribute to global efforts aimed at reducing the impact of diabetic retinopathy on individuals' vision and quality of life.

Our interdisciplinary team of data scientists, healthcare professionals, and experts in the field of ophthalmology collaborates to bring together the best of technology and medical expertise. Through the fusion of cutting-edge machine learning techniques and domain-specific knowledge, we aim to create a powerful tool that can make a tangible difference in the lives of individuals at risk of diabetic retinopathy.

II. METHODOLOGY

Methodology for Diabetic Retinopathy Detection using ConvNets
Step 1: Data Collection and Preprocessing
Gather a dataset of retinal images, labeled for diabetic retinopathy severity. Preprocess images: resize, normalize pixel values, and perform data augmentation to increase dataset size if needed.

Step 2: Data Splitting
Split the dataset into training, validation, and testing sets (e.g., 70-15-15 ratio) to train, tune, and evaluate the model, respectively.

Step 3: Building the ConvNet Model

Design Convolutional Neural Network architecture suitable for image classification tasks. Typical layers might include convolutional layers, pooling layers, batch normalization, and fully connected layers at the end. Experiment with various architectures to find the best-performing one.

Step 4: Training the Model
Train the ConvNet using the training dataset. Use a loss function (e.g., categorical cross-entropy) and an optimizer (e.g., Adam) to minimize the loss. Monitor the performance on the validation set to avoid overfitting.

Step 5: Evaluation and Validation
Evaluate the trained model on the test dataset to assess its performance. Measure accuracy, precision, recall, F1-score, and confusion matrix to understand the model's performance in detecting diabetic retinopathy. Fine-tune the model parameters if needed based on evaluation metrics.

III. WHAT WAS OUR APPROACH?

Why we have selected ConvNet to solve this problem? / Objective
Diabetic retinopathy is a major cause of blindness among working-age individuals in developed countries, affecting more than 93 million people. Efforts have been made to develop an automated and comprehensive screening method for diabetic retinopathy, using image classification, pattern recognition, and machine learning. The aim of this project is to create a new model that can realistically be used in clinical settings, using photos of eyes as input.
The project has two main motivations: firstly, image classification has been a personal interest for a long time, particularly on large-scale datasets. Secondly, there is a significant amount of time lost between patients getting their eyes scanned, their images being analyzed by doctors, and scheduling a follow-up appointment. EyeNet, the proposed model, aims to process images in real time, enabling patients to seek and schedule treatment on the same day.

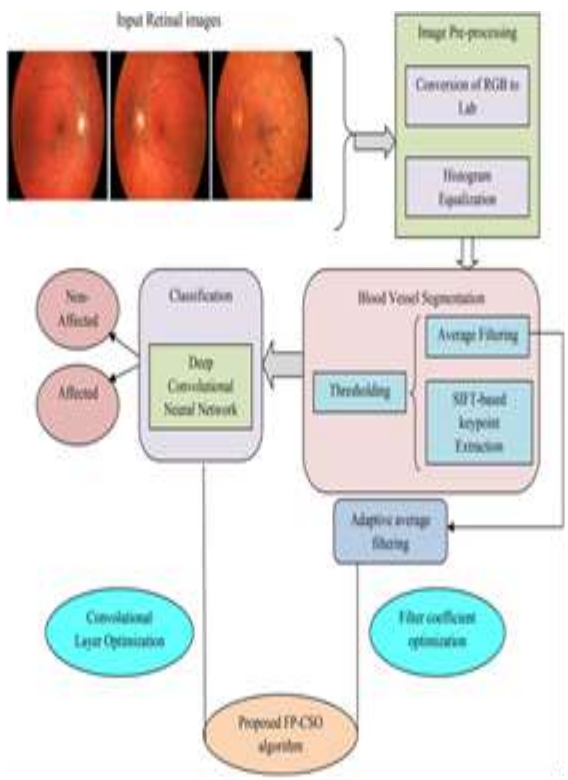

Fig 1. FLOWCHART

The image is a flowchart that shows the steps involved in a machine-learning algorithm for the early identification of diabetic retinopathy. The algorithm takes a fund-us image as input and outputs a classification of the image as either normal, non-proliferative diabetic retinopathy (NPDR), proliferative diabetic retinopathy (PDR), or diabetic macular oedema (DME).
The first step in the algorithm is per-processing, which involves cleaning the image and removing any artefacts. The next step is optic disc detection, which involves identifying the optic disc in the image. The optic disc is the central part of the retina and is important for detecting diabetic retinopathy.
The next step is blood vessel detection, which involves identifying the blood vessels in the image. Blood vessels are also important for detecting diabetic retinopathy. The next step is microaneurysms detection, which involves identifying microaneurysms in the image. Microaneurysms are small bulges in the blood vessels that are an early sign of diabetic retinopathy.
The final step in the algorithm is disease classification, which involves classifying the image as either normal, NPDR, PDR, or DME. The algorithm uses the information from the previous steps to make this classification.
The flowchart shows that the algorithm is a sequential process, with each step building on the previous step. The algorithm is designed to be efficient and accurate, and it is effective in identifying diabetic retinopathy in the early stages.

IV. HOW WE CAN MAKE IT ACCESSIBLE TO DOCTORS?

: In our research, to tackle the aforementioned challenges, we built a predictive model for Computer-Aided Diagnosis (CAD), leveraging eye fundus images that are widely used in present-day hospitals, given that these images can be acquired at a relatively low cost. Additionally, based on our CAD model, we developed a novel tool for diabetic retinopathy diagnosis that takes the form of a prototype web application. The main contribution of this research stems from the novelty of our predictive model and its integration into a prototype web application.

V. ACKNOWLEDGEMENTS

"We express our sincere gratitude for the utilization of the advanced model for retinal disease, specifically in diabetic retinopathy detection. Our acknowledgement extends to the developers and contributors whose efforts have significantly contributed to the success and accuracy of the model, enhancing our understanding and diagnosis of diabetic retinopathy".

VI. CONCLUSION:

A successful deep-learning system for detecting diabetic retinopathy requires a multi-disciplinary approach involving collaboration between data scientists healthcare professionals and other stakeholders. Regular updates and continuous monitoring ensure the liability and effectiveness of the system in the real world.

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Design and Analysis of Microstrip Array Antenna for IoT Applications

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Abstract— This paper presents the design of a microstrip array antenna (MAA) for IoT applications at a frequency of 2.4 GHz. Our objective is to design and analyse single-element and 1x4 rectangular MAA for IoT smart homes, medical fields, and industrial applications. For designing, we use FR4 substrate material with a dielectric constant of 4.4 with a 1.6mm thickness, and microstrip line feeding technique is used in designing of MAA. The Various antenna parameters namely Return Loss (RL), Impedance Bandwidth, Gain and Radiation Patterns are calculated. The 3DEM of Mentorgraphics software is used for design and simulation purposes.

Keywords: Microstrip antenna arrays, FR-4 Substrate, microstrip feed technique, 2.4 GHz and IoT.

I INTRODUCTION

The importance of microstrip antennas in the field of wireless communication applications is very advantageous because of their small size, low cost and easy for fabrication. Every antenna in known because of their design implementations, characteristics and different applications. The present days are difficult to be imagined without the use of technology and microstrip antennas are strength and backbone for different wireless communication and their applications. In the today's era of wireless communication technology application world the microstrip patch antennas perform a very important role [1].

The rectangular MAA are frequently considered as compared to hexagon, circular, triangular etc. The MAA are used in simple as well as in most challenging applications. The broad bandwidth, feed line flexibility, beam scanning and circular polarizations can be achieved using MAA. We use the FR4 (flame retardant) dielectric material with dielectric Constant Ɛr=4.4. FR4 is chosen because reasonably it is low-cost material and it is easily available in the market.

II. ANALYSIS AND DESIGN

The width and length of the single element is calculated using the formula [2]
The width ‘W’ of designed patch is calculated by using the equation

$$W = \frac{c}{2f_r} \quad (1)$$

The Length ‘Lp’ of designed patch is calculated by using the equation

$$L_p = L_{eff} - 2\Delta L \quad (2)$$

The Extension Length ‘ΔL’ of designed patch is calculated by using the equation

$$\frac{\Delta L}{h} = 0.412\frac{(\varepsilon_{reff}+0.3)}{(\varepsilon_{reff}-0.258)}\left(\frac{\frac{W}{h}+0.264}{\frac{W}{h}+0.8}\right) \quad (3)$$

The relationship between actual length ‘L’ and effective length ‘Leff’ of designed patch is calculated by using the equation

$$L_{eff} = L + 2\Delta L \quad (4)$$

The effective length of patch is calculated by using the equation

$$L_{eff} = \frac{\lambda_g}{2} \tag{5}$$

While designing the MAA we considered spacing to be 62.85 mm between each element [3].

III. DESIGN OF SINGLE PATCH AND 1x4 ANTENNA ARRAY

3.1 Design of Single Rectangular Patch Antenna

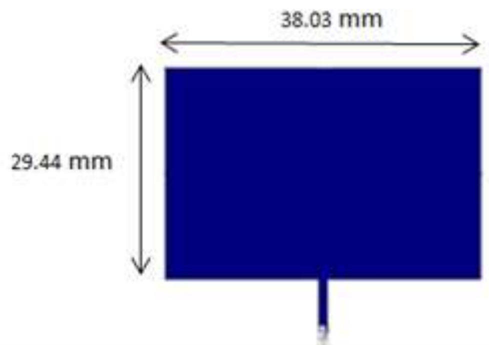


Fig.1. Design of Single Patch Antenna

The designed single microstrip patch antenna of size 38.03 mm width and 29.44 mm length is designed for 100Ω feedline whose width is 0.7mm and length is 5mm is shown in Fig.1.

3.2 Design and Analysis of 1x4 Antenna Array [4]

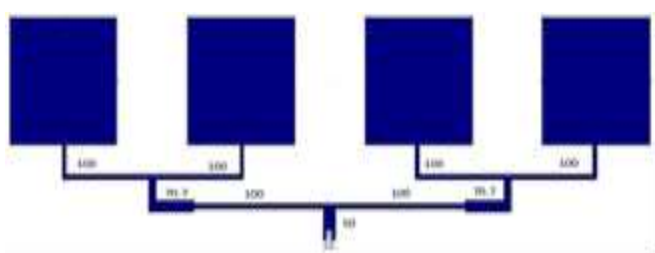


Fig.2. Design of 1x4 MAA

The Fig.2 shows design of 1x4 MAA having 100Ω feed line is used to connect all the patches. The quarter wave transformer impedance is calculated as Z= = = 70.7Ω is positioned among in between 50Ω equivalent point and 100Ω line. The calculated patch and feedline dimensions considered are tabulated in below Table 1.

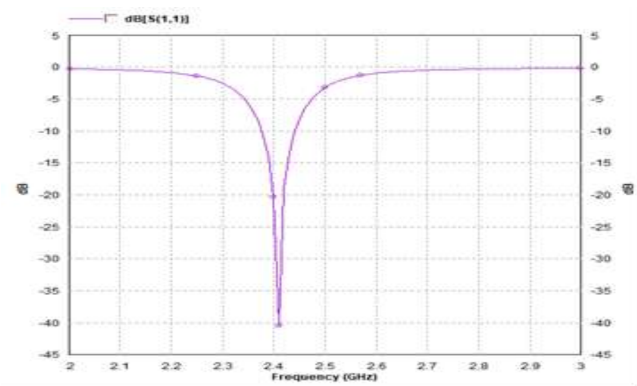
Table 1 Patch & Feedline Dimensions of 1x4 Array

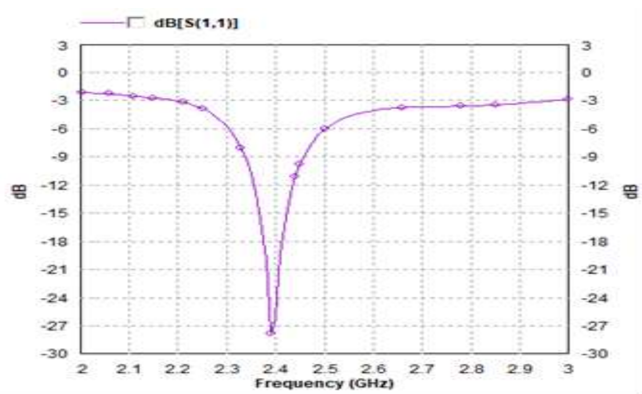
Size of each patch	38.03 mm x 29.44 mm
Spacing between patches	62.85 mm
100Ω feedline width	0.7 mm
70.7Ω feedline width	1.6 mm
50Ω feedline width	3 mm

IV. SIMULATION RESULTS OF SINGLE PATCH AND 1x4 ANTENNA ARRAY

The proposed antenna is designed [5-10] and simulated in 3DEM of Mentorgraphics software. We calculated Return loss, Impedance bandwidth, Gain and Radiation patterns.

4.1 Simulation Results of Impedance Bandwidth & Return Loss

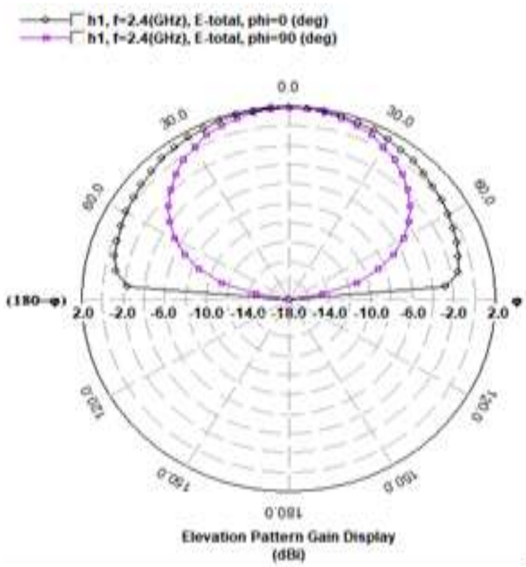




4.2 Simulation Results of Radiation pattern

The radiation patterns of single Patch and 1x4 antenna array at 2.4 for IoT smart homes, medical field and industrial applications are shown in Fig. 4 (a) and (b) respectively. The Fig. 4(a) shows radiation pattern of single patch, where main lobe is widely spread and side lobes are almost null in nature. Whereas Fig. 4(b) shows radiation pattern of 1x4 array, where main lobe is well directed in uniform direction with two minor side lobes.

The measured maximum Half Power Beam Width (HPBW) values of the single Patch and 1x4 antenna array are 101.620 and 50.140 respectively.



(a)

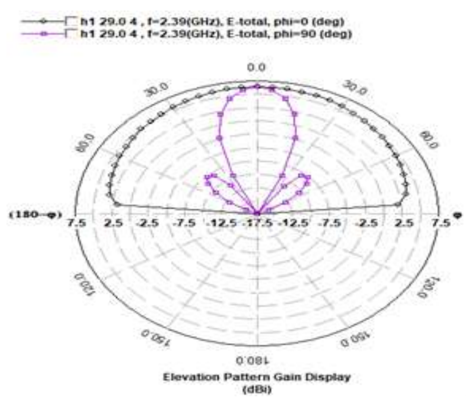
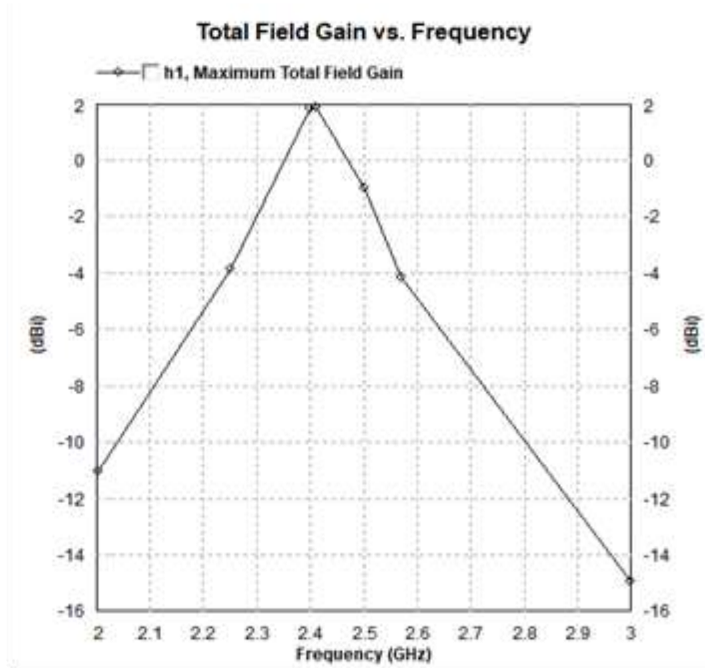


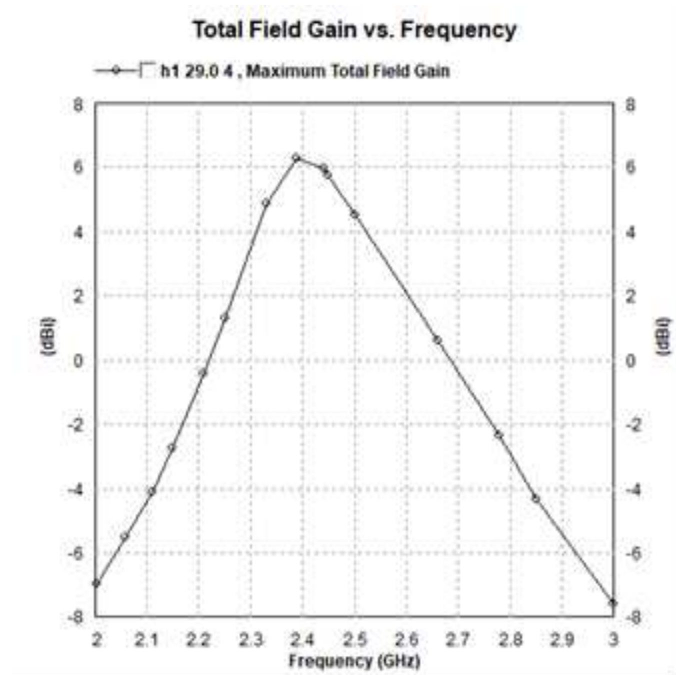
Fig.4. Radiation Patterns obtained for the (a) single patch (b) 1x4 array

4.3 Simulation Results of Gain

The Fig. 5 (a) and (b) shows maximum total field gain values of the single and 1x4 MAA. The total field gain value obtained for single patch antenna is 1.87 dB and total field gain value obtained for 1x4 antenna array is 6.28 dB respectively at frequency of 2.4 GHz.



(a)



(b)

Fig.5. Gain (a) single patch (b) 1x4 MAA

The obtained simulated results are summarised for a single patch, and a 1x4 MAA is represented in Table 2. The return loss value for both antennas is less than -10 dB, which is desirable. There is a slight improvement in bandwidth value and a significant improvement in gain, that is, for the array configuration, we obtained three times more gain as compared to the gain for a single antenna and overall good radiation patterns.

Table 2 Combined Results Obtained for Single Patch and 1x4 Antenna Array

	Return loss (dB)	***Impedance Bandwidth (MHz)***	***Gain (dB)***	***HPBW***
Single Patch	-40.5 dB	64.58 MHz	1.87 dB	101.62^0
1x4	-27.7 dB	110 MHz	6.28 dB	50.14^0

V. CONCLUSION

The rectangular single patch and 1x4 antenna arrays were designed and analysed successfully using the FR4 dielectric material. It was observed that the antenna resonated at a frequency of 2.4 GHz, which can be used for IoT smart homes, medical fields, and industrial applications and results were obtained by using 3DEM of Mentor graphics software. From the proposed design for a single patch, the gain obtained is 1.87 dB and for a 1x4 antenna array the gain obtained is 6.28 dB.

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Leaf Based Plant Disease Detection Using Convolution Neural Network

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Abstract—Conventional has the problems of slow training speed, single characteristic scale and low recognition accuracy. To solve these problems, a convolution neural network identification model based on Inception module and dilated convolution is proposed in this study. The inception module combined with dilated convolution, could extract disease characteristics at different scales and increase the receptive field. By setting different parameters, six improved models were obtained. They were trained to identify 15 diseases of 10 different crops; then the authors selected optimal recognition model. On this basis, the segmented dataset and the grey-scaled dataset were trained as comparative experiments to explore the influence of background and color features on the recognition results. After only two training epochs, the improved optimal model could achieve an accuracy of over 85%. Moreover, the final average identification accuracy reached 95.37%. Contrast experiments indicate that color and background features may influence the recognition effect. The improved model can extract disease information from different scales in the feature map to identify diverse diseases of different crops. The proposed model has faster training speed and higher recognition accuracy than the traditional model, and thus it can provide a reference for crop disease identification in actual production.

Keyword- CNN, Texture, classification, Caffe framework, AlexNet

I. INTRODUCTION

These Crop diseases [[1]] are the main factors affecting agricultural development. The yield and quality of agricultural production are closely related to the occurrence area and harm the degree of crop diseases. Although modern chemical pesticides can effectively control crop diseases, different crops have diverse diseases. Farmers identify crop diseases relying on visual observation and experience, which is prone to misdiagnosis and easily leads to the misuse of pesticides. Therefore, it is of great significance to help farmers diagnose crop disease types timely and accurately [[2]-[4]]. To solve the problem, experts and scholars have been working to develop a method [[5], [6]] that can automatically, quickly and accurately identify a variety of crop diseases.

Provided good support to extend the related research and application of image processing [[7], [8]] in the field of agriculture. In recent years, many types of research based on computer vision technology have been used to identify crop diseases. Tellaeche et al. [[9]] studied the issue of weed disease identification among the fields. According to the principle of the orderly arrangement of weeds among the fields, they used the Hough transform method and regional marking method to identify weeds between crops in different observation angles and spaces. Liu et al. [[10]] firstly applied the fast independent component method to removing random noise of the disease images, then extracted the colour and texture features of the disease persimmon surface image. Finally, the support vector machine (SVM) was used to identify and classify the diseases on the persimmon surface. Bankar et al. [[11]] trained the dataset of healthy and sick samples, then classified plant diseases according to edge detection and histogram matching methods. Ma et al. [[12]] firstly segmented the lesion image, then extracted 25 features including colour, texture and shape features, and constructed an SVM classifier based on radial basis kernel function, which accurately identified downy mildew of cucumber, with an accuracy of 90%.

Most researches in the above literature are based on image feature extraction and traditional instructed algorithms to identify crop diseases. Although these methods have a good recognition effect for specific crop diseases, the characteristics such as colour and texture sometimes do not reflect the disease information well and the recognition effect is weakened. In addition, the processes of image pretreatment and feature extraction require artificial selection and calibration, which consume a lot of time and energy. It is not conducive to the promotion and application of disease identification methods. Another problem is that the identification of these research methods focuses on limited kinds of crops and diseases. In the actual production, farmers who grow different crops usually need to diagnose various diseases, so the above methods are perhaps not effective for different demands.

In recent years, deep learning has become a hot research pot in machine learning [[13], [14]] and has been successfully applied in many fields. Convolutional neural network (CNN) with strong ability to automatically extract features has been widely used in the field of image recognition [[15]-[17]], such as street scene recognition [[18]], face recognition [[19], [20]], object detection [[21]] and image segmentation [[22], [23]]. Meanwhile, CNN has been applied in the agricultural field to detect and identify crop diseases. Dyrmann et al. [[24]] trained a typical CNN model and successfully identified 22 species with a classification accuracy of 86.2%. Lu et al. [[25]] identified ten common rice diseases using a novel method based on the CNN technology, with an average recognition accuracy of 95.48%. Cheng et al. [[26]] constructed a deep residual learning model to identify ten crop pest images in the complex background and achieved an accuracy of 98.67%. Too et al. [[27]] studied crop disease identification using a method of fine-tuning existing deep learning models.

The above researches are sufficient to show that the recognition methods based on deep learning, especially CNN, are effective in the field of agriculture. However, there exist some defects and difficulties in the above researches, involving the recognition rate are higher for specific samples under certain circumstances. In the diagnosis model, some parameters are not optimal and the convergence speed of the training algorithm is slow. The purpose of this study is to construct an improved CNN-based model to achieve fast and accurate automated recognition of crop leaf disease images.

In this paper, we refer to some new developments [[28]] in the field of deep learning, and propose an improved disease recognition model combined with dilated convolution and multi-scale feature fusion structure (Inception module). The improved model is trained to identify 38 different classes, including diseased and healthy crop leaf images. The recognition effect of improved model is compared with that of the traditional AlexNet [[29]] model. Based on the above works, the improved model is also trained via the grey-scaled dataset as well as segmented dataset corresponding to the raw images. Therefore, the influences of colour features and background noise on disease identification methods can be explored. The core motivation of this paper is to provide a reference for developing a crop disease identification system which is suitable for farmers by using a common digital camera.

Our main contributions can be summarised as follows: (i) We propose a CNN framework based on AlexNet for the identification of various crop diseases in the agricultural field.

(ii) An inception module combined with dilated convolution is proposed to obtain a larger receptive field and extract multiple features.

(iii) The influence of background and colour features on the recognition results is explored.

III. MATERIALS

Plant Village Project (www.plantvillage.org) is an open-source database for diagnosing crop diseases. It aims to enrich images of the database and use the database to solve problems related to plant diseases. The database contains diseased and healthy leaf images of various crops. This study uses 54,105 leaf images collected by the Plant Village Project as an experimental dataset, with 26 diseases for 14 crops and healthy leaves of some crops. Several typical images are shown in Fig. 1.

Fig. 1

Raw crop leaf image. Note: Label 1 is apple scab leaf. Label 2 is blueberry healthy leaf. Label 3 is cherry powdery mildew leaf. Label 4 is corn grey spot leaf. Label 5 is grape black rot disease leaf. Label 6 is orange yellow dragon disease leaf. Label 7 is peach bacterial spotted disease leaf. Label 8 is pepper bacterial spotted disease leaf.

We counted the total number of images and different samples, as shown in Table 1. It was found that the number of samples ranged from 152 to 5527, and the distribution was seriously unbalanced. This problem may lead to deviations in the identification and classification of various diseased leaves, which will affect the final recognition accuracy of the model. In order to balance the distribution of different types of images, the data augmentation procedures were conducted:

(i) Flipping the image from left to right;

(ii) Flipping the image from top to bottom;

(iii) Rotating the image by random angle;

(iv) Enlarging the original image randomly. In addition, images of corresponding classes were downloaded from the Internet to supplement the dataset. As for the classes with a large number of images, some original images were retained by eliminating method.

Table 1. Information of the database images

Class	Crop name	Disease name	Images number
0	Apple	apple scab	630
1	Apple	black rot	712
2	Apple	cedar rust	276
3	Apple	—	1835
4	blueberry	—	1735
5	cherry	—	854
6	cherry	powdery mildew	1052
7	Corn	grey leaf spot	1457
8	Corn	common rust	1610
9	Corn	—	2450

The number of images of the training set and test set in the original dataset is 43,424 and 10,681, respectively. After data augmentation, the number of images of each class is about 2000, and the total number of expanded images is 76,000. The expanded dataset is further divided into a training set and test set according to the ratio of 4:1. The training set and test set contain 60,800 and 15,200 images, respectively. Finally, the dataset is labelled as 0–37 by category and the images are resized to 256 × 256 pixels. Comparison experiment is carried out based on different versions of the dataset provided by PlantVillage project to explore the influence of colour feature and background information on identification results. Fig. 2 shows the different versions of the same leaf for a randomly selected set of leaves.

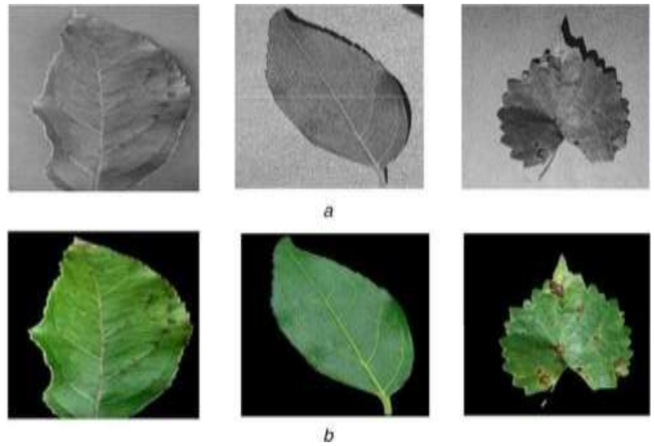

Fig. 2

Sample images from the two different versions of the Plant Village dataset

I. Architecture Of Crop Disease Identification Model

The traditional CNN architecture mainly includes convolution layers, pooling layers and fully-connected layers. The convolution layer is used to extract features from the images, the pooling layer is used to reduce the amount of data, and the fully-connected layer is used to connect the neurons between the layers. As a classic CNN architecture, the AlexNet model has made a major breakthrough in image recognition tasks. However, the convolution kernel size (11 × 11) of the first layer is large and the fully-connected layer is used in the network. This leads to problems such as slow iterative training and single feature scale, which make the model difficult to play a role in practical applications. For these limitations, this paper draws on the latest research progress and the original AlexNet made three improvements:

using the global pooling layer instead of the fully-connected layer to improve the iterative training speed;

(i) adding the inception module to the network to extract features of various scales; and

(ii) combining different scales of dilated convolution in the inception module to increase the receptive field.

A. Inception Module

The 'Inception module' first appeared in the GoogLeNet proposed by Szegedy et al. [[34], [35]] and then there were multiple versions of Inception vN (where N is from 1 to 4 for the number of versions). The CNN-based architecture in this paper is combined with Inception v2. Before the advent of GoogLeNet, experts and scholars had been working to increase the depth and width of the network. Although the network architecture seemed to be more abstract, it caused problems such as too many parameters, slow iteration training and over-fitting. For the sake of reducing the parameters and speeding up the model training while increasing the depth and width of the network, the inception module came into being.

In a nutshell, the inception structure introduces modular function into the traditional CNN architecture, which is mainly composed of convolutional layers and pooling layers. The sizes of convolution kernels are usually 1 × 1, 3 × 3 and 5 × 5. Diverse sizes of convolution kernels are used in the inception module to capture features of different scales, which is quite different from the traditional network architectures. Combining these features together will result in better classification results than using a single-size convolution kernel. Another significant advantage of inception module is the use of 1 × 1 convolutional layer before and after the convolutional and pooling layers, which effectively reduces computational requirements.

B. Architecture of improved model

The proposed model architecture is presented in Fig. 4. The structure removes the fully-connected layer in the original AlexNet and replaces it with a global pooling layer. Also, an inception module is connected after the pooling layer 4 to extract high-dimensional features of different scales. Meanwhile, the dilated convolution combines with Inception module to increase the receptive field of high-level feature maps. The improved model architecture consists of eight convolutional layers (Conv1—Conv5, the inception module uses a parallel combination of 1×1, 3×3, and 5×5 convolutional layers), one Concat layer and five pooling layers (pooling 1–global pooling 5, the inception module includes one pooling layer). The output layer uses Softmax classifier to get 38 labels (not shown in Fig. 4).

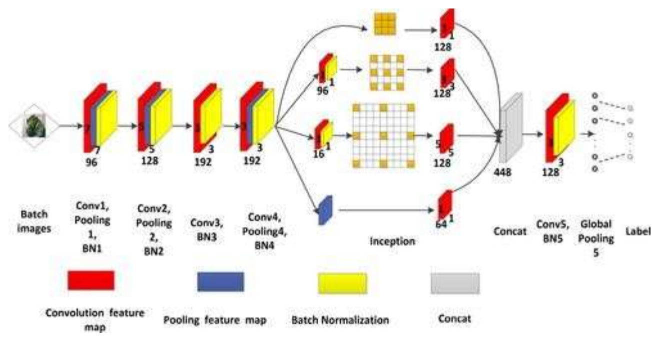

Fig. 3 *Architecture of improved model in this paper*

The main relevant parameters of the improved model architecture are summarized in Table 2. The size of the input image is set to $256 \times 256 \times 3$ according to the experience, which can be divided by 2, and computing capability of the computer. The convolution kernel size of Conv1 layer directly affects the extraction of low-level features. The commonly used convolution kernel sizes are 11×11, 9×9 and 7×7, and the Conv1 layer convolution kernel size is set to 7×7 in our architecture. The other convolution kernel sizes are shown in Table 2. The sizes of the first layer of convolution kernels in the Inception module are all 1×1, and the size of the second convolution kernel is 1×1, 3×3, 5×5, respectively. The number of convolution kernels of Conv1, Conv2,. …, Conv5 are 96, 128, 192, 192, 128, respectively; the number of convolution kernels of the first layer and the second layer in the inception module is 96, 16, 128, 128, 128, 64, respectively.

IV. MODEL TRAINING

Model training is the most important step in the experiment because training the appropriate model can improve the classification accuracy. This paper uses different datasets to train the improved CNN to obtain different models, for the purpose of comparing the classification effects of each model. Although the training sets of each model are different, the experiment mode and hyper-parameter configuration of this paper are standardised to ensure the validity of the experiment. The experimental setup is shown in Table 3, using Caffe as a deep learning framework, and GPU acceleration module is used to improve the training speed.

Proper parameter setting is very important during CNN training. We trained the networks with the Batch size of 64, 128 and 256 in different experiments. Each of the experiment ran for a total of 50 epochs where the epoch was the number of training iterations. The training mechanism used in the model is stochastic gradient descent (SGD), which [[36]] is the same training mechanism used in the original AlexNet. It ensures that the improved CNN framework can be compared with the original AlexNet objectively. This optimisation algorithm is currently widely used in deep networks; it runs faster and converges easily [[37]]. The learning rate was set to 0.01 for all networks. To prevent over-fitting, the weight decay was set to 0.0005, and the learning rate was gradually reduced to 0.1 (gamma) times in stages. Due to the GPU memory constraints, the step size was set to 9000. The loss function used in the model is the softmax-loss function. The loss function used in Caffe is determined by the last layer of the classifier. Since the last layer of the network is softmax classifier (mentioned in Section 3.4), the use of softmax-loss makes it more stable in computing. Other parameters used the default parameters of the Caffe framework.

V. RESULT AND DISCUSSION

Across all our experiments, we used the augmented dataset and three different versions of the whole PlantVillage dataset to train the network. Considering that different parameter settings will affect the performance of the model, this paper also compared the impact of the global pooling type, batch size and other parameters on the accuracy of disease identification, and then optimised the model. Finally, we got an optimal model which was expected to achieve automatic, fast and accurate identification of crop diseases.

As shown in Table 4, the inception module and dilated convolution improve the performance remarkably. Compared with the baseline AlexNet, employing inception module yields a result of 97.93% in AA, which brings 1.52% improvement. It indicates that inception module can extract the disease characteristics at different scales on the surface of diseased leaves. Due to the different sizes of the lesions on the surface of the diseased leaves, the inception module brings benefit to disease identification. Meanwhile, employing dilated convolution individually outperforms the baseline by 1.16%. This shows that the increase of receptive field contributes to disease identification. When we integrate the inception module and dilated convolution together, the performance further improves to 98.44%. Results show that the proposed architecture, combined with inception module and dilated convolution brings benefit to crop disease identification. Based on the above experiments, the subsequent experiments are conducted to obtain a suitable recognition model.

Effects of global pooling type on model performance

Due to different settings, six improved models were obtained in our experiments. Classification accuracies of diverse models are summarised in Table 5. As described in Section 3.1, global pooling includes global average pooling and global maximum pooling. In our experiments, models 1, 3, 5 use global maximum pooling, and models 2, 4, 6 use global average pooling. It can be observed from Table 5 that using global average pooling gets better results than using global maximum pooling. For example, the accuracy of Model 2 is 0.5% higher than that of Model 1, training on the original dataset. We suppose that global average pooling averages the pixel values of the entire feature map. It could make full use of the information and effectively reduce the estimation error caused by the domain constraints. In contrast, the global maximum pooling can only retain the low-level texture feature. Therefore, the deep feature information is lost, which results in lower recognition accuracy. However, we are not sure that the global average pooling is always the best option, since different classification tasks may have various suitable configurations.

Table 5. Classification accuracies with different parameters during diverse experiment

Model number	**Model**	**Model parameter**		**Accuracy, %**	
		Global pooling type	**Batc h size**	**Origi nal image datas et**	**Augment ed image dataset**
0	AlexNet model	–	64	96.41	97.62
1	improved model	maximum pooling	64	97.13	98.56
2		average pooling	64	97.63	98.93
3		maximum pooling	128	98.26	99.25
4		average pooling	128	98.45	**99.37**
5		maximum pooling	256	96.25	97.34
6		average pooling	256	96.47	97.78

Effects of batch size on model performance

It can be seen from Table 5 that the global average pooling contributes to the performance of models. In order to further optimise the model, the batch size is taken into consideration during the experiments. The batch training method is used to train the network model in experiments, and the training set is divided into several batches. In Table 5, the best accuracy 99.37% is got by the improved model combining with batch size 128 and global average pooling (Model 4). Compared with other models, employing batch size 128 yields better results in AA. Thus, it is supposed that the batch size 128 is quite effective in this work.

In the case of deep learning, if the dataset is enough, the gradient calculated from half of the batch data (even more less) is almost the same as that from all the dataset. Thus, increasing the batch size within a reasonable range might effectively improve the computational efficiency of matrix multiplication and reduce the number of iterations. However, compared with Model 3, employing batch size 256 (Model 5) yields a result of 96.25% in AA, which causes 2.01% loss. Thus, improving batch size blindly may be getting the opposite results. The memory utilisation is increased, yet the memory capacity may not meet the calculation requirements. In addition, as the batch size increases, the number of iterations required to train a full dataset is reduced. To achieve the same accuracy, the time it takes is greatly increased, and the correction of the parameters becomes slow. As a result, the accuracy stops rising if the batch size is increased to a certain extent.

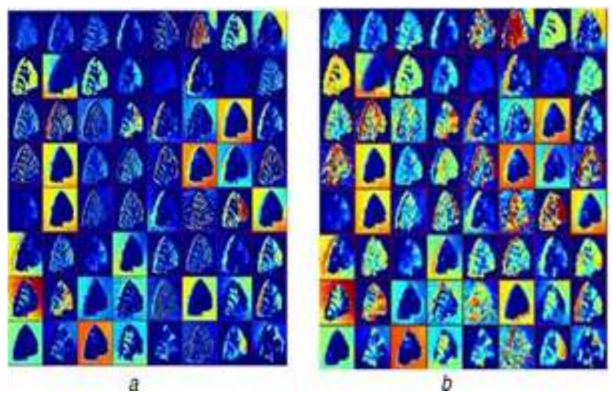

Fig. 4 *Result*

The later experiment is compared to the experiments with the raw dataset and augmented dataset. The recognition model trained on augmented dataset performs the best, with the highest recognition accuracy of 99.37% and the lowest loss of 0.023. As expected, the performance of the recognition model obtained from training grey-scaled dataset is significantly lower than that of the experiments on the other version of the datasets, but still achieves the accuracy of 96.73%. It indicates that the improved CNN-based model has learnt to extract colour features and the lack of colour features (especially green) in the image would affect the final recognition accuracy. Compared with the model trained on the raw dataset, training on the segmented dataset yields a result of 98.83% in accuracy, which brings 0.38% improvement. We suppose that the model which trained on the segmented dataset can investigate the role of the background of the images in overall performance. Thus, the redundant information and noise introduced during model training might be reduced to increase the final accuracy.

To further verify the convergence effect of the four recognition models, the relationship between accuracy and epochs is illustrated in Fig. 7. It is obvious that after only ten training epochs, all models start to converge. Meanwhile, after 25 training epochs, all models have converged and the test accuracy of the four models can reach over 95%. Besides, it can be found from Fig. 7 that the recognition model based on the segmented dataset and the raw dataset has a convergence speed close to each other, and the final recognition accuracy has little difference. On the one hand, it can be concluded that a small amount of redundant information introduced from the simple background has little effect on the recognition effect of the model. On the other hand, if the background is complex, a better classification model is likely to be obtained by training the images which segment the background.

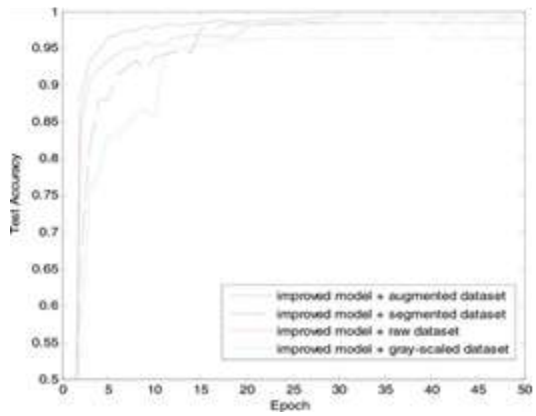

Fig. 5 *Relationship between test accuracy and epoch*

Results compared with other studies

Table 7 shows the best results obtained in this study, compared with other studies that previously classified diseases using computer vision and deep learning. The last column shows the classification accuracies when the methods are trained and tested on our dataset with 38 classes. The classification accuracy of this study is higher than that of other studies. Overall, deep learning methods perform better than traditional computer vision methods.

The methods used by Ma et al. [[12]] and Girish and Priti [[38]] both rely on feature extraction, which consumes a lot of time and energy. As our dataset contains various disease images, their methods are therefore not applicable to this dataset. Instead, the methods described by Lu et al. [[25]] and Jayme [[39]] have been implemented and tested against our method using the same dataset. Lu et al. [[25]] designed a typical CNN architecture to identify ten common rice diseases. As shown in Table 7, training their models resulted in a classification accuracy of 96.86%. This accuracy is higher than the original classification accuracy since our dataset is richer than their original dataset. It indicates that rich dataset benefits to identification effect. Jayme [[39]] used transfer learning technology in a pretrained GoogLeNet CNN and achieved identification of plant diseases. By using this approach, an accuracy of 98.24% was achieved on our dataset. These accuracies could be compared to the classification accuracy of 99.37% achieved using our method. In general, the proposed method outperforms these approaches that classified diseases previously.

VI. CONCLUSION

In this paper, CNN is applied to the identification of many crop diseases. Traditional AlexNet model is improved by combining the inception module with dilated convolution. Then the proposed model is trained to identify many crop diseases and is able to effectively classify 26 crop diseases and healthy crops through images recognition. The improvedel could extract disease features of different scales and ease the receptive field of the network compared with the inal AlexNet model, and therefore the final average ognition accuracy reached 99.37%. In addition, the higher convergence rate of the model is obtained.

After only two epochs of training, the accuracy of the improved model is over 95% and the loss value is only 0.023. The contrast experiments based on the segmented dataset and grey-scaled dataset also verify that noise in background and colour features maybe have an impact on the recognition effect, which provides valuable support for further improvement of the recognition method.

The results show that the improved CNN-based model trained on augmented dataset has good adaptability and robustness to image spatial position changes. Our optimal model can identify different diseases of multiple crops. We hope and believe that the research and observations of this paper will provide help for disease identification of crops in actual production. In future work, we are supposed to apply and improve other deep CNN-based architectures and train the model with images of more complex background.

VII. ACKNOWLEDGMENTS

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Suspicious Activity Tracking & Detecting Ai Camera

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Abstract— Recognition of suspicious humanoid activity from surveillance video is an energetic research area of image processing and computer visualization. In order to avert violence, theft, accidents, chain snatching, crime, and other suspicious activities, human activity can be supervised visually in sensitive and public spaces like bus stations, railway stations, airports, banks, shopping malls, schools, and colleges, parking lots, roads, etc. Because it is very hard to keep an eye on public spaces all the time, intellectual audiovisual surveillance that can follow human activity in real-time, classify it as normal or exceptional, and send out notifications is necessary. In the previous ten years, a lot of research in the area of anomalous activity recognition in visual surveillance has been published. Furthermore, a number of studies are accessible in the literature to identify different abnormal activities; but none of them dealt with it differently abnormal activity in the review. In this paper, the state-of-art demonstrating the overall improvement in recognizing suspicious activities from surveillance videos in last decade is presented. In broad, we discussed all steps taken to recognize human activity from surveillance videos; such as forefront object abstraction, tracking-based object detection or non-tracing approaches, feature extraction, classification, movement investigation and recognition.

Keywords: Suspicious Activity, AI Camera, Machine Learning, Google Teachable, Recognition

I. INTRODUCTION

IoT platforms have grown into a worldwide behemoth over the past ten years, grabbing hold of every aspect of our everyday lives and improving human life with its inexplicable smart services [1]. IoT is currently confronting greater security concerns than it has in the past because to its easy accessibility and the rapidly growing demand for smart devices and networks. IoT can be secured with readily available security techniques. Conventional methods, however, are less operative when dealing with progression booms and various attack kinds and their severances. Therefore, a next-generation Internet-of-things system requires a robust, continuously enhanced, and modern security system. The suggested work intends to decrease time and effort wasted on video surveillance camera monitoring through the usage of Deep- Learning and Image- Processing [3].

Video Surveillance illustrates a vital role in present world [2]. It is an unique budding areas of Computer visualization and artificial intelligence [6]. An instantaneous, proactive surveillance scheme is desirable, which could instantly sense dubious personnel, recognize suspicious activities, or raise momentous alerts [8]. Insecure security systems provide criminals an advantage during armed robberies in settings like banks and airports. Out of dread, people won't be able to call the police for assistance. One vital task in video investigation is identifying unusual events such as traffic accidents, crimes or illegal activities Such systems require frequent rule-base updates and signature updates, and are not capable of detecting unknown attacks[11]. However, similar crimes can be avoided if a smart camera can capture any suspicious movement and automatically raise an alarm to notify the authorities.

II. RELATED WORK

In [1], the authors proposed a paper on Machine- Learning Based Solutions for Security of Internet of Things (IoT). IoT platforms have developed enormously dominating every aspect of our daily existence by improving human life through its unique suite of intelligent services.

Because of informal ease and reckless-rising demand for smart devices and network, IoT is now facing additional safety challenges than ever beforehand. There are on hand security measures that can be applied to protect IoT. However, conventional techniques are not as competent with the progression booms as well as diverse attack types and their severances. Thus, a robust-vigorously superior and up to date security system is necessary for nextGen IoT system. Machine-Learning (ML) is a prevailing technology that has opened up many promising exploration windows to address current and future challenges in the Internet of Things (IoT). In this paper [1], the design of IoT is discussed; after a widespread literature assessment on ML, the implication of IoT security is approached in terms of numerous types of potential attacks. Additionally, ML-based emerging solutions for IoT security have been presented, and forthcoming challenges are discussed.

In [2], the authors has described that, in present world, Video Scrutiny plays a fundamental role. When artificial intelligence, machine-learning and deep-learning inclined into the system, the technologies are advanced too much. Utilizing above blends, various frameworks are situated which assists to distinguish diverse doubtful performances from the live tracing of footages.

The utmost impulsive one is human behavior and it is very complicated to detect whether it is abnormal or normal. To notice suspicious or normal activity, deep-learning methodology is used in various environments, which guides a vigilant information to the analogous authority, in case of foreseeing a suspicious-activity. Supervision is often performed through successive frames which are extracted from the video. The complete context is separated into dualistic phases. In the main phase, the features are computed from video frames and in next phase, based on the attained features classifier predict the class as suspicious or normal.

In [3], the authors has described that nowadays, video surveillance is used almost everywhere for security. The traditional method of monitoring cameras requires constant human intervention. Using Deep-Learning and Image Processing, the anticipated work aims to eliminate time and effort wasted on monitoring video surveillance cameras. Predicting humanoid behavior is almost impossible. Deep Learning is used to detect suspicious and non-suspicious activity and to warn the user if any suspicious activity is detected. The proposed system strives for the detection of real-world suspicious activities such as burglaries, assaults etc. in surveillance videos.

III. METHODOLOGY

We Make an ML model first using datasets representing common activities like chatting, reading, sitting, etc. Based on the supervised learning model, after being trained on a collection of data, these models are given an algorithm to analyze data, find patterns in feed data, and gain knowledge from the data. These models can be used to forecast the unfamiliar dataset once they have been trained.Then feed datasets of questionable activity—such as fighting, boxing, pointing weapons, or any other suspicious violent movement—into the machine learning algorithm. Additionally, carry out these actions in front of the smart camera to catch different gestures. This would be helpful for building a smart AI camera using Raspberry Camera by training the ML model and installing it on the Raspberry Pi. There are number of adaptable choices available for creating and training ML models, including TensorFlow, Google Teachable, Edge Impulse, Lobe, etc.

IV. HARDWARE & SOFTWARE DESCRIPTION

The proposed block diagram is shown in Fig.1. RASPBERRY PI: Raspberry Pi is a tiny single board computer. By linking peripherals like Keyboard, mouse, display to the Raspberry Pi, it will act as a mini personal computer. Raspberry Pi is extensively used for actual time Image/Video Processing; IoT based applications and Robotics applications. Raspberry Pi is slower than laptop or desktop but is still a computer which can offer all the likely features or abilities, at a low power utilization.

BUZZER:

There are 2 types of buzzers: passive and active. Active buzzers are easier to use and allow us to use them independently, even if we're just using constant DC power.So we will use an active buzzer. With constant DC voltage, it will hum at a pre-defined frequency of about 2300 Hz. Ideally, the buzzer works at 5V. Since the output voltage of our Raspberry Pi's GPIO pins is only 3.3V, this seems a bit too low for our 5V buzzer. But the buzzer works even at 3.3V. However, at 3.3V, the volume of the sound produced is less powerful. So if we have an NPN transistor we will be able to supply 5V to the buzzer and it is better to use it.

Two different RASPBERRY PI camera boards are available: an 8MP camera and a 12MP High Quality (HQ) camera. The 8MP gadget is also offered without an IR filter in No IR form. The Raspberry Pi no longer sells the original 5MP camera.

All Raspberry Pi cameras can capture full HD 1080p video and high-resolution images, and they can all be completely programmed.

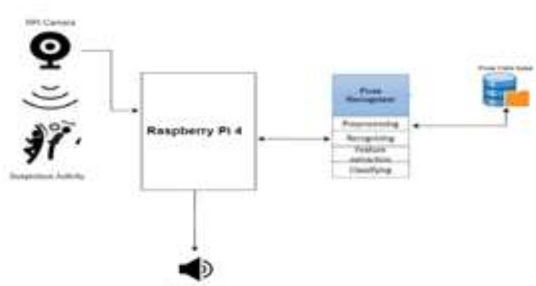

Fig.1Proposed Block diagram

V. MACHINE LEARNING MODELLING USING GOOGLE TEACHABLE

A.Data Preparation

Google Teachable Machine: Teachable Machine is an online device that makes building AI models quick, simple, and open to everybody. Workable Machine is helpful - use documents or catch models live. It's a conscious method for taking care of your business. We could decide to utilize it completely on-gadget with next to no webcam or amplifier information leaving your PC. The models we make with Teachable Machine are genuine TensorFlow.js models that work anyplace JavaScript runs, so they play well with instruments like Glitch, P5.js, Node.js, and then some. Besides, we can commodity to various configurations and utilize your models somewhere else like Coral, Arduino, and more The enchanted behind Teachable Machine depends on a famous profound learning strategy called move learning. The majority of the brain network design of the completely prepared model is saved, while a more modest piece of it is supplanted in view of the information. This approach requires less figuring power along with more modest dataset for preparing. Google utilizes probably the best profound learning and brain network models for the Teachable Machine. Preparing Google Teachable is a stage for building models.

B. Training

What can we use to teach it?

Images: We teach the model to classify images using files or your webcam. Sounds: Teach the model to classify sound by recording short sound samples. Poses: Teach the model to classify body poses using files or striking poses in your webcam.

Sample positions in Google Teachable can be formed and many as we requested creating many sample positions and adding them to the data file can increase the accuracy of reading and tracking activity.

How to teach a model using Google Teachable: It Includes gather data, Train the model and product the information base Collect and gathering our models into classes or classifications that we believe the PC should learn. Train the model and afterward quickly test it to check whether it can accurately characterize new models export the data set export our model for our tasks: sites, applications and that's just the beginning.

C.Exporting the Database

Creating & Exporting Pose Model database: New position Project Place a person through the webcam so that the camera can see the person to craft a new image project on Teachable Machine. Train the first class: Fill your first class with first class photos captured from your webcam. Training dataset using normal actions without suspicious activity. Train the second class next, populate your second class with pictures of the second class as well captured from your webcam. Next, press "model train" and that's it! Trained model. Try to test how well your model works for normal activity and suspicious activity. The model will try to classify the miscellaneous actions at the bottom right of the site. If your model doesn't recognize very accurately, try adding more images to the classes that seem weak. Then click "export model" and then "upload my model" to upload to the cloud.

VI. RESULT

Working set up of Suspicious Activity Tracking and Detecting is shown in fig.2.We see that the accuracy of detecting and tracking was seen best i.e. 95% in the Google Teachable platform , the accuracy is also depend on the clarity of the camera and the database of the machine learning pose module that is created On google Teaching model .If there is difference in the class one models and class two Pose models then the Value cross to 1 , if the value of class 1 pose models is Zero then it is considered a normal activity. If the value of class 2 is one then it is considered as Suspicious Activity and there is alert Sound.

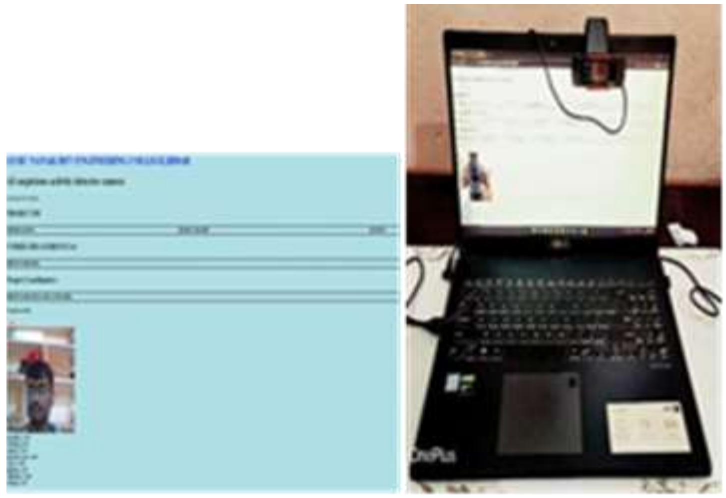

Fig 2: Working of Suspicious Activity Tracking and Detecting

Identification of Normal Activity:

CASE1: Identification of Normal Activities.

Fig.3 shows identifying Non-suspicious activity as sitting.
- Class-one of the Google Teachable have the Data set o f Non-Suspicious Activity Images.
- These Non Suspicious activity include sitting, walking, standing etc..
- Comparing to the Data set of class1images, Here Non-Suspicious activity is deducted.

Fig.3.Identifying Non-suspicious activity as sitting with accuracy

CASE2: Identification of Suspicious activity.

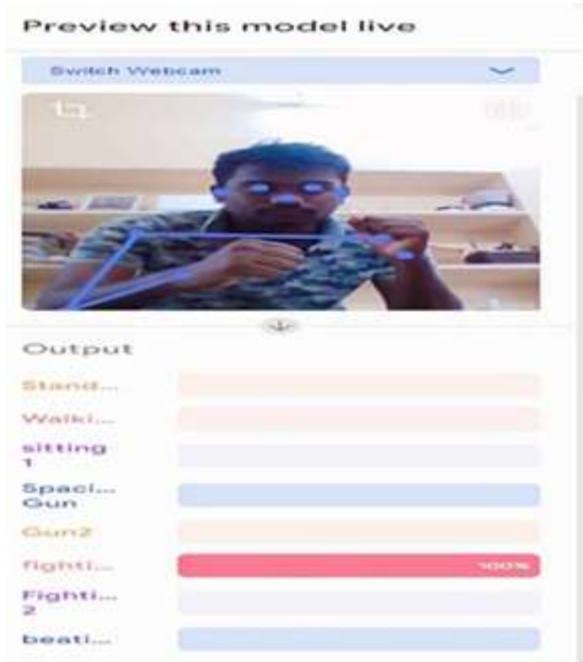

Fig.4. shows identifying the Action of Fighting

- Class- two of the Google Teachable have the Data set of Suspicious Activity Images.
- These Suspicious activity includes Fighting, beating &Weapons like Gun.
- Comparing to the Data set of class 2 images ,Here Suspicious activity is deducted with Accuracy

VII. CONCLUSION & FUTURE SCOPE

The numerous methods for detecting abandoned objects, theft, falling objects, accidents, unlawful activity, violence, and other events have been covered in this article. In previous decades, a number of researchers suggested cutting-edge methods for detecting objects to lessen erroneous object detection. Numerous researchers have also labored to construct real-time intelligent surveillance systems, but the processing speed of the video frames is not as good as needed, and no scheme has been assembled that has 100% detection accuracy and 0% false detection rate for movies with complicated backgrounds. This AI camera may be utilized for surveillance at numerous public places using the newest technology, such as artificial intelligence and machine learning, to detect and track suspicious actions in real time.

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Visualizing and Forecasting Stocks

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Abstract— The "Review and Forecast" project aims to create a software application to analyze historical data, identify trends and predict future market prices. This project includes data collection, forecasting, visualization and forecasting, providing users with the right tools to understand stock market dynamics. Reliable historical data originally from platforms like Yahoo Finance and Alpha Vantage. This data is then cleaned and prioritized to resolve important and negative situations. The cleaned data is converted into a suitable format for analysis. The main function of the application is interactive visualization created using libraries such as Matplotlib, Seaborn and Plotly. These views include historical price charts, indicators such as moving averages and Bollinger Bands, and market forecasts. Users can interact with the view by viewing zoom, pan, and instructions.

Keywords: Review and forecast, software application, historical data analysis, trend identification, future market price predication, data collection, visualization, stock market dynamics.

I. INTRODUCTION

The change in product demand is huge. But as technology advances, so does the way to make a steady profit from desired products and it also helps experts find the best tips to inject better reaction. Determining the asking price is important to help you get the most out of your product selection while keeping risk low. Interval Neural Networks (RNN) have proven to be one of the most important models for continuous data processing. Short-term memory is one of the most efficient RNN infrastructures. LSTM refers to the memory of the brain, a computer that replaces traditional artificial intelligence in the remaining process of the network. With memory cells, the network can well integrate memory and ideas in the remote area over time, thus being suitable for processing the structure of data over time and high preservation capacity. The third paper presents the model and predicts NIFTY 50 stock returns using LSTM. We collected data of 5x NIFTY 50 and used it for training and implementation purposes of the model. The next part of this article will be the process where we will explain each process in detail. We will then graphically represent the analysis we used and also consider the possible outcomes.

II. METHODOLOGY

Data collection and preparation

The first step in the process is data collection and preparation. Historical transaction data, including price and trading volume data, can be collected from trusted sources such as financial data providers or APIs. Data collection will be performed subsequently, including data cleaning, design, and handling of missing values or results. This step ensures that the data is in the appropriate format for analysis and prediction.

Fig 1 Data Preprocessing Feature

Construction and selection

After preliminary information, the next step is construction and selection. Relevant features can be extracted or extracted from the raw data to increase the predictive power of the predictive model. Indicators such as moving averages, relative strength index (RSI) and Bollinger Bands can be calculated based on price and volume data. A special selection process will be applied. Specifies the most important and useful data for forecasting models. Model Selection and Training Model will include the selection and training of a suitable model. Various models can be considered, such as autoregressive integrated moving average (ARIMA), exponential smoothing (ES), or machine learning algorithms such as random forests, support vector machines (SVM), or neural networks. The choice of model will depend on its suitability for capturing key patterns and relationships in stock data. The selected model is trained using historical data and its parameters are optimized using methods such as grid search or cross-validation. Visualization TechniquesThe visualization method involves creating data reports and visualizing charts, graphs, and dashboards to represent data and analysis. Visualizations can include bar charts, graphs, or area charts to show price movements over time. Additionally, other visual points such as volume, moving averages, and trend lines can be combined to provide a comprehensive view of stock data. Interactive features or guides may also be used to allow users to explore information and gain a deeper understanding. Charts are a simple but effective visual tool for showing the price history of a stock. It links the closing price all at once, allowing users to track the total price. Charts are especially important for analyzing long-term trends and evaluating stock performance over time. The combination of these visualization techniques enables understanding and interpretation of market data. This technology allows users to identify patterns, trends, disparities, and relationships, allowing them to make investment decisions. Visualizations can include bar charts, graphs, or area charts to show price movements over time. Additionally, other visual elements such as volume, moving average and trend lines can be combined to provide a comprehensive view of stock data. Interactive features or guides may also be used to allow users to explore information and gain a deeper understanding. Charts are a simple but effective visual tool that shows historical price trends of a stock.

Machine Learning Based Predictive Models

The solution strategy includes machine learning based predictive models that are unique in business analytics. By leveraging the power of machine learning algorithms, solutions can learn from historical data, identify complex patterns, and make accurate predictions about future products. This new approach goes beyond traditional forecasting methods to achieve more accurate and reliable results. Learning models continually adjust and improve their performance over time, providing users with new and predictable changes to make better decisions.

Real-Time Data Integration

Another new way to solve problems is the instant integration of data. The solution allows users to access and analyze data in real time, enabling timely decision making and effective investment strategies. Real-time data integration and APIs give users access to new data, allowing them to quickly respond to changes in business. This unique feature provides users with a competitive advantage in an environment where timely information is critical to investment decisions.

Interactive Trading Simulation

The solution strategy has interactive trading simulation as a special feature. Users can simulate trading scenarios based on historical data and evaluate the performance of different investment strategies. This innovation allows users to better understand the consequences of their investment decisions by allowing them to test and adjust their business strategies in a risk-free environment. Interactive trading simulation provides a practical, hands-on experience for learning and testing, allowing users to improve their trading skills and confidence.

Customization and Personalization

Solutions mean customization and personalization based on specific features. Users can customize views, metrics, and forecast models to meet their specific needs and preferences. The solution provides flexible options for selecting and configuring indicators, allowing users to create analytical and decision-making tools. This update enables users to customize the solution according to their investment strategy and business, improving their experience and efficiency.

User-friendly interface and intuitive user experience

User-friendly interface and intuitive user experience are important innovative aspects of the solution. This solution, which is important in terms of simplicity and ease of use, enables it to reach a wide range of users, including those without expertise. Intuitive design and navigation allow users to easily search and interact with views and tools. This feature allows users to use the solution effectively, eliminating the need for extensive training or expertise. In summary, solutions for visualizing and estimating products stand out due to the integration of many new and unique features. The integration of advanced visual technologies provides users with an interactive and intuitive interface to search and analyze business data. Using advanced technology, the solution provides informative charts, graphs and dashboards that help identify patterns, trends and anomalies. Additionally, the integration of predictive models based on machine learning differentiates this solution from traditional approaches. These models continue to learn from historical data to make more accurate decisions. With its innovative features, the solution allows users to better understand the stock market and make informed investment decisions. Additionally, although LSTM models are promising in stock price predictions, their complexity and lack of interpretation pose significant limitations. The black box nature of LSTM models hinders our ability to understand the logic behind their predictions. To close this gap, future research should focus on improving the interpretation and interpretation of LSTM models in the context of cost estimation. By developing strategies to present visual content and interpret learning patterns, we can close the gap between LSTM prediction and investment decision making. Additionally, the integration of other factors into the LSTM model should also be investigated. By integrating a variety of data such as economic indicators, news, geopolitical events and specific company news, we can increase the accuracy and efficiency of our estimated costs. Investigating how LSTM models can be used by these outliers will pave the way for more powerful predictive models. The visionary concept and solution represents the integration of many new and unique features. The integration of advanced visual technologies provides users with an interactive and intuitive interface to search and analyze business data. Using advanced technology, the solution provides informative charts, graphs and dashboards that help identify patterns, trends and anomalies. Additionally, the integration of learning-based prediction models makes this solution different from traditional methods. These models continue to learn from historical data to make more accurate decisions.Deep learning is becoming a trend as financial predictions continue. Among these technologies, the long distance model (LSTM) is a variant of the recurrent neural network (RNN) that has become popular in the last few years. LSTM overcomes the gradient vanishing problem found in traditional RNNs and is good at capturing long-term dependencies in data series. This makes LSTM particularly suitable for stock price prediction. LSTM models can capture patterns in connected data by combining storage and gateways that store or discard data over time. The ability to recall key information from early stages is critical to successful product cost estimation. In the next section, we will delve deeper into LSTM concepts and applications in the context of business analysis. In recent years, the use of deep learning techniques for financial forecasting has gained significant attention. One such technique is the Long Short- Term Memory (LSTM) model, a type of recurrent neural network (RNN) known for its ability to capture long-term dependencies in time series data.

Understanding LSTM

LSTM is a type of RNN that solves the vanishing problem commonly encountered in traditional RNN. The LSTM model is particularly useful for capturing patterns in continuous data by combining cells and gates that can selectively store or discard data over time. These storage units allow the model to remember important information from previous steps, which is important for predicting the correct stock price. Data preparation: The first step in developing an LSTM model for stock price prediction is data preparation. Collect historical price data, which typically includes features such as opening price, closing price, trading volume, and other metrics. This data is preprocessed by normalizing or standardizing features to ensure scale in stock.

III.MODEL ARCHITECTURE

LSTM models consist of multiple LSTM layers and one or more thickness layers for prediction. The input of the model is the historical data of the stock price, and the output is the price prediction for the next step. The LSTM layer learns to extract relevant patterns and dependencies in the components, while the density layer provides the final prediction. The LSTM (long-range long) model is a recurrent neural network (RNN) architecture designed to overcome the limitations of traditional RNNs in capturing long-lived populations in the network. Natural language processing, speech recognition, time series analysis, etc. It is widely used in many tasks such as.

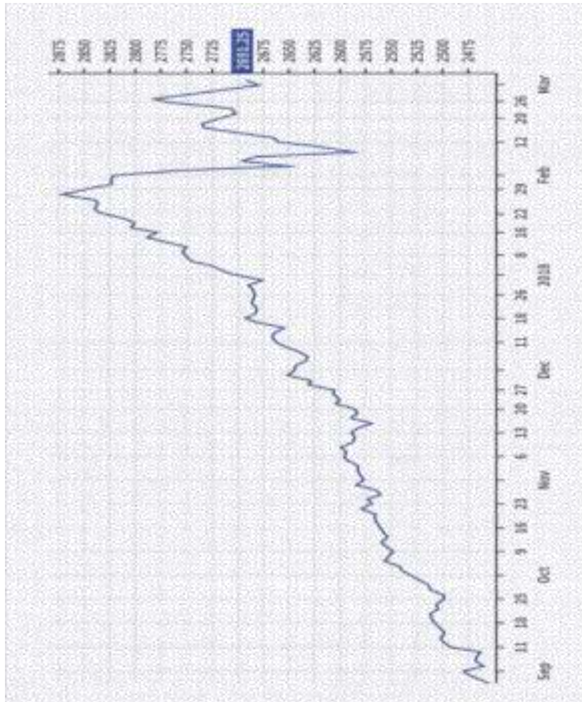

Fig. 2 Graph Visualizing stock prices with respect to time.

Forecasting and evaluation:

The learned forecasting model will be used to predict future market prices or trends. The model will be applied to invisible data or test data to evaluate its effectiveness and accuracy. Metrics such as mean error (MAE), root mean square error (RMSE), or precision measurement can be used to compare and evaluate the performance of forecast models. This method allows iterating and improving models and visualizations based on evaluations. If the prediction model or visualization does not meet the desired accuracy or efficiency, it can be modified or improved. This iterative process may involve fine- tuning the model parameters, exploring alternative models, or enhancing the visualizations to provide clearer insights.

Algorithms and tools used:

The success of the project in visualizing and forecasting stocks relies on the effective utilization of r elevant algorithms, techniques, and tools.

Forecasting algorithm:

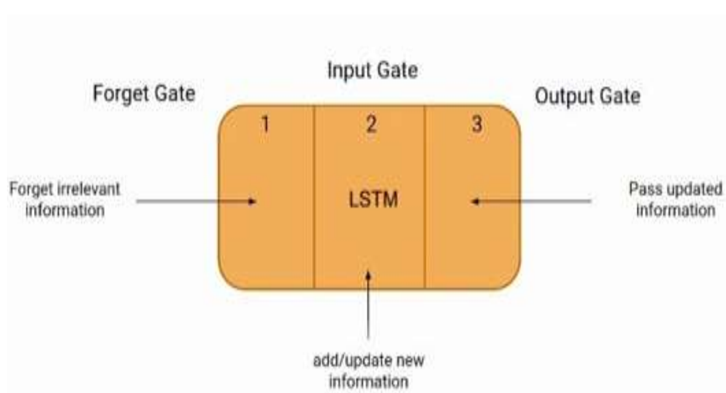

Fig 3 Forecasting Algorithm

LSTM (Long Short Term Memory) is a deep learning algorithm belonging to the Recurrent Neural Network (RNN) category. It is designed to be effective and model long-term expectations or trends in connected products. The main advantage of LSTM is its ability to solve the problem of incompleteness, which is a common problem in training deep neural networks. The vanishing problem means that when gradients are repeated across layers, their effects weaken, making it difficult for the network to learn its dependency on the system over long periods of time. LSTM solves this problem by introducing a storage and control algorithm. Memory is the main component of the LSTM unit. It collects data over time and selectively decides what to keep and what to discard. The unit has an integrated recycling feature that allows information from previous steps to be preserved. It can be thought of as a conveyor belt where information flows in and out and is modified or controlled based on the information it carries. LSTM has three types of gates to control the flow of information in the unit: input gates, forget gates, and exit gates. Each gate is a layered neural network that uses a sigmoid and convolutional algorithm to process data. Using this gating technique, LSTM networks can selectively retain or discard long-term data, allowing them to capture and display relevant information over time. This makes LSTM especially useful for tasks with complex components, such as natural language processing, speech recognition, and real-time processing.

Training and evaluation

Consolidate your data by cleaning, tokenizing, and coding it into a model for your version of LSTM. This will include removing uppercase and lowercase letters, splitting the row, and drawing parentheses for index numbers. Divide the data set into study, validation and analysis units. The training method is used to train the LSTM model, the validation method is used to tune hyperparameters and demonstrate the overall performance, and the testing method is used to evaluate the final model. Create a version of LSTM using a deep learning framework such as TensorFlow or PyTorch. You can specify the number of LSTM layers, the number of hidden objects in the layer, and the input form. Feed the training data into the LSTM version and repeat the training set for different time periods. These forms make predictions at any given time, calculate losses and adjust weights used in recovery. Tweak as necessary to understand the value and other hyperparameters. Check the performance of the version of the application installed at exit at any time. Collect metrics that include precision, loss, accuracy, recovery, or F1 metrics to measure how well the model is learning.

Hyperparameter Tuning

The overall performance of the LSTM version depends on many hyperparameters, including the number of LSTM layers, the number of units in a layer, the training cost, and the batch size. These hyperparameters can affect the accuracy and reliability of the model. Therefore, it is very important to perform hyperparameter tuning to find the most reliable parameter that produces good prediction results.

Ⅳ.RESULTS AND DISCUSSION

Once the LSTM model is well known and refined, it can be used to estimate the inventory value of unobserved data. Prediction accuracy can be measured using a variety of metrics, including mean error (MAE), standard deviation of error (RMSE), and standard deviation percent error (MAPE). Also, look at the estimated and actual stock prices on the chart to better understand the effectiveness of the release. The results obtained in the project "Visualizing and Forecasting Stocks Using LSTM" demonstrate the effectiveness of the proposed method in capturing stock dynamics and making accurate forecasts. A combination of visual and LSTM versions has proven useful in analyzing trades, trends and potential trading opportunities.

Many types of neural networks can be created by combining various factors such as network topology and learning methods. In this experiment we consider neural connections and long-term memory. At this stage, we can talk about the technology of our device.

Our site has different levels as follows:- Level 1: Raw Data:

In this level, historical data is collected from https://www.quandl.com/information/ NSE, this historical fact Future stock Used to predict prices.

Level 2: Fact Preprocessing:

The preprocessing stage should include: a) Data discretization: some of the facts are reduced, but are especially important for statistics.

b) Data transformation: standardization.

c) Actual Cleanup: List missing values.

d) Real integration: Integrate data files.

After the data set is converted into simple data, the data set will be divided into teaching and evaluation for evaluation. Here the current rate on the course fee will be higher. Try to keep statistics on 5-10% of the total data set.

Stage 3: Feature Extraction:
In this stage, select only the features that can be fed into the neural network. We will select Day, Open, High, Low, Close and More.
Stage 4: Neural Network Learning:
In this stage, data is fed into a neural network and trained to predict the distribution of random numbers and heavy numbers. Our LSTM model consists of a communication layer (displayed by 2 LSTM layers), a dense layer with ReLU activation, and a density output layer with a linear activation function. The Neural ensemble rule used in Keras is as follows:
Fifth stage: output generation:
In this stage, the output value produced from the output layer of the RNN is compared with the target value. . The error or difference between the target and the generated value is minimized using the return exposure method, which adjusts the weight and bias of the ensemble.

Evaluation:
We use root mean square error (RMSE) for machine readout. By using RMSE estimates, the error or difference between the target and the results can be reduced. RMSE is the square root of the implied/mean value of each error squared. The use of RMSE is not uncommon and provides the best possible margin of error for numerical estimation. RMSE reinforces and severely penalizes the large compared to the equivalent implicit error.

$$\mathrm{RMSE} = \sqrt{\frac{1}{N}\sum\left(\hat{Y}_i - Y_i\right)^2}$$

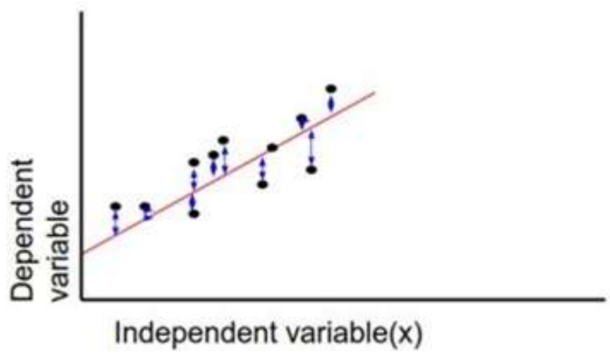

Fig. 4 RMSE Value Calculation

Experimental Work:
● Dataset description: We acquired the records from https://www.quandl.com. we have amassed the historical stock facts of NIFTY 50 from the national stock alternate. we have collected a day-by-day dataset and saved a window length of 22 days. Facts degrees from 01.01.2011 to 31.12.2016.
● Collection records: We were given 1312 sequences from 01.01.2011 to 31.12.2016. From these facts set we used 1180 samples for schooling cause and 132 samples for validation motive.
● Education detail: For schooling the version we used RMSprop as the optimizer and normalized every vector of the sequence. We use Google Cloud Engine as the training platform [Machine type: n1-standard-2 (2 vCPU, 7.5 GB memory), CPU platform: Intel Ivy Bridge] and Ubuntu Sixteen.04, Keras (front-end) and TensorFlow (backend) we use end)) because of the learning environment. For experimental use, we use different methods with different time intervals to measure the RMSE of training and testing data.

Experimental Result:

Parameters	No.Of Epochs	Education RMSE	Education RMSE
Open/close	250	0.01491	0.01358
Open/close	500	0.01027	0.00918
High/low/close	250	0.01511	0.014
High/low/close	500	0.01133	0.01059
High/low/close/o pen	250	0.0133	0.01236

Once the LSTM model is trained and updated, it can be used to estimate the value of unknowns. The accuracy of the forecast can be estimated using a variety of methods, including mean absolute error (MAE), root mean square error (RMSE), and mean absolute error (MAP). Additionally, presenting estimated costs and actual market costs on a graph provides insight into the model's performance. The results obtained from the design of "Visualization and Inoculation of Inventory Using LSTM" show the effectiveness of the proposed method in extracting the required inventory and making the correct forecast. The combination of visualization and LSTM modeling has proven to be very useful in demand interaction, conversion and open market intervention.

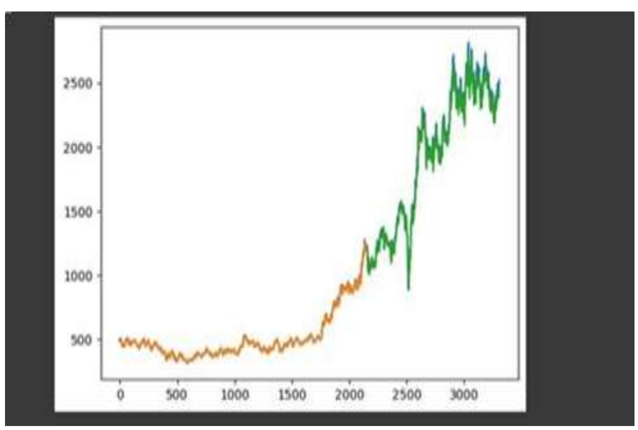

Fig 5 Prediction of Reliance stock using LSTM

V. CONCLUSION:

In conclusion, the "Forecasting and Weather" project provides a good insight into the field of business analysis and forecasting. In one of these papers, we explored a variety of techniques and tools to visualize inventory data, learn historical characteristics, and create predictive models to help people make purchasing decisions. One of the main findings of the visit is the importance of visual analysis in sharing information. By seeing past price movements, volumes and different indicators, we can clearly understand the market and trends. This insight not only improves our language, but also allows us to convey statistics accurately. Additionally, the company is trying to develop a forecasting model to predict future stock prices. We explore extraordinary techniques such as real- time analysis, machine learning algorithms and deep learning models. These methods have proven effective in capturing underlying patterns and making accurate predictions

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Directivity Enhancement Of Multilayer Direct Feed Hexagonal Micro Strip Patch Antenna Array For Wireless Applications

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Abstract— In this research paper, Directivity enhancement is investigated in Multilayer direct feed Hexagonal Micro strip patch antennas array. Performance analysis of Multilayer Direct feed Hexagonal Micro Strip Patch Antenna Array is done to improve its parameters like Bandwidth, and Directivity. Comparing the proposed Multilayer direct feed Hexagonal Micro strip patch antenna array to conventional alternatives, it demonstrates enhanced bandwidth of 180 MHz and directivity of 7.737 dB. The proposed antenna design models have a functional center frequency ranging from 2.400 GHz to 2.58 GHz, suitable for wireless applications. The Return Loss and VSWR have been examined within an acceptable range. The electric field and current flow of the antenna are contained inside the intended radiating area. The utilization of the probe feed technique in the design model of a multilayer direct feed hexagonal microstrip patch antenna array has been found to improve the bandwidth, directivity, and other parameters of the antenna compared to traditional antennas.

Keywords: Hexagonal, Bandwidth, Gain, Directivity, Multilayer, Direct feed technique.

I. INTRODUCTION

In the present era, antennas play a crucial role in every wireless communication system. Antennas are of utmost importance in communication due to the significant role they play, especially in light of technological improvements [1-2]. Microstrip antennas (MSAs) possess various advantages, including their lightweight and small-volume nature, as well as their ability to be made conformal to any sort of host surface. In addition, PCB Technology can be utilized for the physical fabrication of Microstrip Patch Antennas, enabling cost-effective mass production [1]. The use of Micro Strip Patch Antenna in defense and commercial applications is being considered as a viable alternative to conventional antennas. Nevertheless, it has been stated that the MSA is experiencing a limitation in its bandwidth capacity. Expanding the bandwidth of the MSA has emerged as a fundamental necessity in the realm of research. This is evident in a substantial volume of scholarly articles on the topic that have been published in academic journals and conference proceedings [1]. Various broadband MSA design models have been examined in recent decades. Both the coaxial and probe feed approaches are applicable in various design methodologies. In order to achieve impedance matching, it is necessary to solder the patch and center conductor of the coaxial connector. The probe feeding approach offers the advantage of being able to place the feed point at any desired location to achieve input impedance matching [1, 10]. A novel microstrip antenna with a Ψ-shaped configuration is described in this paper. The antenna's bandwidth is enhanced by transforming it from a rectangular shape to an E-shape and then to a Ψ-shape [3]. The investigation focused on achieving wide bandwidth by utilizing the stacking of two substrates and slotted patches [4]. The usage of Defected Ground Structure (DGS) as a strategy to enhance the gain and bandwidth of the ground plane has been described [5]. The study presents the first-ever use of multilayer stretchable conductors (SCs) as a cost-effective solution for creating conformal and reconfigurable antennas on flexible substrates [6]. Researchers have utilized micromachining processes to design patch antennas on single, double, and multilayer dielectric substrates [7]. A small patch antenna is suggested for use in satellite applications operating in the C-band, X-band, and Ku-band frequencies. The multiband antenna that has been built is suitable for satellite applications [8-9]. The design of a fractal antenna is optimized for the 2.4 GHz frequency band, making it well-suited for Wireless Local Area Network (WLAN) applications. The antenna is constructed using FR-4 dielectric substrate material [10]. To improve the bandwidth and Directivity of Micro Strip patch antenna deferent methodologies investigated and anyone technique can be adopted.

II.PROPOSED ANTENNA DESIGN MODEL

Figure 1 shows the proposed Multilayer Direct feed Hexagonal MSA Array with probe feeding. The design model comprises a copper ground plane, a radiating patch, an air gap, and a FR-4 dielectric substrate. The probe feed technique has been employed to achieve impedance matching with the radiating element.

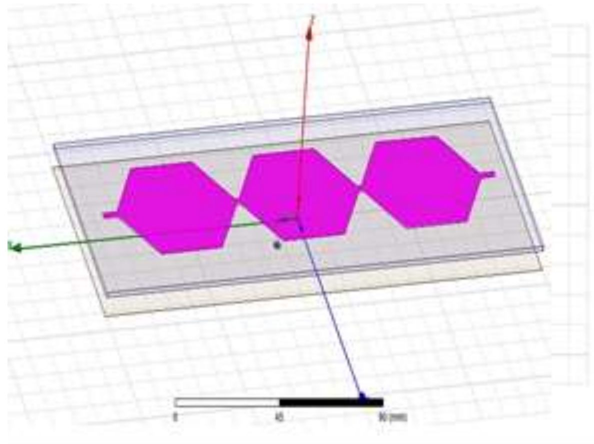

Fig. 1 Multilayer Direct feed Hexagonal MSA Array

The air gap functions as a dielectric substrate with a dielectric constant of one. The proposed model now comprises a Multilayer structure, including a copper ground plane, an air gap with a height of 6 mm, a dielectric substrate with a readily available height of 1.6 mm, and a Hexagonal radiating patch [11-12]. The permittivity can be selected near to 1 to obtain a wide bandwidth.

III.SIMULATION RESULTS OF THE PROPOSED DESIGN MODEL

3.1 Bandwidth And Return Loss Of Multilayer

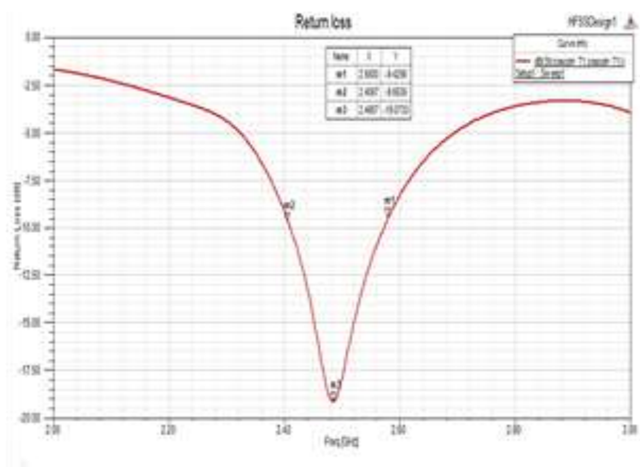

Fig. 2 Bandwidth and Return loss of Multilayer Direct feed Hexagonal MSA Array

3.2 VSWR of Multilayer Direct feed Hexagonal MSA Array

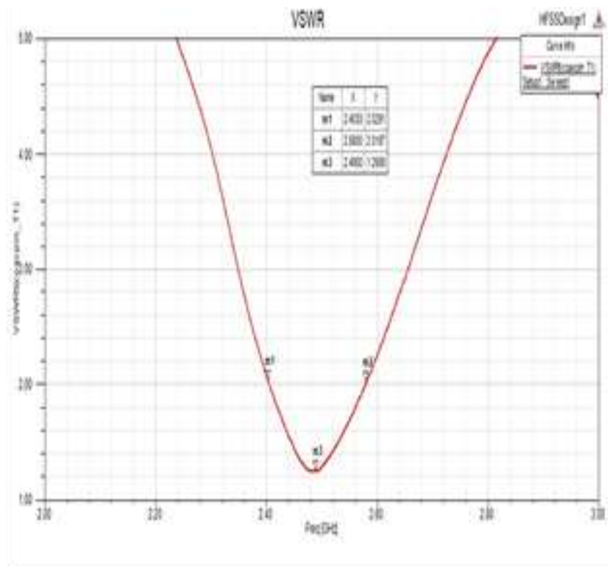

Fig 3 VSWR of Multilayer Direct feed Hexagonal MSA Array

3.3 Directivity of Multilayer Direct feed Hexagonal MSA Array

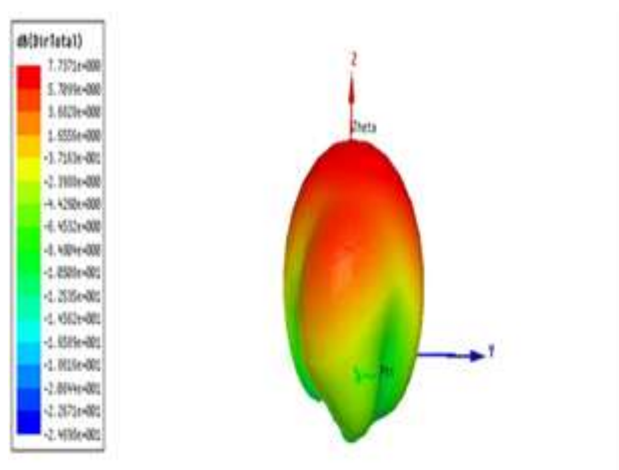

Fig 4 Directivity of Multilayer Direct feed Hexagonal MSA Array

3.4 GAIN OF MULTILAYER DIRECT FEED HEXAGONAL MSA ARRA

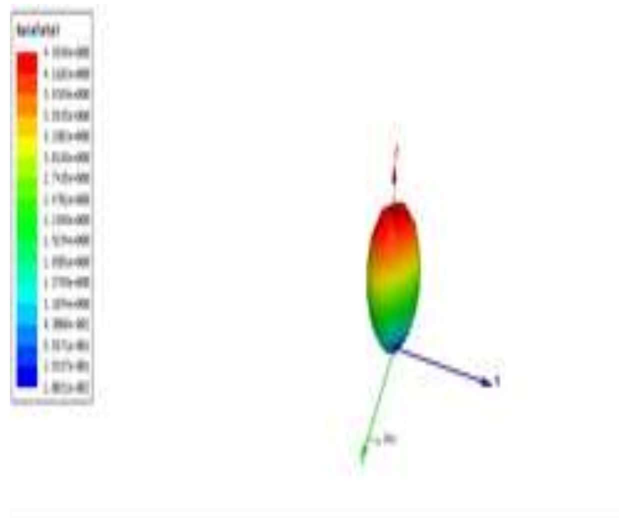

Fig 5 Gain of Multilayer Direct feed Hexagonal MSA Array

3.5 Radiation Pattern of Multilayer Direct feed Hexagonal MSA Array

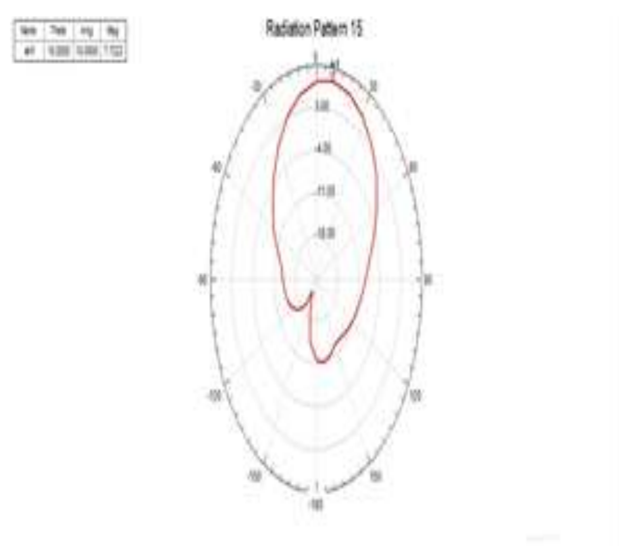

Fig 6. Radiation Pattern of Multilayer Direct feed Hexagonal MSA Array

3.6 E-Field of Multilayer Direct feed Hexagonal MSA Array

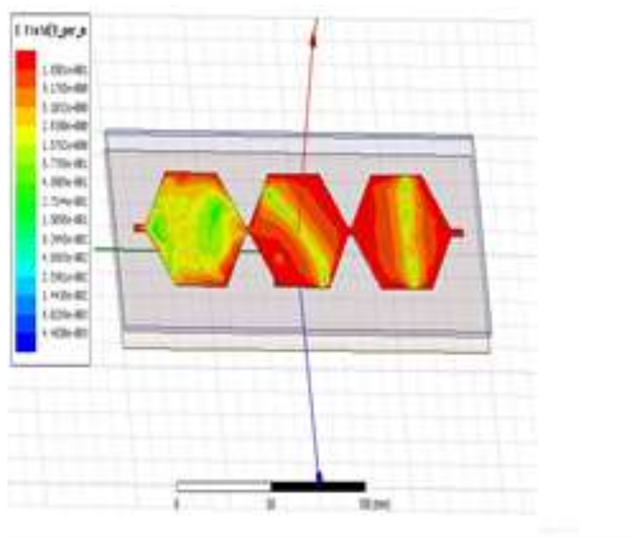

Fig 7 E-Field of Multilayer Direct feed Hexagonal MSA Array

IV. RESULT ANALYSIS TABLE OF ULTILAYER DIRECT FEED HEXAGONAL MSA ARRAY

Table No.1 consists of result analysis table for Multilayer Direct feed Hexagonal MSA Array with performance Parameters like Operating Frequency in GHz, Bandwidth in MHz, Return Loss in dB, VSWR, Directivity in dB and Total Gain in dB as shown below:

Table No.1 Result analysis table for Multilayer Direct feed Hexagonal MSA Array.

Parameters	**Multilayer Direct feed Hexagonal MSA Array**
Operating Frequency (GHz)	2.400-2.580
Bandwidth (MHz)	180
Return Loss(dB)	-19.073
VSWR	1.255
Directivity (dB)	7.737
Total Gain (dB)	4.383

The Bandwidth can be defined as a reappearance extends over which VSWR is always under two (which relates to an arrival loss of 9.5 dB or 11% reflected force). The VSWR or impedance BW of the MSA is characterized as the recurrence extend over which it is coordinated with that of the feed line inside determined cut off points.

The Bandwidth of proposed Multilayer Direct feed Hexagonal MSA Array is 180 MHz, which is within the specified limits as shown in figure 2.

Return Loss has been observed in an acceptable range. VSWR can be defined in terms of the input reflection coefficient (Γ) as:

$$\text{VSWR}=\frac{1+|\Gamma|}{1-|\Gamma|} \text{ ---------------------------------- (1)}$$

The VSWR (Voltage Standing Wave Ratio) of the Multilayer Direct feed Hexagonal MSA (Microstrip Antenna) Array is below 2, as depicted in figure 3. Figure 4 illustrates the Directivity of the Multilayer Direct feed Hexagonal MSA Array, while Figure 5 depicts its Gain. Figure 6 displays the radiation pattern of the antenna that has been suggested. The electric field of the multilayer direct feed hexagonal MSA array is depicted in Figure 7. All of the suggested antenna parameters have been observed within the acceptable range.

V.CONCLUSION

In this paper, Bandwidth and Directivity improvement is investigated in Multilayer Direct feed Hexagonal Micro Strip Antenna Array by using suspended and probe feed techniques. The design model of Multilayer Direct feed Hexagonal MSA Array is operating at 2.486 GHz centre frequency. The Multilayer Direct feed Hexagonal Micro Strip Antenna Array, as compared to a regular antenna, exhibits an enhanced bandwidth of 180 MHz and a directivity of 7.737 dB. The proposed developed model has a return loss of -19 dB, which is below the threshold of -10 dB. The Voltage Standing Wave Ratio (VSWR) has been measured to be 1.255, which falls within the allowed limit. The design is modeled using FR-4 dielectric substrate material, which has a relative permittivity of 4.4. It is more cost-effective compared to other materials. The Multilayer Direct feed Hexagonal Micro Strip Antenna Array is a superior choice for wireless applications.

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The Design Of Multiband Microstrip Patch Antenna Use Of Truncation And Slot Techniques For Wireless Application

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Abstract— Typically, a microstrip antenna is created via the microstrip process on the PCB. They are designed to function at microwave frequencies. In today's communication systems, microstrip antennas have an advantage because of their tiny dimensions. The majority of communication devices use MPA because it has a low profile and a very low volume.

The patch's conducting substance is metal, such as copper or gold, and it can be shaped in any way, including triangles, circles, rectangles, and other arbitrary shapes. All things considered, Square design is incredibly easy, and extensive research is currently underway.

A square microstrip antenna with an operational frequency of 3.5GHz is intended to be designed utilizing a variety of methods, including slot loading, truncation, and parasitic. Additionally, simulations have demonstrated that antennas possess favorable radiation properties, such as broadside radiation patterns and dual band operations.

.Keywords-component: Bandwidth; microstrip antenna; VSWR, Impedance matching, Truncated.

I. INTRODUCTION

The Institute of Electrical and Electronics Engineering (IEEE) defines an antenna as a device that transmits or receives electromagnetic radio waves. Long-distance communication is impossible without antennas, which are a crucial part of microwave wireless communication systems.

The majority of antennas in use today are resonant, meaning they work well over a small range of frequencies. The frequency at which the transmitting system operates must be adjusted for these antennas. If not, there may be impairments to the transmission and/or reception. Many types of antennas have been designed and used in communication devices for past Over the past few decades, a wide variety of antennas have been built and employed in communication devices. These antennas come in a variety of sizes and forms, including dielectric and metal substrate materials. A few of these include array antennas, microstrip antennas (MSA), wire antennas, yagi uda antennas, dipole antennas, and others. Microstrip antennas have made a big impact on the communication industry. G. A. Deschamp introduced the idea of microstrip antennas in 1953. Nonetheless, in the 1970s, Robert E. Munson and John Q. Hwell build antennas for practical application. MSAs have now progressed from being new academically to being used commercially.

The characteristics of microstrip antennas are inferred using Maxwell's equations. The original and most basic kind of antenna was the dipole, which was made up of a single wire that was fed from the center. We consider a dipole's length to be equal to half of the operating frequency's wavelength. For a variety of communication applications, MSAs with different shapes—such as triangular, rectangular, circular, square, semicircular, elliptical, etc.—are employed. A straightforward patch antenna is comprised of a metal radiating patch, power dividers, a matching network, and a photoelectric phasing circuit etched on one side of a dielectric substrate board. Over on the other side is a metal ground plane.

II. SQUARE PATCH ANTENNA DESIGN WITH ANALYTIC APPROCH

The resonance frequency and diameter of the microstrip patch antenna determine its performance. The operating frequency, radiation efficiency, directivity, and return loss are all affected by the dimension. This paper uses a customized epoxy substrate with a specified resonance frequency of 3.5GHz. The substrate has a height of 0.16cm and a dielectric constant of 4.2. The practical patch width can be determined using the conventional formulae for efficient radiation.

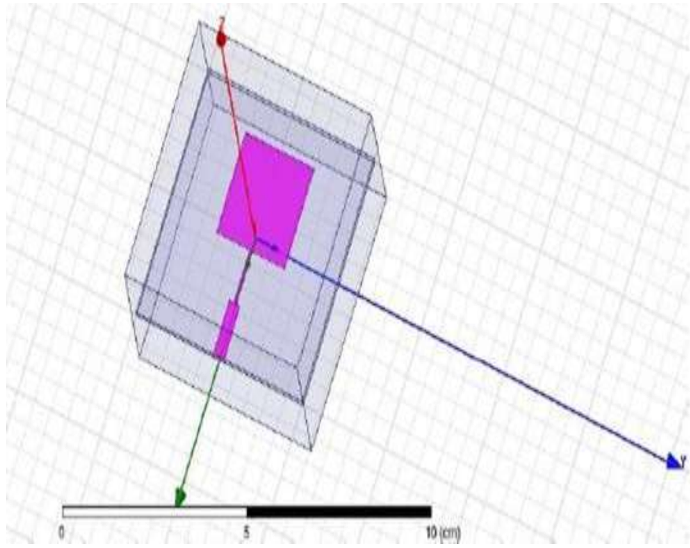

Fig 1: Geometry view of Square Microstrip Patch

III. FEEDING TECHNIQUE

Microstrip antennas are fed by coaxial probes or microstrip lines through the ground plane, and they have radiating elements on one side of the dielectric substrate. Various elements to take into account when choosing Feeding techniques are as follows

1. Impedance matching radiating structure and feed Structure
2. Minimization of spurious radiation.
3. Suitability of feed for array applications

Different feeding techniques used in antennas are

1. Inset feed
2. Fed by quarter wavelength transmissionline
3. Co-axial Probe feed
4. Microstrip(Coplanar)feeds
5. Gap- coupledfeed
6. Proximity Coupled microstrip feed
7. Aperture Coupled microstripfeed
8. Coplanar Waveguidefeed

IV. METHODOLOGY

With HFSS, a basic patch antenna is simulated. An interactive software program called HFSS is used to determine a structure's electromagnetic behavior. The program has post-processing commands to examine this behavior in greater depth. HFSS facilitates computation

1. 1. Basic electromagnetic field quantities and, for open boundary situations, radiated near and far fields.
2. Propagation constants and characteristic port impedances.
3. S-parameters that have been generalized and renormalized to particular port impedances.
4. The resonances, or eigen modes, of a structure

V. RESULTSAND DISCUSSION

The Conventional Square Microstrip patch antenna (CSQMA) is simulated using HFSS software. Following are the results obtained for Peak gain, Return loss, Directivity, bandwidth and VSWR.

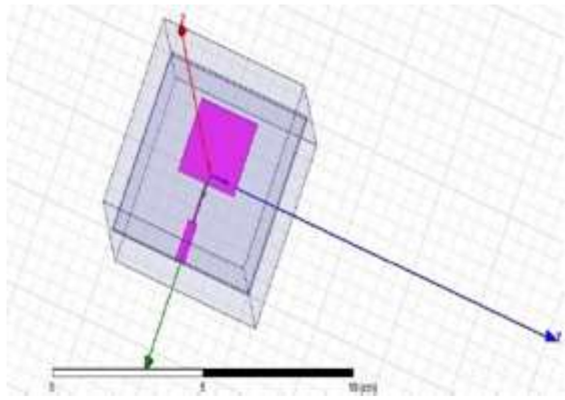

Fig 2: CSQMA on HFSS software

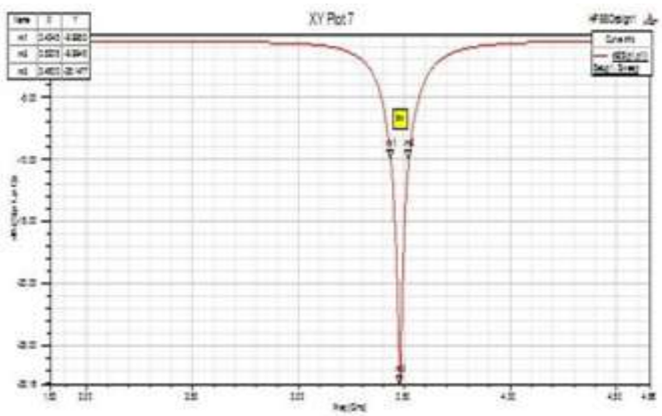

Fig 3: Variation between Frequency and Return Loss.

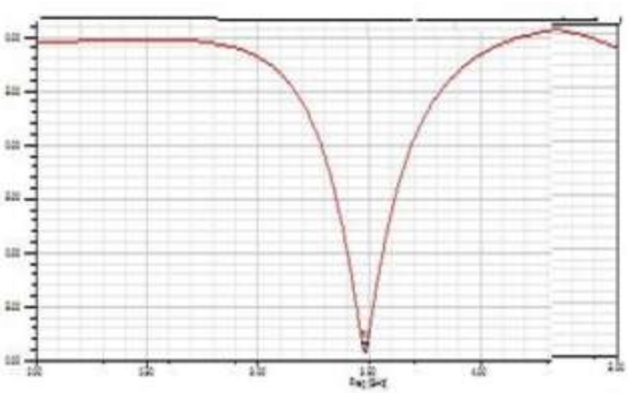

Fig 4: Variation between Frequency and VSWR

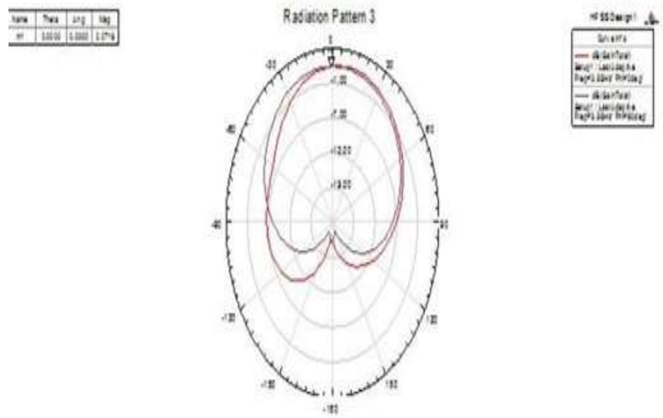

Fig 5: Pattern of CSQMA

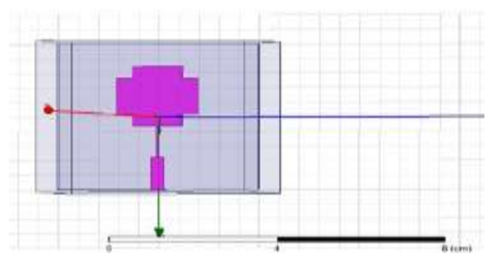

Fig 6: Geometry truncated square microstrip antenna(CTSQMA)

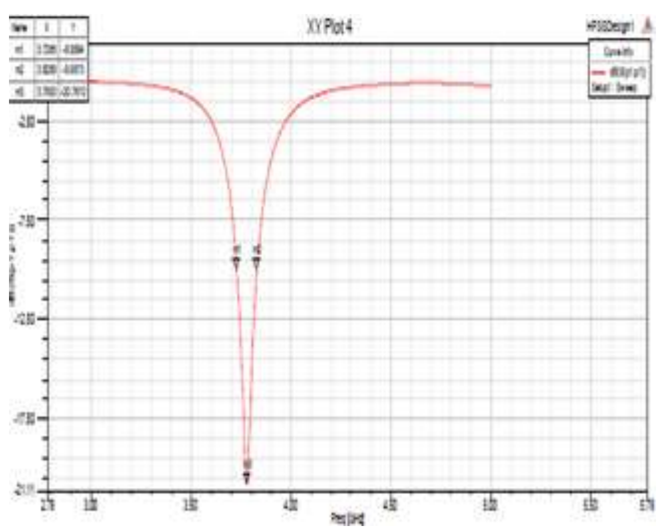

Fig 7: Variation between Frequency and Return Loss.

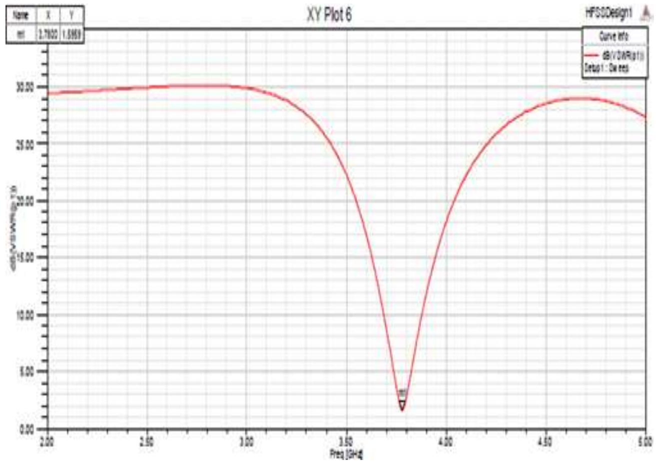

Fig 8: Variation between Frequency and VSWR

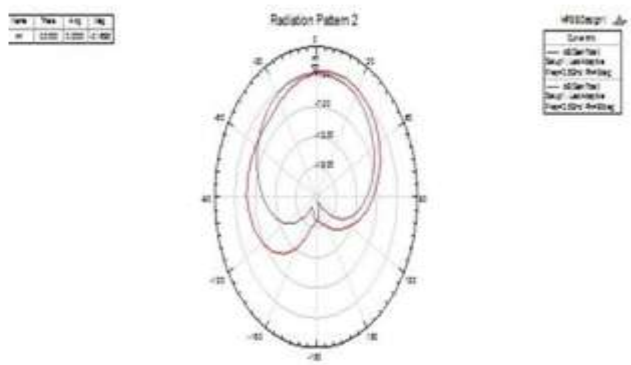

Fig 9: Pattern of CTSQMA

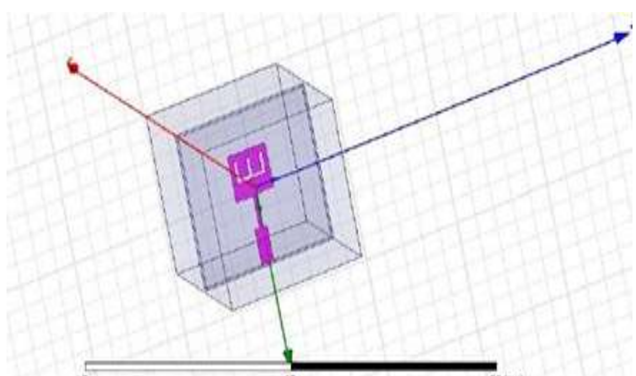

Fig 10: Geometry ofE slot conventional square microstrip antenna (ECSQMA)

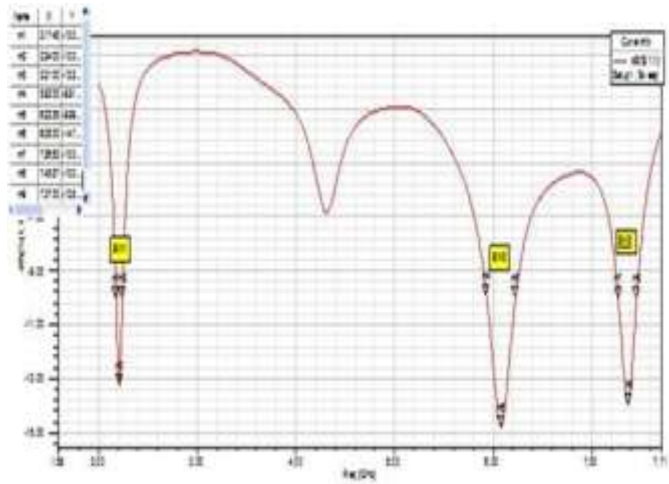

Fig 11: Variation between Frequency and Return Loss.

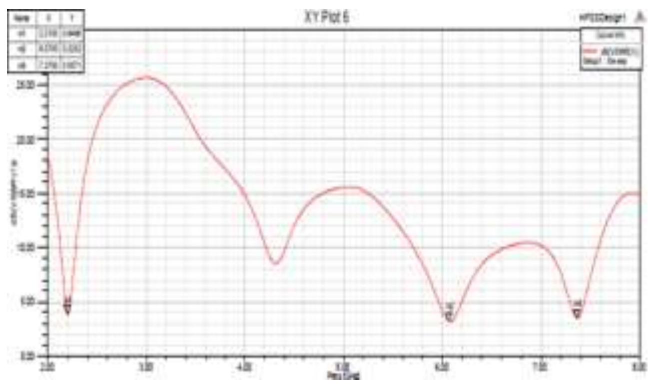

Fig 12: Variation of VSWR vs Frequency

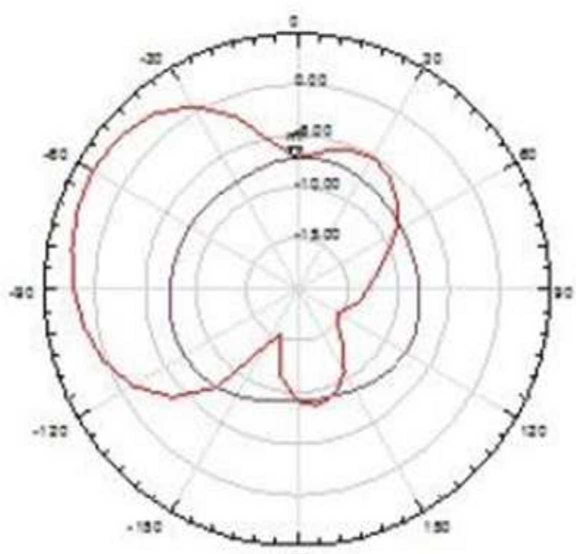

Fig 13: Pattern of ECSQMA

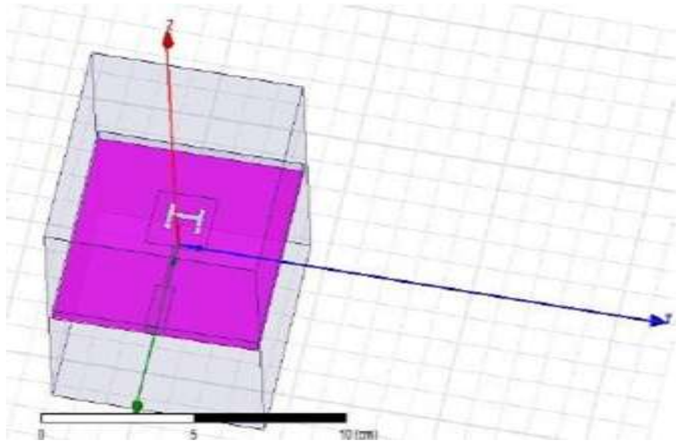

Fig 14: Geometry of H slot conventional square microstrip antenna (HCSQMA)

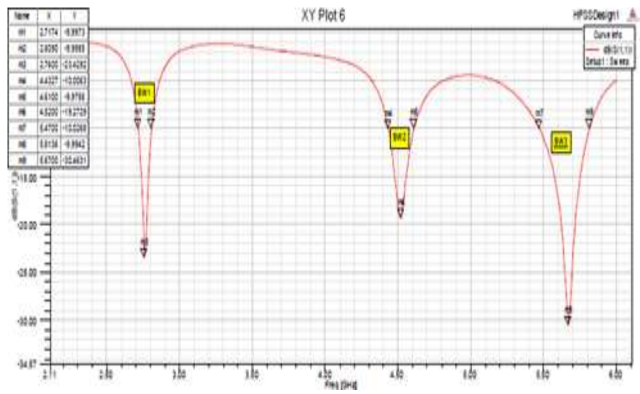

Fig 15: Variation between Frequency and Return Loss.

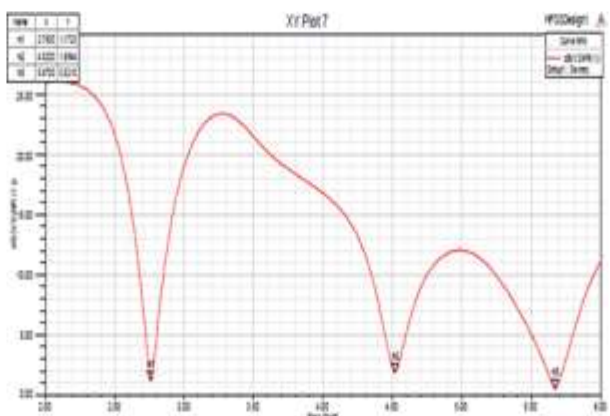

Fig 16: Variation of VSWR vs Frequency

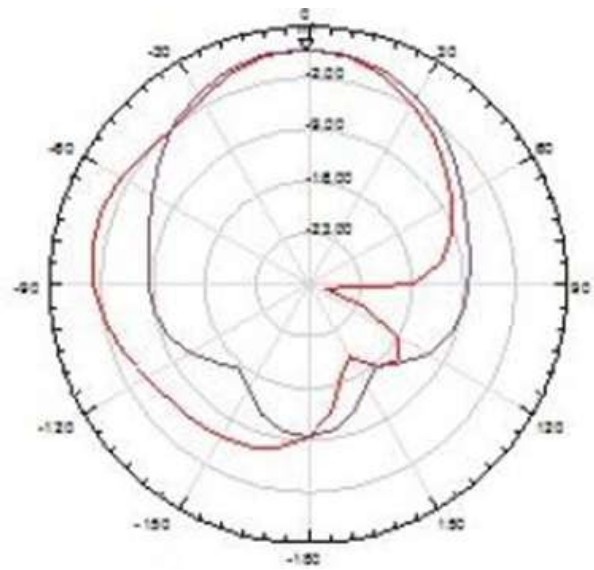

Fig 17: Pattern of HCSQMA

Table1.1 Analyzing and contrasting different microstrip antenna parameters

Antenna Geometry	No.of Bands	BW(%)	Return loss(dB)	VSWR (dB)
CSQMA	1	2.58	-28.147	0.68
CTSQMA	1	2.66	-20.76	1.59
ECSQMA	3	2.95 4.78 2.54	-13.22 -14.7 -13.89	3.95 3.24 3.64
HCSQMA	3	3.3 3.9 6	-23.42 -19.27 -30.46	1.47 1.89 0.52

VI. CONCLUSION AND FUTURE WORK

It is clear from the thorough analysis of the work that microstrip antenna design and formulation are straightforward. In order to verify their findings, HFSS software simulates the 3.5 GHz CSMA architecture. By comparing the CSMA, adding parasitic parts to the patch, truncating the patches' corners, and inserting H and E slots into radiating patches, the study is expanded. Simulated results also show that antennas have good radiation properties, such as broadside radiation patterns and multiband operations.

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Unmanned Aerial Vehicles (Uavs) And Iot Integration In Agriculture: A Comprehensive Review Of Smart Farming Solutions For Precision And Efficiency Enhancement

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Abstract— This review paper critically examines the design and development of smart farming solutions through the integration of Unmanned Aerial Vehicles (UAVs) within an Internet of Things (IoT) framework. Drawing insights from diverse literature surveys, the study offers a thorough exploration of the contemporary landscape of smart farming, with a primary focus on enhancing precision and efficiency in agriculture. The research navigates challenges and opportunities at the intersection of UAV technology, IoT, and agriculture, synthesizing findings from various literature sources. The abstract encapsulates key components, methodologies, and the potential impact of the proposed smart farming solution. By providing a holistic overview of the research's scope and significance, this paper contributes to the evolving field of precision agriculture, addressing the pressing need for sustainable and technologically advanced farming practices.

Keywords— Unmanned Aerial Vehicles (UAVs), Systematic Review, IoT

I. INTRODUCTION

The paper focuses on the synergy between UAVs and IoT frameworks to create intelligent solutions for contemporary farming practices. In addressing the challenges of enhancing agricultural productivity, sustainability, and resource efficiency, the research aims to design and develop a robust Smart Farming solution. The paper outlines the integrated System's key components, methodologies, and outcomes, showcasing its potential to transform traditional farming practices. Specific objectives include the utilization of UAVs for data acquisition, establishing an efficient IoT infrastructure for real-time data analysis, and developing intelligent algorithms for decision support in agriculture.

The significance of this research lies in the potential for optimizing resource utilization, improving crop yield, and fostering sustainable farming practices through the integration of UAVs and IoT. The paper contributes to the evolving field of Smart Farming by presenting a practical and scalable solution applicable across diverse agricultural landscapes. In conclusion, the research paper unfolds the design and development of a Smart Farming solution, highlighting the marriage of UAV technology with an IoT framework. By addressing the challenges faced by modern agriculture, the research not only presents a technological innovation but also lays the groundwork for a more resilient, efficient, and sustainable future in farming practices. Subsequent sections delve into the methodology, results, and implications of this integrated approach, offering valuable insights for researchers, practitioners, and policymakers in the agricultural domain.

Reviews of Literature Surveys

The agricultural sector accounts for 20% of India's GDP, making it a significant economic driver. Farmers can benefit from using UAVs and the Internet of Things (IoT) in agriculture by improving crop management, real-time monitoring, and prediction. Internet of Things (IoT)-based precision agriculture (PA) significantly outperforms manual farming in terms of production; this review will focus on the function of unmanned aerial vehicles (UAVs) in monitoring crop health, among other essential factors, WSNs, and platforms. [1]

The PRISMA-based systematic review emphasizes the promising use of UAVs with these cutting-edge technologies in smart farming. The enormous promise of UAVs in promoting sustainable agriculture is one of the key conclusions drawn from this study. The results show that UAVs have valuable features for collecting data, keeping an eye on things precisely, and making decisions in farming operations. These capabilities are further improved by integrating cloud, IoT, and AI, allowing remote access, efficient resource management, and real-time data analysis. Modern agriculture increasingly relies on technology-driven solutions, which is why this research is necessary. Farmers may use unmanned aerial vehicles (UAVs) and cutting-edge technology to enhance agricultural yields. If academics, politicians, and industry professionals are interested in smart farming and the possibilities and problems of using UAVs, the offered material is a great place to start. [2]

Methods for connecting and transmitting data to the ground station, as well as UAV systems and communication architecture, were covered in this article. Data processing through sensors and applications while maintaining security was also covered. Review the history of GCS and communication systems and offer essential definitions and ideas of UAV systems. Services include evaluations and assessments of UAV security measures and the many assaults that aim to disrupt UAV communication. Lastly, provide open research topics for improving UAV technology for the industry by further developing the UAV system and communication. [3]

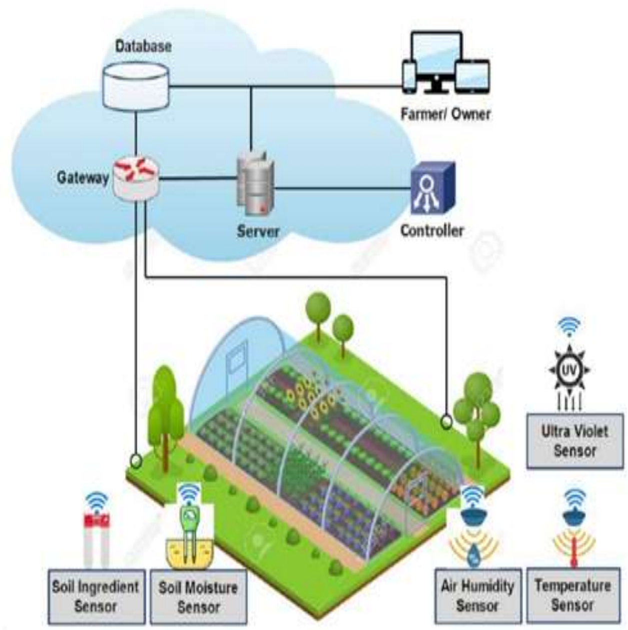

Fig.1 IoT enables Smart. Agriculture

This study sought to explore the intellectual framework of UAV adoption for agriculture by extensively reviewing current research using the biblical SLR technique to synthesize previous information. This study makes a unique contribution in multiple ways. A comprehensive review of the geographic diversity of UAV use and plant and crop taxonomy was also carried out. In conclusion, this study's executive summary lays the groundwork for further work along the road. The research offers a comprehensive resource wherein technologists, agricultural experts, and researchers can obtain the overarching data necessary to make informed decisions on forthcoming. For instance, researchers can enhance the precision and efficiency of agricultural services while expanding coverage by devising the following experiment with superior or combined technologies if they comprehend the capabilities of UAVs and the effects of imaging modalities utilized in prior investigations. Technologists can construct and advance precision agricultural remote-sensing systems by leveraging a collection of UAVs and associated technologies that have undergone empirical testing. [4]

Small unmanned aerial vehicles (UAVs) and drones, in particular, have come a long way in the last several decades in design, construction, operation, flying characteristics, and navigation control. Photographing, route planning, search and rescue, inspecting electricity lines and civil works, etc., are a few services that heavily use UAVs. With a quick note on the research and advancements covered in the last decade, This literary work offers a comprehensive analysis and wide-ranging survey of recent advancements in commercially available UAVs. The research offers a comprehensive framework for comprehending the progressive advancement of advanced drones/UAVs, encompassing aspects such as intelligent behavior, smart structure, sensing and visual capabilities, aviation quality, path planning, and adaptability. A systematic literature review is carried out on 254 retrieved publications published within the past decade, with 96 items deemed relevant. Path planning, neural networks, AI, inspection, surveillance, tracking, identification, etc., are these selected articles' most pertinent approaches or applications. This study aims to shed light on the expanding role of unmanned aerial vehicles (UAVs) and drones in modern life while encouraging aspiring researchers to go deeper into the topic and develop novel approaches to tailoring flying robots to specific tasks. Additionally, researchers can use this page as a guide to better comprehend and assess their study work with preexisting solutions. As a bonus, it provides a concise synopsis of the extensive literature in the relevant domains, which is helpful for both newbies and pilots/practitioners. [5]

As the world's population rises, agriculture's role as a primary food producer will significantly grow. As a result of public pressure, policymakers are under increasing pressure to guarantee enough food on Earth to feed everyone. Therefore, an option for effective farm management that can boost output is using a UAV. This article aims to educate readers on using UAVs and their agricultural applications to encourage continued use and ensure the technology's long-term viability. Based on the literature review, it was discovered that UAVs have many potential uses in agriculture. As for the methods, drew on a literature assessment of all the studies done thus far. The change's outcome is that various sensors provide varying degrees of crop analysis. To improve data quality and analysis, it is necessary to analyze the project's goal before utilizing UAV technology. Finally, to use UAVs to collect precise data and conduct reliable analyses, it is necessary to identify an appropriate sensor and UAV. [6]

A critical component of smart warehouse operations, unmanned aerial vehicles (UAVs) allow faster and more efficient receiving, picking, storing, and shipping. On the other hand, research reviews focusing on UAV-based warehouse management are few and far between. There needs to be more research and insights into UAV uses in this industry, which makes it difficult to make informed decisions about commercial usage. This research presents a systematic literature review (SLR) on utilizing UAVs in warehouse management to optimize the current state and prospective applications of UAVs. Based on two descriptive research questions—"What are the past applications of UAV?" and "What are essential elements affecting UAV adoption in warehouse management?"—an SLR approach was used to identify, select, appraise, and summarise data critically. It was possible to identify thirteen subfactors and five major ones. Based on the findings, the main elements affect hardware components (such as payloads, battery power, and sensors). The managerial implications of research can help decision-makers and practitioners put UAV-based warehouse management to good use. [7]

Drones have become more commonplace in many industries thanks to advancements in wireless communication and information technology services. When used as a bridge, drones offer many services that can boost the efficiency of any particular Internet of Things system. This paper is the initial effort to survey AI-powered MECs that can be accessed using drones. This paper delves into the latest research trends and offers future perspectives on the possible applications of UAV-enabled MEC in the Internet of Things realm. Using the most popular new AI approaches, it demonstrates the possible contributions of UAVs to the IoT era's communication and intelligent computing infrastructure. A few issues that UAVs as MECs are generating much interest from researchers are looking to improve these applications' performance in various contexts. Particularly in MEC, more effort is required to introduce the new concept of UAV-enabled MEC.[8]

To offer a thorough development and comprehension of current research hotspots, this study utilized a bibliometric method to examine. The analysis found an uptick in studies involving wheat and UAVs during the study's time frame. While developing nations use UAV technologies less frequently, industrialized nations that grow much wheat employ them more frequently. Research outputs and the most cited papers worldwide follow a similar pattern. According to the significant findings, UAVs can monitor and provide important real-time crop variability information, allowing for fast crop management. The findings of this study will be helpful for agricultural institutions and government corporations as they work to enhance crop management practices for high-yielding crops to fulfill the demands of the global market. Because countries with less or no research on wheat and UAV studies are the ones whose authors had the lowest keyword rankings, the results of this study are crucial for improving agricultural methods in crop production and guiding future research. The study's shortcomings were data fusion and the complicated assembly of numerous datasets. This paper demonstrates the potential of the approaches used in the current study; it would be beneficial to combine other research databases to uncover other prospective research breakthroughs within the study's specialty area. [9]

This study demonstrated how smart agriculture can help close the food demand gap by enhancing and expanding agricultural output. The Internet of Things (IoT) links all parts of smart systems, including those used in agriculture and other industries, making it the backbone of smart agricultural technology. Many agricultural activities can benefit from the Internet of Things (IoT), including crop monitoring, irrigation, insect management, harvesting, and more. The IoT links multiple sensors to processing units to make the right real-time judgments, subsequently evaluating the data. This study summarised the benefits and drawbacks of IoT integration with UAV and robotics systems controlled by artificial intelligence (AI) techniques in underdeveloped nations. Speed of data transport is now a key performance metric for SF. Therefore, the 5G network introduced smart agriculture and offered effective and adaptable solutions due to its significantly higher speed than 4G networks. Some Egyptian ideas are excellent examples of how smart agricultural technology is starting to spread; it can assist developing nations in improving their agricultural sectors and making farms more sustainable. Lastly, governments in developing nations should aid small-scale farmers in adopting these smart technologies to boost output while decreasing water and land waste. [10]

This is the first comprehensive study on recent developments in precision agriculture utilizing edge intelligence and unmanned aerial vehicle RS. The key findings are: (a) For precision agriculture, unmanned aerial vehicle (UAV) systems consisting of compact, lightweight, industrial rotor-wing or fixed-wing UAVs are frequently employed. b) Although UAV sensors can gather data from various sources, the availability of publicly accessible UAV datasets for intelligent precision agriculture is limited. DL-based UAV RS approaches can be classified into three categories: segmentation, object detection, and classification. Convolutional and recurrent neural networks are these tasks' most often employed network topologies. (d) UAV RS data processing frequently uses cloud computing, but edge computing facilitates computation closer to the data sources. (e) Edge intelligence integrates cloud computing and edge computing. Model compression is the most significant and extensively implemented technique, specifically parameter pruning and quantization. Standard edge resources comprise compute units, GPUs, and field-programmable gate arrays. [11]

Fig.2 Smart Agriculture

This study designed a cheaper automated UAV pesticide sprayer for rice production systems that could be made locally. In a field performance test, the UAV sprayer covered 750 m2 in 10 minutes and applied 3.2 liters of water per 1,000 m2. Unfortunately, the battery life was insufficient to cover at least 0.1 hectares. The study's proposed UAV pesticide sprayer was the most cost-effective regarding its tank capacity and field capacity, as measured against the market price of UAV sprayers today.[12]

Many current and prospective business areas can benefit from Unmanned Aerial Vehicle Technology, which is the focus of this research. As a result of Industry 4.0 and subsequent waves of digitization, nearly every industry is undergoing some transformation. The military and civilian sectors also stand to gain from these technological advancements. Unmanned Aerial Vehicles (UAVs) or drones can do much work with little human intervention, which is very helpful in farming. Future digital system implementation can be better understood by studying drone systems in UAV and agricultural sectors. [13]

Pesticides are necessary to maintain high agricultural yields and eradicate pests from plants. Soil fertility is reduced. Another approach that is both precise and flexible is unmanned aerial vehicle (UAV) variable-rate spraying, which can be used to overcome these obstacles. Trends in the use of semi-automatic methods and platforms designed for use on land for precision spraying are investigated in this study. A combination of an autonomous control system and several hardware components, including microcontrollers, sensors, pumps, and nozzles, allows for precise spraying, efficient UAV performance, and adaptability to different plant pesticide needs. The consequences of current and future research are addressed in this article. To help with future studies, compare the hardware, control system methodologies, and data collecting from each study's parameters. Although there are severe constraints on the amount of spraying, future study is encouraged to combine variable rate development with farmland mapping to identify the requirement for pesticides. This will help continue the precision performance, even though the quality is beneficial. [14]

Unmanned aerial vehicles (UAVs) have tremendous potential for smart farming. One factor that could encourage farmers to adopt UAVs for smart farming is how easy and cheap they are to control. Individuals typically pilot Unmanned Aerial Vehicles at a distance via radio waves. Several other technologies are also utilized for UAV control, including WiFi and ZigBee. The widespread availability of smartphones and the low cost of smart Bluetooth make it a compelling technology. In the not-too-distant future, farmers will be able to control their UAVs using any smartphone, even ones with Bluetooth Smart capabilities. Some prerequisites and obstacles must be overcome before UAVs may be used for smart agriculture applications. Therefore, the purpose of this article is to make an effort to investigate the kinds of sensors that would work well for smart farming, as well as the possible needs and difficulties of using UAVs for smart agriculture. Also foreseen the potential uses of UAVs in intelligent farming in the future. [15]

Unmanned aerial vehicles (UAVs) and other regularised smart-farming solutions are being examined for usage in agriculture (UAVs). Unmanned Aerial Vehicles (UAVs) integrate ICTs, robotics, AI, big data, and the Internet of Things. Because of their versatility and high capabilities, agricultural UAVs are finding new uses in every facet of farming, from sowing seeds to assessing and mapping crop development to spraying fertilizer and pesticides. So, along with the related technologies, the market for agricultural UAVs is anticipated to keep rising. Several examples of actual agricultural settings where UAVs have been used. Agricultural UAVs and their potential future developments are also discussed. [16]

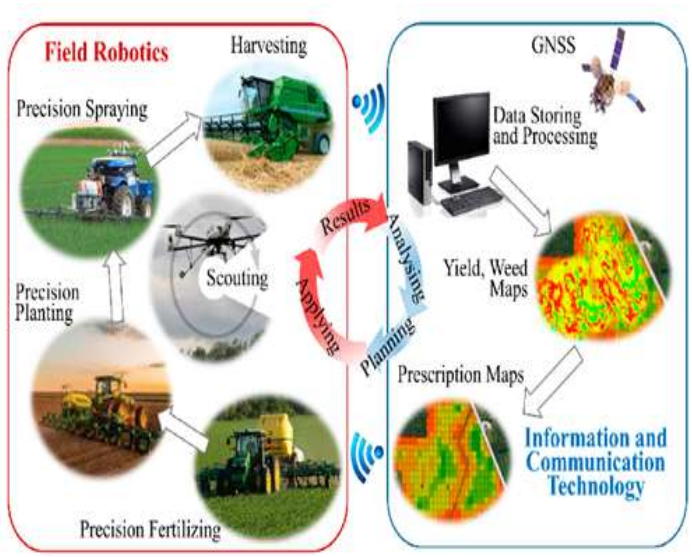

Fig.3 Field Robotics Farming

Unlike traditional aircraft, unmanned aerial vehicles (UAVs) don't need human pilots to fly them. Unmanned Aerial Vehicles (UAVs) have grown in popularity and use due to the tremendous improvements in electronics and IT. Recent breakthroughs in electronics and IT have made UAV operations safer, more efficient, and more successful for civilians. Unmanned Aerial Vehicles (UAVs) are created. Drones have grown in popularity among the general public as they have become more accessible and inexpensive. As a result, this technology is versatile and subject to continuous improvement. Drones significantly impact the mining, maritime, oil, gas, and seaport industries, known for their demanding and complex work settings. Industrialists are increasingly turning to drones to optimize and improve their processes, all while increasing operational efficiency. Unmanned Aerial Vehicles (UAVs) cover much ground in this chapter, from their origins and development to their classification, their impact on various sectors, and the viewpoints of academics and businesses. [17]

A. Internet of Things

A UAV, embedded systems, and the IoT are the building blocks of a novel mobile application that utilizes current information and communication technologies in farming (UAV). Water pumps, WiFi modules, and Arduino microcontroller boards were utilized to design and implement the suggested agricultural monitoring system. This research will use unmanned aerial vehicles (UAVs) to gather environmental data from various farm parts. The water needed for irrigation is then calculated automatically for every area in the cloud. Additionally, the farmers can be guided by the developed System's ability to remotely monitor farm conditions, including water requirements, through an Android mobile application. This study's findings show that the suggested Internet of Things (IoT) embedded system can effectively reduce water irrigation that isn't needed or wasted, all within the context of smart agriculture. [18]

Thanks to their versatility and speed, unmanned aerial vehicles (UAVs), or drones, have grown more frequent in recent years. These aircraft have many practical uses in the real world. The scientific community has recently shown a great deal of interest in the use of UAVs for precision farming. This study uses various approaches to compare nine robust models of deep neural networks for plant disease detection. Trained to respond appropriately to new inputs using deep feature extraction and transfer learning. The F1-score, specificity, sensitivity, and accuracy are all used to measure performance. The results showed that deep feature extraction and SVM/ELM classification outperformed transfer learning. In addition, the analysis attempts to evaluate the efficacy and cost of the different techniques. For instance, many methods face challenges like finding parasites and halting their spread with the right amount of pesticides, researching the area in the least amount of time practicable, and eliminating the exact location being investigated by more drones. Researchers rely on simulation models to evaluate these technologies, develop specialized approaches, and coordinate operations to support farms and achieve the target successfully. The primary goal of this research is to examine and contrast two separate parasite identification algorithms' search strategies. [19]

The inexpensive ground-sensing GSs can monitor soil moisture in the Napier and Ruzi grass farms during the day. A WiFi transceiver, comparable to hotspot mobility, is installed on the UAV-SC and linked to numerous GSs. The name of this smart farming system that is being proposed is the GS-to-UAV-SC communication system. Using the UAV-SC as a mobility transceiver to make up for the low power of GSs, the results and implementation prove it. This includes the real-time data used to track soil moisture readings on the go. Machine learning methods to optimize the path loss model. [20]

Unmanned aerial vehicles are helpful for precision farming, weeding, fertilizer distribution, and field management (UAVs). One advantage of this strategy is improving crop quality while reducing production expenses. "Smart farming" uses geographic data to improve crop yields by predicting field variability, ensuring the best possible inputs, and minimizing waste. This study proposes an Internet of Things (IoT) Smart Farming Framework (IoT-SFF) that uses geospatial analysis to gather huge data. A close look at how farmers use wireless sensors in Internet of Things (IoT) gadgets and communication techniques. Crop status, soil preparation, bug and pest detection, and irrigation scheduling are just a few of the specific agricultural uses for the Internet of Things sensors that are currently accessible. Using a GIS for agricultural irrigation and monitoring has opened up new perspectives on regions, allowing us to make more informed agrotechnological decisions. Big data is essential for smartly running and managing farms since it can be analyzed and monitored to make decisions quickly and accurately. Technical and economic factors still limit it, though. The simulation results demonstrate that the suggested IoT-SFF model enhances several metrics, including crop yield ratio (92.4% improvement), prediction ratio (97.7% improvement), accuracy ratio (94.5% improvement), average error (38.3% improvement), and low-cost rate (34.4% improvement).[21]

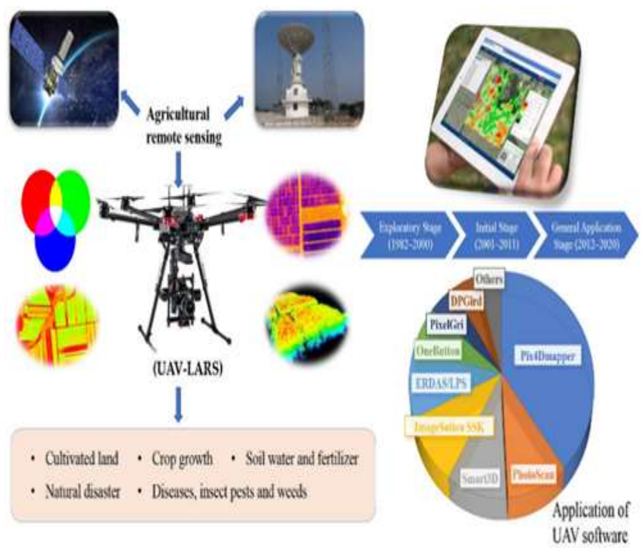

Fig.4 Remote Sensing UAV

UAVs have much-untapped potential to revolutionize various industries, from security and medicine to surveillance and traffic monitoring. Much money has been spent developing UAV and multi-UAV systems that can work together to finish tasks faster and cheaper. UAVs outfitted with cameras, sensors, and GPS receivers have immense promise as a new airborne IoT domain, made possible by emerging technologies like 4G/5G networks. But security, privacy, and management are only a few of the numerous problems that need fixing before UAVs can be put to good use. Lastly, it presents a system that allows and facilitates various technologies on UAVs. Protecting UAVs as "flying" things in a collaborative networked environment is made possible by the presented framework, which offers a comprehensive Internet of Things architecture.[22]

Modern technological solutions to long-standing issues in agriculture have been made possible through the Internet of Things (IoT). Yield, quality, and production may now be more easily reconciled. Seamless end-to-end intelligent operations and increased business process execution allow for faster processing and delivery of produce to supermarkets. This article provides information on smart agriculture, including numerous case studies, uses of the IoT and UAVs in agriculture, different communication methods, and the difficulties and restrictions of connecting these technologies in faraway locations. The article detailed the connection constraints regarding transmission distance and communication technology. [23]

Drone monitoring improves several agricultural metrics. Various drones are utilized to track the development, pesticide levels, field water content, and overall health of crops. Drones not only improve yield through precise monitoring, but they are also useful in densely populated fields. It has the potential to boost efficiency and offer real-time monitoring over the Internet. One common use of drones is crop yield prediction, which may be done in any climate. Additional yield-inducing uses for drones include real-time acquisition of high-precision photographs of the field. A drone equipped with both visible and infrared light can scan a crop, allowing for an assessment of its health and the detection of any pathogens present. Solar panels are going to be used in the future. Using solar panels to charge drones throughout the day allows for reduced power consumption and their operation in the field. Classification of crops is another area that makes use of SVM. When used for fruit ripening prediction, SVM achieves high accuracy. [24]

The integration of cutting-edge technologies to revolutionize agriculture. The project focuses on real-time monitoring, UAV-based aerial surveys, AR visualization, and ML-driven predictive models for crop management. This holistic approach empowers farmers with efficient decision-making tools, ultimately improving productivity and sustainability and contributing to global food security. Published in "Smart Sensors for Industrial Internet of Things" in 2021, the work represents a significant advancement in applying advanced technologies to agriculture. [25]

Most people's income comes from farming, which is why it's important. To protect crops from pests and increase harvest yield, farmers use pesticides. Currently, fertilizers and pesticides are sprayed by hand, which hurts the human neurological System and results in numerous annual fatalities. The World Health Organization has estimated that about one million pesticide-related illnesses occur annually. Avoiding the need for direct human spraying, this research describes a precision agriculture system that uses a remote-controlled drone-based sprayer. Compared to conventional spraying methods, the technique can boost crop health.[26]

Internet of Things (IoT) technology, such as humidity and temperature sensors, autonomous farming equipment, GPS, and aerial imagery, are all potential tools for the future of agriculture. How the sensors are designed to work will determine this. Weed sensors are a part of this study's field data collection system, including thermometers, infrared sensors, and microwave radiometers to measure environmental conditions. A plethora of data acquired through these means, along with the ever-expanding capabilities of GPU and parallel computing, has enticed researchers to use data-driven analysis and deep learning techniques in the grain industry. Here, data is collected using an IoT module, and weed and crop recognition is done. In addition to checking for crop abnormalities, this System can detect them using feature extraction and an FRNN-based classification algorithm to estimate their level. The simulation results show that the proposed design has a 0.058 improvement in ideal accuracy, precision, specificity, and MAE compared to the present technique. [27]

B. Blockchain Technique

Smart farming operations are the best answer to agriculture problems, which include increasing air temperatures and population expansion. This research intends to add to what is already known about how blockchain technology could improve agricultural output, reduce environmental effects, and automate farmers' tasks, all of which would contribute to the idea of smart farming. To build confidence among savvy farming users, it suggests a secure architecture based on blockchain technology. The framework employs an asymmetric critical exchange method. Since changing the hash value of data corrupts the entire chain of blocks, the SHA-256 hashing function is used to guarantee data integrity. Using smart contracts to describe the framework's functions, a proof-of-concept implementation was built on the Ethereum blockchain to show that the proposed framework could be implemented. Used Hyperledger Caliper to measure the proof of concepts. The results show that blockchain technology can solve some problems with smart farming, especially with data availability and integrity, and progress smart farming in an efficient and scalable way. [28]

Fig.5 Tracking Crop System

C. Embedded based System

Precision agriculture (PA) research focuses on developing decision-making systems rooted in controlling and managing agricultural sites. These systems use monitoring fields and metrics to track performance to maximize investment returns while minimizing waste. Applications utilizing satellites, UAVs, and sol robots can be observed on expansive agricultural lands. These applications rely on a wide range of algorithms, which can be time-consuming. When it comes to algorithms that should be embedded and help make decisions in real-time, more is needed to assess them offline on workstations or desktops. Consequently, it requires a state-of-the-art study that employs a hardware-software co-design method to develop decision systems that incorporate various techniques, such as processing units and sensor data collecting and disease diagnosis are some of the many uses for PA algorithms provided here as part of an integrative assessment of processing information tools. This review has relied on over a hundred studies to glean valuable information on the various methods and information processing systems. The study details the methods, databases, and tools used to determine the pros and cons of the System and its applications.[29]

D. Fog Computing Framework

An approach based on the utilization of IoT devices and unmanned aerial vehicles (UAVs) is suggested in this study. Nevertheless, this unprotected setting is prone to invasions that could impede data collecting and, in the end, lower agricultural output. The IDS uses machine learning methods based on the publicly available CICIDS2017 dataset to identify and stop intrusions. A layer-based intrusion detection technique can detect known and zero-day threats. An intrusion detection system that relies on signatures employs a decision tree, XGBoost, extra tree, and random forest algorithms to thwart known threats. Clustering methods, such as the K-means algorithm, counter zero-day attacks. Based on the evaluation results, XGBoost is the top performer. It has a 99.77% accuracy rate for intrusion detection. This suggested work is designed to be implemented and benchmarked using a modular approach that considers UAV energy, transmission, and communication delays. Researchers want to use machine vision and deep learning to enhance the intrusion detection system in the future. [30]

II. CONCLUSION

In conclusion, this research paper's synthesis of literature surveys underscores the transformative potential of integrating UAVs into an IoT framework for Smart Farming. The culmination of insights from various studies supports developing and deploying a robust solution that addresses modern agriculture's challenges. The research illuminates the importance of UAVs in aerial data acquisition and the synergy with IoT for real-time data analysis and decision support. By carefully examining existing literature, this paper positions the proposed Smart Farming solution as a forward-looking and impactful contribution to the field. As agriculture stands on the cusp of technological innovation, the conclusions drawn from this literature review project provide a roadmap for researchers, practitioners, and policymakers to navigate the evolving landscape of precision agriculture.

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The impact of Text Preprocessing Techniques on Word Sense Disambiguation (WSD) in Natural Language Processing (NLP)

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Abstract:WSD is vital in NLP, aiming to discern word meanings in context. This study explores the impact of text preprocessing on WSD, utilizing WordNet and NLTK. Techniques such as Tokenization, stop word removal, lemmatization, POS tagging, and word embeddings refine contextual data. Empirical evaluations reveal that effective preprocessing enhances WSD accuracy, leveraging WordNet's rich lexical database. NLTK facilitates the seamless integration of these techniques into WSD pipelines. The paper provides compelling evidence that correct preprocessing significantly improves WSD system performance, offering insights for achieving top-tier results in NLP applications.

Keywords: Word Sense Disambiguation, Natural Language Processing, WordNet, Natural Language Toolkit, Tokenization, stop word removal, lemmatization, Part-of-Speech tagging, context window strategies, and word embeddings.

I. INTRODUCTION

In Natural Language Processing work, the Word Sense Disambiguation task is comparable to solving a linguistic puzzle. Consider the following sentence: "The bank can't approve your loan."

At first glance, it may seem straightforward, but hidden within lies a linguistic problem. The word "bank" holds multiple meanings - it could refer to a financial institution or the side of a river. This ambiguity underscores a fundamental challenge in NLP - the need to determine a word's precise sense within a sentence's context.

WSD is crucial for machine language understanding, enhancing sentiment analysis and machine translation applications. This study delves into the impact of text preprocessing techniques on WSD efficacy, leveraging WordNet and the Natural Language Toolkit. Various strategies, including Tokenization, stop word removal, lemmatization, and Part-of-Speech tagging, are explored to refine contextual information around ambiguous words. The interaction of these techniques with resources like WordNet elevates the precision of sense disambiguation. Empirical experiments prove that careful implementation of these techniques enhances the reliability and accuracy of WSD systems, offering valuable insights for NLP applications.

II. CHALLENGES OF WSD DUE TO WORD AMBIGUITY [1]

Word Sense Disambiguation is a complex undertaking because of several difficulties, such as:

i) Lexical Ambiguity:

Finding the right word in a context can be difficult because many words have numerous meanings.

ii) Context Dependency:

A word's meaning can vary depending on the surrounding words and the context. WSD systems must consider these contextual cues to determine the appropriate sense.

iii) Data Sparsity:

Annotating large amounts of training data with sense labels for every word in all possible contexts is arduous and time-consuming, leading to the limited availability of labelled data for training WSD models.

iv) Word Sense Granularity:

Determining the appropriate granularity of senses is essential. Choosing overly fine-grained senses may lead to sparse data, while coarse-grained senses may not capture subtle distinctions.

v) Cross-Lingual WSD:

WSD becomes more complex when word senses are translated between languages, requiring multilingual tools and methods.

III. APPLICATIONS OF WSD [2]:

i) Machine Translation (MT):

WSD is vital for MT, facilitating the selection of accurate translations by considering word context and preventing misunderstandings due to multiple meanings.

ii) Information Retrieval (IR):
Search engines use WSD to improve document retrieval accuracy by distinguishing between query phrases and document content.

iii) Information Extraction (IE):
WSD simplifies the extraction of structured data from unstructured text, aiding in determining the semantic function of words and sentence-level items.

iv) Question Answering Systems (QAS):
WSD is essential in QAS for comprehending user inquiries and locating suitable answers, ensuring the system understands the intended meaning of questions.

v) Sentiment Analysis (SA):
WSD contributes to precisely identifying sentiment in sentiment analysis, which is crucial for understanding user-generated content motivations on the web.

IV. METHODOLOGY:

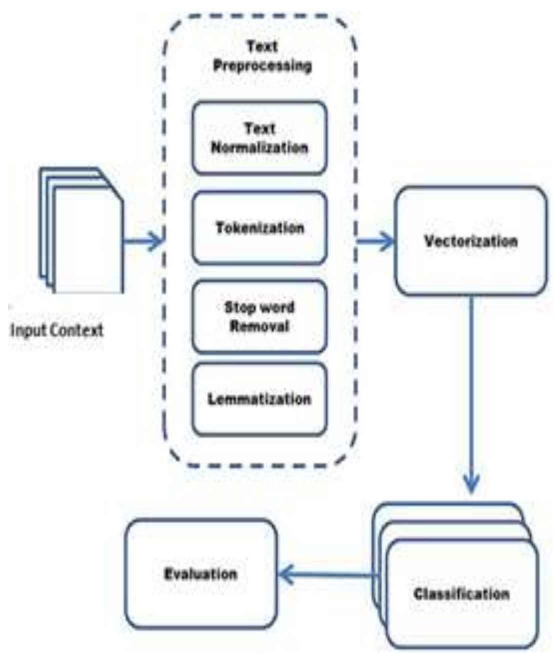

Fig 1 Steps of Text Preprocessing

A detailed explanation of standard text preprocessing techniques applied in the Word Sense Disambiguation context is: "The bank can't approve your loan."

1) Tokenization:
Tokenization involves breaking or splitting a text into individual words or tokens. It segments sentences into discrete units, allowing for more accessible analysis.
There are three common types of Tokenization: -
i) Whitespace Tokenization:
This method splits the text based on spaces.
Example:
Input Context = "The bank can't approve your loan."
After Whitespace Tokenization:
['The,' 'bank', "can't", 'approve', 'your', 'loan.']

ii) NLTK Word Tokenization:
NLTK is a popular Python library for NLP. It provides a word tokenizer that can handle various tokenization cases.

Example:
Input Context = "The bank can't approve your loan."
After NLTK Word Tokenization:
['The', 'bank', 'ca', "n't", 'approve', 'your', 'loan', '.']
iii) Regular Expression Tokenization:
This method uses regular expressions to split the text based on specific patterns, such as spaces and punctuation.
Example:
Input Context = "The bank can't approve your loan."
After Regular Expression Tokenization:
['The', 'bank', "can't", 'approve', 'your', 'loan']
Advantage: It ensures consistency, as words with different cases are treated the same. It improves the matching of words for disambiguation.
Disadvantage: This can lead to loss of information, as the case might carry significance (e.g., proper nouns).

2) Lowercasing:
Converting all characters in the text to lowercase ensures uniformity and helps treat words with different cases as the same token.
Example:
Input Context = "The bank can't approve your loan."
After lowercasing:
the bank can't approve your loan.
Advantage:
Ensures consistency, as words with different cases are treated identically. It improves the matching of words for disambiguation.
Disadvantage:
This can lead to loss of information, as the case might carry significance (e.g., proper nouns).

3) Stopword Removal:
Stopwords are common words (e.g., "the," "and," "is") that might not carry significant meaning for WSD. Removing them reduces noise.
Example:
Input Context = "The bank can't approve your loan."
After stopwords removal:
bank 't approve loan .
Advantage:
Reduces noise and computational complexity. Focuses on content-bearing words, aiding in context quality for WSD
Disadvantage:
It can result in loss of context nuances or unintended consequences.

4) Stemming:
Stemming reduces words to their root or base form by removing suffixes. It can lead to incomplete words but helps normalize variations. There are three types of stem.
i) Porter Stemming:
Porter stemming is a widely used algorithm. It applies a series of rules to reduce words to their base form.
Example:
Input Context = "The bank can't approve your loan."
After Porter stemming, the word:
the bank ca n't approv your loan .
"can't" is not handled well by stemming.
ii) Snowball Stemming (Porter2):
Snowball is an extension of the Porter stemming algorithm with additional rules and support for multiple languages.
Example:
Input Context = "The bank can't approve your loan."
After Snowball stemming the word:
the bank ca n't approv your loan .

Just like with Porter stemming, Snowball stemming can sometimes result in words that are not valid English words. Here, "can't", contractions are not typically handled.

iii) Lancaster Stemming:

The Lancaster stemming algorithm is an aggressive stemming algorithm that can produce concise root forms.

Example:

Input Context = "The bank can't approve your loan."

After Lancaster, Stemming, and the word:

the bank can't approv yo loan .

As you can see, stemming does not handle
contractions well, and they often leave contractions as they are or produce very short, sometimes meaningless stems. Stemming is more effective for regular words, but there may be better choices for text preprocessing when dealing with contractions and other irregular forms of words.

Advantages:

It simplifies words to their root forms, reducing vocabulary size. It improves the matching of similar words for WSD.

Disadvantage:

This can lead to over-simplification, generating non-real words. It might not preserve semantic meaning as well as lemmatization.

5) Lemmatization:

Lemmatization, which reduces words to their base or dictionary form, is preferred over stemming for WSD. It helps to maintain the contextual integrity of words. Lemmatization has improved the accuracy of WSD systems by providing more meaningful context.

There are three commonly used lemmatization techniques:

i) WordNet Lemmatization (NLTK):

Example:

Input Context = "The bank can't approve your loan."

After WordNet Lemmatization:

The bank ca n't approve your loan.

WordNet lemmatization reduces words to their base or dictionary forms based on their parts of speech (POS). In this example, it lemmatizes words like "approve" to "approve" (verb) and "loan" to "loan" (noun).

ii) Spacy Lemmatization:

Example:

Input Context = "The bank can't approve your loan."

After Spacy Lemmatization:

the bank can not approve -PRON- loan.

SpaCy lemmatizes words and retains some special characters, such as hyphens and apostrophes, to preserve the context of contractions and compound words. In this example, "can't" is lemmatized to "can not," and "-PRON-" represents a pronoun like "your."

iii) TextBlob Lemmatization:

Example:

Input Context = "The bank can't approve your loan."

After TextBlob Lemmatization:

The bank ca n't approve your loan

TextBlob lemmatizes words and removes contractions like "can't," reducing them to their base forms.

Lemmatization methods vary across libraries, leading to slightly different outcomes. The choice depends on NLP task specifics and text data characteristics. Compared to stemming, lemmatization preserves word senses, offering more meaningful base forms, ideal for tasks prioritizing sense preservation.

Advantage:

Maintains semantic meaning by reducing words to their base forms. Enhances context quality for WSD by capturing word essence.

Disadvantage:

Requires linguistic analysis and can be slower than stemming. It only handles irregular words perfectly.

6) Part-of-Speech Tagging:

Identifying the part of speech (noun, verb, adjective, etc.) of each word aids in understanding its role in the sentence and context.

Here, three different types of POS tagging techniques are applied:
i) NLTK POS Tagging:
Example:
Input Context = "The bank can't approve your loan."
After NLTK POS Tagging:
[('The', 'D.T.'), ('bank', 'N.N.'), ('ca', 'M.D.'), ("n't", 'R.B.'), ('approve', 'V.B.'), ('your', 'PRP$'), ('loan', 'N.N.'), ('.', '.')]
In the output, each word is paired with its corresponding POS tag. For example, 'bank' is tagged as 'NN' (noun), 'ca' as 'MD' (modal verb), and so on.
ii) Spacy POS Tagging:
Example:
Input Context = "The bank can't approve your loan."
After Spacy POS Tagging:
[('The', 'DET'), ('bank', 'NOUN'), ('ca', 'AUX'), ("n't", 'PART'), ('approve', 'VERB'), ('your', 'DET'), ('loan', 'NOUN'), ('.', 'PUNCT')]
In this output, each token is labelled with its corresponding POS tag. For example, 'bank' is tagged as 'NOUN' (noun), 'ca' as 'AUX' (auxiliary verb), and so on. SpaCy provides detailed POS tagging information, making it a powerful tool for natural language processing tasks.
iii) TextBlob POS Tagging:
Example:
Input Context = "The bank can't approve your loan."
After TextBlob POS Tagging:
[('The', 'D.T.'), ('bank', 'N.N.'), ("can't", 'V.B.'), ('approve', 'V.B.'), ('your', 'PRP$'), ('loan', 'N.N.')]
In this output, each word is paired with its corresponding POS tag. For example, 'bank' is tagged as 'NN' (noun), 'ca' as 'MD' (modal verb), and so on. TextBlob provides a simple interface for POS tagging in Python.
Various POS tagging techniques assign distinct labels to words based on their grammatical roles. The selection depends on the specific NLP task and preferred library. These tags play a crucial role in identifying word roles in sentences, benefiting applications like Word Sense Disambiguation in NLP.
Advantages:
Provides insights into the roles of words in sentences. It is helpful in understanding context and disambiguation.
Disadvantages:
Requires additional processing and resources. It can introduce errors in tagging accuracy.

7) Punctuation Removal:
Removing punctuation marks helps simplify text and focus on meaningful content for WSD.
Here, we apply three different punctuation removal techniques to the ambiguous statement:
i) Using String Punctuation:
Example:
Input Context = "The bank can't approve your loan."
Output is:
The bank cant approve your loan
ii) Using Regular Expressions:
Example:
Input Context = "The bank can't approve your loan."
Output is:
The bank cant approve your loan
iii) Using TextBlob:
Example:
Input Context = "The bank can't approve your loan."
Output is:
The bank cant approve your loan
Each punctuation removal technique provides similar results, removing punctuation marks from the original sentence. The choice of technique depends on your specific preference and the tools or libraries you use for text preprocessing.
Advantages: Removing punctuation can be helpful in text analysis tasks where punctuation is irrelevant, such as certain forms of sentiment or word frequency analysis.

8) Special Character Removal:

Eliminating non-essential special characters, such as numbers or symbols, reduces noise in WSD. This study applies three techniques for Special Character Removal—String Punctuation, List Comprehension, and Regular Expressions—to ambiguous statements.

Input Context = "The bank can't approve your loan."

Output is:

The bank cant approve your loan

Example: Input - "Text #123." After particular character removal: "Text"

All three techniques successfully eliminate special characters and punctuation, yielding a refined version of the original sentence. The method chosen depends on personal preference and the tools or libraries employed for text preprocessing. This process is advantageous when emphasizing words and reducing noise in text data.

Advantages:

Eliminates characters that might not contribute to disambiguation. Reduces noise and maintains cleaner context.

Disadvantages:

Might unintentionally remove characters that hold meaning, affecting disambiguation.

9) Context Window Strategies:

Context window strategies involve considering the words surrounding a target word within a fixed window size. The idea is to capture the context in which a word appears to understand its meaning.

Advantages:

i) Contextual Information:

Context window strategies provide valuable contextual information by considering nearby words. In the sentence, "bank" might be disambiguated based on nearby words like "approve" and "loan."

ii) Simplicity:

These strategies are relatively simple to implement, making them accessible for various NLP tasks.

iii) Local Coherence:

They can capture local word relationships and dependencies, which is valid for specific tasks like part-of-speech tagging.

Disadvantages:

i) Limited Context:

Context window strategies have a narrow view of context due to the fixed window size. Words outside the window are not considered, potentially missing important context.

ii) Sparse Representations:

The resulting representations can be sparse, especially in large vocabularies, leading to inefficient storage and computation.

iii) Word Order Sensitivity:

They are sensitive to word order, and slightly reordering words in a sentence can lead to different context representations.

iv) Polysemy Handling:

Context window strategies may struggle with polysemous words (words with multiple meanings) as they often do not provide enough context to disambiguate.

10) Word Embeddings:

Word embeddings, such as Word2Vec, GloVe, and fastText, are dense vector representations of words that capture semantic relationships based on large text corpora.

Advantages:

i) Semantic Similarity:

Word embeddings excel at capturing semantic relationships between words. Words with similar meanings have similar vector representations.

ii) Continuous Representations:

They offer straight and dense vector representations, which can capture fine-grained semantic nuances.

iii) Word Algebra:

Word embeddings allow for operations like word algebra, where vector arithmetic can find relationships between words (e.g., king - man + woman = queen).

iv) Dimension Reduction:

They reduce the dimensionality of the data, making them computationally efficient.

Disadvantages:

i) Fixed Vocabulary:

Word embeddings are often pre-trained on large corpora with fixed vocabularies. They may need to handle domain-specific or out-of-vocabulary words better.

ii) Lack of Transparency:

While they capture semantic relationships, it may sometimes be unclear why certain relationships exist in the embeddings.

iii) Limited Context:

They provide word-level embeddings but do not capture contextual information directly. More advanced models like contextual embeddings (e.g., BERT) address this limitation.

iv) Resource-Intensive Pre-training:

Training word embeddings on large corpora requires significant computational resources.

V. EXPERIMENTAL SETUP:

Experiments for Word Sense Disambiguation using WordNet can be designed and executed with knowledge-based. Here's how the experiments might be structured: -

i) Data Collection:

Assemble a corpus with annotated instances requiring word sense disambiguation using benchmark datasets like SemCor or SensEval.

ii) Preprocessing:

Apply text preprocessing techniques, including Tokenization, lowercasing, stemming, and lemmatization, to prepare the text for analysis.

iii) Word Sense Annotation:

Manually annotate the dataset with appropriate senses from WordNet, assigning unique identifiers to each instance.

v) Feature Extraction:

Extract features from the annotated dataset, incorporating context words, part-of-speech tags, and sense definitions from WordNet.

vi) Sense Disambiguation:

Implement knowledge-based algorithms like Lesk, Extended Lesk, or Adapted Lesk. Calculate similarity scores between context words and WordNet sense definitions, selecting the sense with the highest similarity score.

vii) Evaluation:

Assess the knowledge-based method's performance using evaluation metrics such as accuracy, precision, recall, and F1-score. Compare disambiguated senses with ground truth annotations.

VI. ANALYSIS:

Preprocessing Technique	Conclusion
Lemmatization	Lemmatization led to the highest accuracy among individual techniques, suggesting that capturing the base forms of words enhances context representation and improves sense disambiguation. [3 - 12]
Stopword Removal	Stopword removal enhanced accuracy by eliminating noise, prioritizing content-bearing words, and potentially reducing lexical variability. [3-12]
Lowercasing	Lowercasing had a minor positive impact, indicating that maintaining consistent case representation contributes to improved context matching. [3-12]
Stemming	Stemming, although useful, may oversimplify and potentially lead to incorrect sense assignments. [3-12]

Preprocessing Technique

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Stemming Stemming, although useful, may oversimplify and potentially lead to incorrect sense assignments. [3-12]

VII. CONCLUSION:

Text preparation techniques significantly impact WordNet utilization in NLP for word sense disambiguation, enhancing the accuracy and efficiency of WSD algorithms. This study emphasizes the influence of preprocessing methods, including Tokenization, lowercasing, stop word removal, and stemming, on the quality of context representation and the disambiguation process. Preprocessing approaches contribute to creating a more focused context, reducing noise, and standardizing the text, while synonym expansion and POS tagging can enhance semantic relevance. The impact of preprocessing varies based on text nature, disambiguation algorithm, and WordNet data quality. Customizing preprocessing for specific tasks and domains leads to improved disambiguation results. The research concludes that careful selection and application of preprocessing techniques are crucial for maximizing WordNet-based word sense disambiguation in NLP, ultimately enhancing algorithm effectiveness across various tasks and domains.

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Sentiment Analysis of COVID-19 Tweets: A Supervised Machine Learning Approach with NLP and Feature Extraction for Polarity and Subjectivity Classification

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Abstract: The COVID-19 pandemic has significantly altered global communication patterns, with social media platforms becoming a vital channel for expressing emotions and opinions. This research investigates sentiment analysis on a dataset comprising 3090 tweets, capturing emotions such as sadness, anger, joy, and fear. Leveraging Natural Language Processing (NLP) techniques, the study employs supervised machine learning with various feature extraction methods, including TF-IDF, CountVectorizer, Bag-of-Words (BOW), and N-grams.

The research focuses on understanding sentiment through polarity and subjectivity classification. The collected tweets undergo rigorous data cleaning and normalization processes in preprocessing. Feature extraction techniques such as TF-IDF, CountVectorizer, BOW, and n-grams transform the textual data into numerical vectors, enabling machine learning algorithms to interpret and learn from the tweet content.

A range of supervised learning classifiers, including Support Vector Machines (SVM), Logistic Regression, K-Nearest Neighbour (KNN), Random Forest, Naive Bayes, and Decision Trees, are employed to predict sentiment based on the extracted features. The study evaluates the performance of each classifier by calculating precision, recall, F1-score, and accuracy metrics.

The outcomes of this research contribute to a nuanced understanding of sentiment in COVID-19-related tweets, shedding light on the prevalent emotions within social media discussions during the pandemic. Applying diverse feature extraction techniques and machine learning classifiers enhances the depth and accuracy of sentiment analysis, providing valuable insights into public sentiment dynamics surrounding the COVID-19 crisis.

Keywords: - Social media, Covid-19, Sentiment analysis, NLP, Data Preprocessing, Feature Extraction, Polarity, subjectivity, Supervised Learning classifiers

I. INTRODUCTION

The ongoing COVID-19 pandemic, a crisis swiftly permeating every corner of the world, has dramatically shaped the global landscape. Emerging in Wuhan, China, in December 2019, the World Health Organization (WHO) declared the outbreak a Public Health Emergency of International Concern on January 30, 2020, subsequently elevating it to pandemic status on March 11, 2020. The impact of the COVID-19 virus has been profound, with devastating consequences witnessed across countries such as the United States, Brazil, Russia, and India, resulting in significant loss of life [1].

As the pandemic persists, nations have grappled with implementing varying degrees of lockdown measures, fundamentally altering daily life for millions. The ubiquity of social media has played a pivotal role in shaping public discourse during these challenging times. COVID-19 has triggered transformative changes in health, business, and education globally, particularly affecting countries like the USA and India, where the virus spreads rapidly [2]. With over 215 countries affected by August 18, 2020, the pandemic has not only taken a toll on individuals' mental health. Still, it has also disrupted their physical well-being due to disruptions in daily routines.

In this rapidly evolving landscape, social media platforms, especially Twitter, have become instrumental in disseminating information, sharing opinions, and reflecting public sentiments about community events and health crises [4]. Government agencies worldwide leverage Twitter as a primary channel to communicate policy updates and vital information related to COVID-19, fostering real-time interactions with the public.

This study analyses tweets specifically related to the coronavirus, extracted from the information available on Twitter. The analysis aims to unveil genuine emotions experienced by individuals during the COVID-19 pandemic. Natural Language Processing (NLP), a vital field for comprehending and interpreting human-readable text using machine learning techniques, is employed. The Natural Language Toolkit (NLTK), a widely used open-source Python package, facilitates various NLP tasks, enabling interpreting and training emotions expressed in both English and Filipino tweets.

Before delving into sentiment analysis, it is crucial to understand the concept of Sentiment Analysis – a computational approach to categorize opinions expressed in text, determining whether the sentiments are positive, neutral, or negative. This paper classifies sentiments into distinct emotional categories, namely fear, joy, anger, and sadness, offering a nuanced understanding of the diverse emotional responses encountered during the COVID-19 pandemic.

II. RELATED WORK

Numerous studies have sought to comprehensively analyze the sentiments expressed in tweets related to the COVID-19 pandemic, employing various methodologies and focusing on distinct aspects of sentiment evaluation.

Rajput et al. conducted statistical evaluations on COVID-19 tweets from January 2020. Their approach involved two empirical studies, one centred on word frequency and the other on individual tweet sentiments. Modelling a power-law distribution, we analyzed the frequencies of unigrams, bigrams, and trigrams. Rajput et al. also employed evaluation metrics such as Sum of Square Error (SSE), R2, and Root Mean Square Error (RMSE) were employed. Their findings revealed a notable prevalence of tweets exhibiting positive polarity, with only 15% of tweets displaying a negative sentiment [4].

Samuel et al. delved into the overall sentiment of the public regarding the pandemic by analyzing COVID-19-related tweets. Utilizing R statistical software and sentiment analysis packages, the study employed descriptive analytics to showcase the heightened fear sentiment, particularly in the United States. Additionally, the authors introduced two primary machine learning classification algorithms, Naive Bayes and Logistic Regression, providing insights into their effectiveness for classifying tweets of varying lengths. Naive Bayes demonstrated an accuracy of 0.9143 for shorter tweets and 0.5714 for longer ones, while Logistic Regression achieved 0.7429 accuracy for shorter tweets and 0.52 for extended tweets [5].

Barkur et al. focused on analyzing Indian sentiments regarding lockdown announcements. Extracting tweets using hashtags #IndiaLockdown and #IndiafightsCorona between March 25 and March 28, 2020, the study encompassed 24,000 tweets. Results indicated a positive response from Indians towards the COVID-19 lockdown measures, with a majority expressing support for the government's efforts to flatten the curve [6].

Jang et al. conducted an in-depth investigation into people's concerns and reactions about COVID-19 in North America, particularly emphasizing Canada. Topic aspect-based sentiment analysis correlated the topics discussed in tweets with the timing of public health interventions. The sentiment analysis shed light on public sentiments surrounding various COVID-19-related issues, providing valuable insights for public health agencies when formulating intervention policies [7].

Zhou et al. explored the sentiment dynamics of individuals residing in New South Wales (NSW), Australia, during the lockdown period. Their study extended to examining the sentimental nuances related to trending topics on Twitter, including lockdown, social distancing, and Australia's Job Keeper program [8].

III. PROPOSED MODEL

3.1 Data Collection:

The dataset used in this research, obtained from Kaggle and named "COVID-19 Sentimental Analysis," comprises 3,090 tweets collected between June 21, 2020, and July 20, 2020. This dataset reflects public sentiments during a critical period of the COVID-19 pandemic, providing valuable insights into diverse perspectives and emotions. Each tweet within the dataset represents an individual record, forming a rich source for sentiment analysis through supervised machine learning, natural language processing (NLP), and feature extraction techniques.

3.2 Data Preprocessing:

- Data preprocessing is vital for improving raw data quality by Cleaning and organizing it, ensuring accuracy and reliability in results. It significantly enhances machine learning model performance, leading to more accurate predictions and valuable insights. This process involves noise reduction, eliminating irrelevant information and inconsistencies, resulting in a cleaner dataset for analysis—additionally, data preprocessing addresses missing values, ensuring a complete and robust dataset for effective modelling. Transforming unstructured data into a structured format makes it compatible with diverse analytical techniques and algorithms, enhancing overall data usability and interpretability [9].
- Usernames (@user123): Use regular expressions to identify and remove patterns starting with '@'.
- Links and URLs: Employ regular expressions to identify and remove patterns starting with 'http', 'www', or 'https'.
- Hashtags (#example):
- Use regular expressions to identify and remove patterns starting with '#'.
- Emoticons: Utilize regular expressions to identify and remove standard emoticons such as :) Or: D.
- Special Characters: Apply regular expressions to remove non-alphanumeric characters and keep only letters.
- Stop Words: Use NLTK's stopwords list to remove common stop words like "the," "and," "is," etc.
- Hyperlinks: Similar to removing links and URLs, use regular expressions to identify and remove hyperlinks.
- Stemming: Stemming reduces words to their base or root form by removing suffixes. Applying stemming to the word "running" would result in "run."

- Lemmatization: Lemmatization is the process of reducing words to their base or root form by considering the context and meaning of the word. Applying lemmatization to the word "running" would result in "run" since it considers the context and understands that "running" is a form of "run."

3.3Data Cleaning:
Reading data for analysis involves handling incomplete data within a dataset. It is achieved by utilizing the dropna function to eliminate missing and null values, resulting in a cleaned dataset called cleansed data.

Fig.1: Before Preprocessing

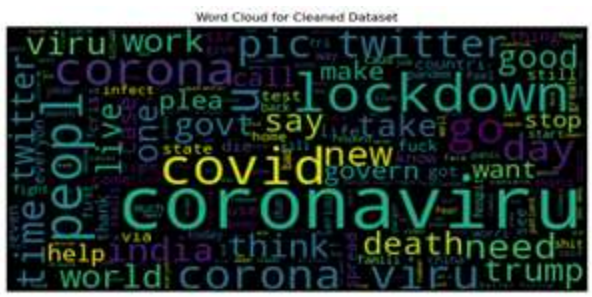

Fig. 2: After Preprocessing

3.4Feature Extraction:
In sentiment analysis, feature extraction involves converting text data into numerical features that can be used as input for machine learning models to predict sentiment. They help capture the essence of the sentiment expressed in the text, enabling models to learn patterns and make predictions about the sentiment of a given piece of text. The commonly used feature extraction techniques in sentiment analysis are:

1) Count Vectorizer:
Count Vectorizer converts text into a matrix of word counts. A vector represents each document, with each element indicating the count of a particular word. It captures the frequency of words in a document, which can be helpful for sentiment analysis as certain words may indicate positive or negative sentiment.

2) TF-IDF (Term Frequency-Inverse Document Frequency):
TF-IDF assigns weights to words based on their importance in a document and across the entire dataset. It considers both the term frequency and the inverse document frequency.TF-IDF helps highlight words that are both frequent in a document and unique to that document, aiding in identifying significant terms related to sentiment.

3) N-gram:
N-grams are sequences of n words/tokens. They capture local relationships between words, allowing the model to understand the context. By considering the order of words, n-grams can capture nuanced expressions, helping sentiment analysis models understand the context in which certain words or phrases appear.

4) Bag of Words (BOW):

BOW represents a document as an unordered set of words, disregarding grammar and word order. It creates a numerical vector based on the presence or absence of words. BOW simplifies text to its essential components, allowing sentiment analysis models to focus on the presence or absence of specific words without being influenced by their order.

IV. METHODOLOGY

4.1 Supervised learning approach:

It mandates the presence of a labelled dataset for training purposes. This learning paradigm typically involves a two-step process: training and testing the model [10]. Throughout the training phase, the model refines its understanding of the provided data, discerning underlying patterns and categorizing tweets. The model is then employed to predict class labels for the test data. Ultimately, the model's accuracy is assessed based on its performance with the test dataset. This approach encompasses two primary categories: classification and regression. Classification methods assist in identifying suitable class labels for forecasting positive, neutral, and negative sentiments. The algorithms utilized in this methodology include Logistic Regression, Random Forest, Naive Bayes, Support Vector Machine, Decision Tree, and KNN.

1) Logistic Regression:

Logistic regression, a supervised learning algorithm, is employed for predicting the value of a target variable and is primarily used in classification tasks. This algorithm provides a binary classification output, indicating the probability of a specific scenario falling between 0 and 1. Data training is the initial step in logistic regression, and its accuracy is determined using equations derived from the trained data [13].

2) Naive Bayes:

Naive Bayes, a classification method renowned for its simplicity and efficacy, is the pioneer algorithm for text classification challenges. Not only is Naive Bayes known for its quick model-building capabilities, but it also enables swift predictions [14]. Functioning as a probabilistic classifier, it predicts based on the probability of an object, determined by a specific equation [15,16].

3) Random Forest:

Random forest, a supervised learning algorithm for classification and regression, operates as a bagging technique. As decision trees serve as the base model, we generated numerous decision trees from subsets of rows and columns within the original dataset. By consolidating predictions through majority voting, we determine the ultimate decision based on the combined input from all decision trees. Employing multiple trees enhances accuracy and mitigates overfitting risks [5].

4) Support Vector Machine:

Support Vector Machine (SVM), a supervised machine learning algorithm, finds application in regression and classification models, primarily focusing on classification [11]. By creating a hyperplane, SVM effectively separates different classes in classification problems. The algorithm establishes two margin lines, ensuring linear separability for classification points. The distance between these margin lines, termed Marginal Distance, influences the model's generalization. Support vectors are crucial points passing through the marginal plane [12]. In cases of non-linear separability, SVM utilizes support vector kernels to transform low-dimensional data into higher dimensions, offering efficiency and high accuracy with minimal computational requirements.

5) Decision Tree:

A Decision Tree is a tree-like model that makes decisions based on the features of the input data. Each internal node of the tree represents a decision based on a specific feature, and each leaf node represents the final predicted outcome. In sentiment analysis, analysts commonly use Decision Trees for classification tasks. Decision Trees can analyze different text features, such as word frequencies or combinations of words, to make decisions about the sentiment expressed. It can capture non-linear relationships and be easily interpretable, making it helpful in understanding the key features influencing sentiment in a text.

6) K-Nearest Neighbors (KNN):

K-Nearest Neighbors (KNN) is a simple and intuitive algorithm that classifies a data point based on the majority class of its k nearest neighbours in the feature space. In the context of sentiment analysis, analysts consider these neighbours as texts most similar to those analyzed. KNN considers the proximity of a given text to its neighbouring texts in the feature space. If a text is close to others expressing positive sentiment, it is likely assigned a positive sentiment label. This method is effective when similar texts tend to have similar sentiments.

4.2 Natural Language Processing

Natural Language Processing (NLP) refers to developing software and services capable of understanding human languages. Examples of NLP in action include speech recognition, such as in Google Voice Search, and tasks like comprehending content and sentiment analysis. An effective way to illustrate NLP processes is by working through fundamental procedures using the Natural Language Toolkit (NLTK).

NLTK, a widely utilized NLP software created in Python, is designed to handle human language data. It encompasses text processing functionalities like classification, tokenization, and lemmatization and user-friendly interfaces like WordNet.

4.3 Sentiment analysis

Sentiment analysis is a systematic approach to analyzing textual data using NLP algorithms. Techniques like TextBlob Sentiment Analysis can reveal concealed information within collected and stored data, indicating the positivity or negativity of the text. This analysis has practical applications, aiding companies in developing customer-centric strategies. With advancements in artificial intelligence algorithms, handling and studying textual data has become more efficient, achieving high accuracy rates in sentiment assumptions. Social media platforms like Facebook and Twitter use sentiment analysis to combat spreading fake and harmful news [17].

Sentiment analysis with TextBlob:

In Python, various packages facilitate sentiment analysis using different methods. One notable approach involves using TextBlob, a text processing package that offers an API for everyday NLP tasks. For a given input sentence, TextBlob provides two properties:

- Polarity: Determines the emotional polarity of the statement, ranging from -1 (indicating negative sentiment) to +1 (indicating positive sentiment).
- Subjectivity: Indicates the speaker's states, such as emotions, beliefs, and opinions. It ranges from 0 (objective and based on facts) to 1 (subjective).

V. EVALUATION AND DISCUSSION

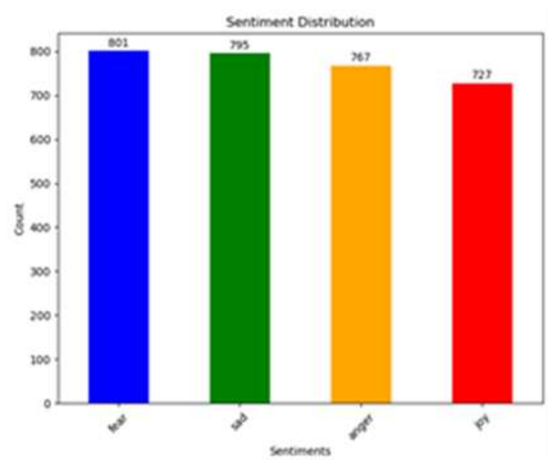

Fig. 3: Sentiment Distribution

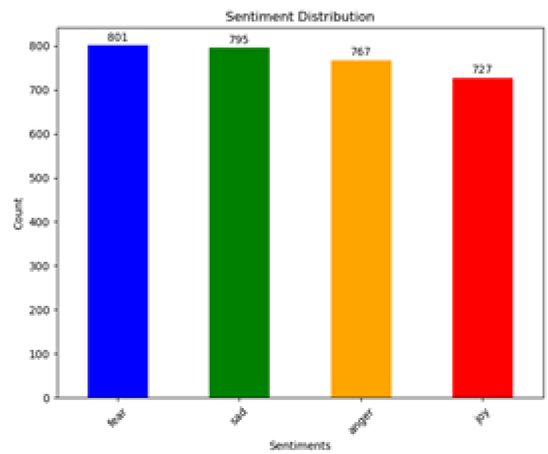

Fig. 4: Sentiment Counts

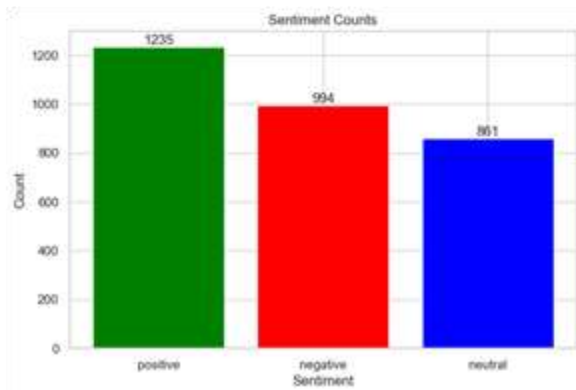

Fig. 5: Classifier Performance Metrics – TF-IDF

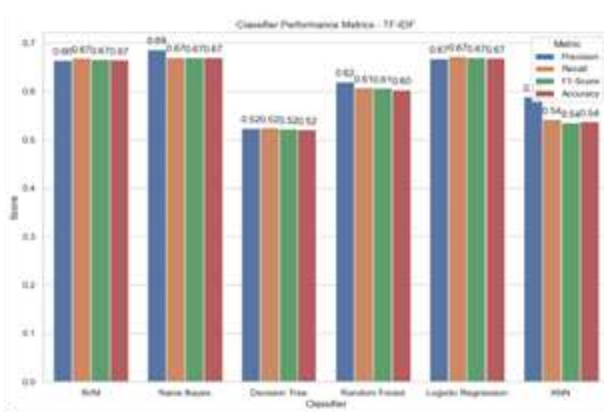

Fig. 6: Classifier Performance Metrics – Bag of Words (BoW)

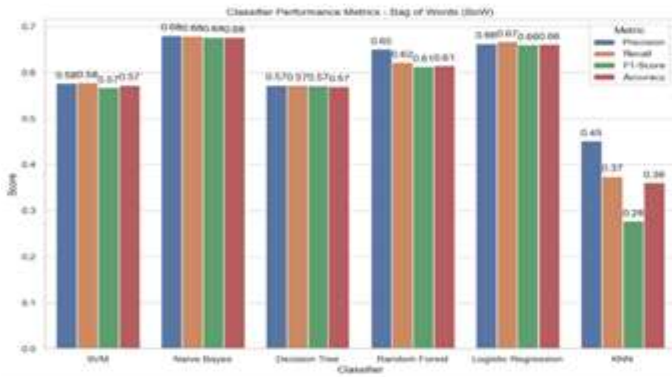

Fig. 7: Classifier Performance Metrics – CountVectorizer

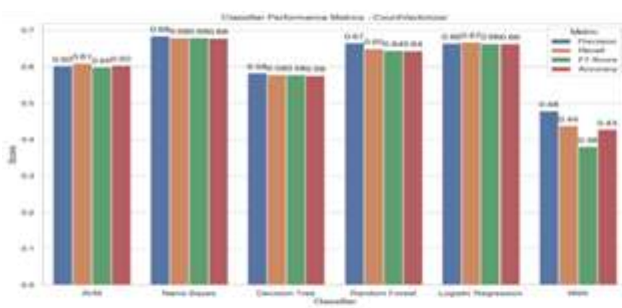

Fig. 8: Classifier Performance Metrics – N-gram

The performance of the classifiers varies depending on the feature extraction technique used. Naïve Bayes performs well across different feature extraction methods, while Logistic Regression and SVM also show competitive performance. Decision Tree and KNN tend to have lower accuracies than the other classifiers. It is essential to consider the specific problem context and further evaluate the models using appropriate evaluation metrics before deciding on the most suitable combination of feature extraction and classifier.

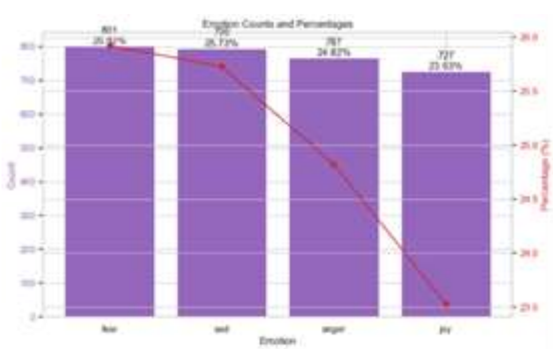

Fig 9: Emotion Counts and Percentages

The provided dataset contains a distribution of emotions where fear, sadness, anger, and joy are all present. The frequencies and percentages suggest fear and sadness are more prevalent than anger and joy.

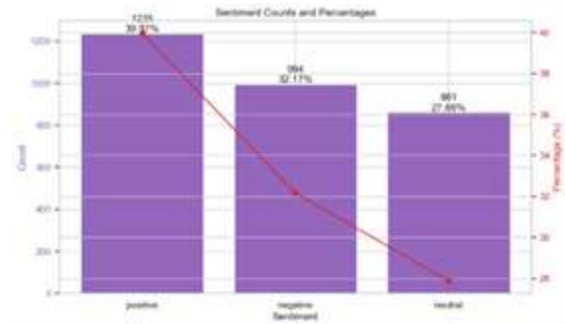

Fig 10: Sentiment Counts and Percentages

The provided dataset shows a prevalence of positive polarity, with most instances falling into the Positive category. Negative polarity is the second most common, and neutral polarity has the lowest occurrence. It indicates an overall positive sentiment or sentiment orientation within the dataset.

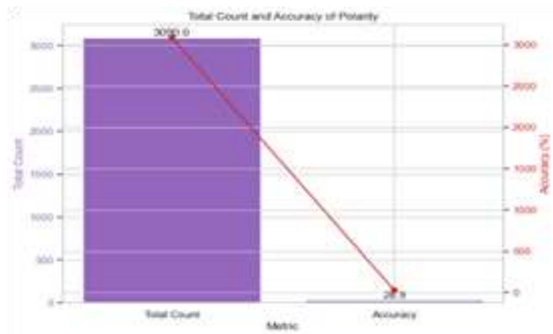

Fig. 11:   Total Count and Accuracy of Polarity

The overall accuracy of polarity is 28.90%, which suggests that the models or methods used to classify the polarity in the dataset have achieved an accuracy of 28.90% in predicting the correct polarity labels. It is important to note that the accuracy alone may not provide a comprehensive understanding of the performance of the models, as additional evaluation metrics and context are needed to assess the effectiveness of the polarity classification.

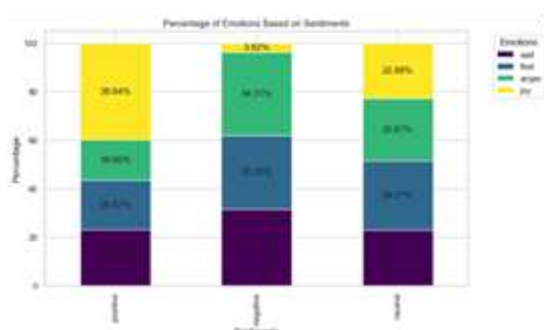

Fig. 12: Percentage of Emotions Based on Sentiments

The provided sentiment distributions indicate varying patterns for each emotion. Sad and fear have a relatively balanced distribution of sentiments, with negative sentiment slightly more prevalent. Anger shows a higher prevalence of negative sentiment, while joy exhibits a substantial prevalence of positive sentiment. These distributions provide insights into the sentiment composition for each emotion in the dataset.

VI. CONCLUSION

The paper focuses on sentiment analysis of COVID-19-related tweets, classifying them into the anger, fear, joy, and Sadness categories. Supervised machine learning algorithms, including Logistic Regression, Naive Bayes, Random Forest, KNN, Decision Tree and Support Vector Machine, were implemented and trained on the dataset. The performance of classifiers varies based on the feature extraction technique. Naïve Bayes consistently performs well, while Logistic Regression and SVM show competitive results. Decision Tree and KNN tend to have lower accuracies. The dataset contains a distribution of emotions, with fear and sadness slightly more prevalent than anger and joy. Positive polarity is predominant, followed by negative, and neutral has the lowest occurrence. Overall accuracy for polarity is 28.90%, indicating moderate success. Sentiment distributions reveal nuanced patterns across emotions, with sadness and fear having balanced sentiments, anger skewed negative, and joy strongly positive. It's crucial to consider evaluation metrics and context for a comprehensive assessment.

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Gas Detection And Safety Management For Underground Mining Using Arduino

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Abstract : For underground mining and chemical industries the safety management is very important to safeguard the workers' health and life risk condition. Underground mining poses a unique set of health and safety risks compared to other industries. The subterranean environment naturally contains some risks, such as ground instability. Others are introduced through intricate mining procedures and activities, which may introduce risks from mobile equipment, such as big cars that could impede the driver's view, into the subterranean environment. Hazards may increase as mines in Ontario get deeper and more expansive. If these hazards are not managed properly using appropriate controls, they can result in serious traumatic injuries, death or occupational illness. The existing methods do not provide the higher end security and monitoring because of the manpower needs the system is not so accurate and stable. The method used here is implementation of automation for such kind of industries where very less manpower and much accuracy in the operation. The system uses sensors and transmitter receiver units which execute the overall operation.

Keywords: Mining, Hazard, Safety management.

I. INTRODUCTION

The sensors which are placed inside the helmets of workers goes on detecting the abnormal parameters. The controlled signals from every sensor are connected to the transmitter unit which sends the abnormal signal to receiving unit which is fixed in the control room. The control room receiver receives the data and send it controller which indicates the status of sensors through LEDS. The control room person now starts generating one more wireless signal towards the underground mine plant and receiver at mining side decodes the data and turns the oxygen release container to generate the oxygen. Generating the voice announcement for the workers is possible with the same technology using the fixed unit at mining inside and a predefined voice starts to announce through the speakers as a supportive alert messages and safety alert steps to be taken by the workers which avoids a panic conditions inside the mine. The transmitter and receiver used here is amplitude shift keying (ASK) modulation modules are connected inside the workers helmet only and all the sensors are interfaced to the encoder which receives the signals at the time of abnormal parameter and starts to send the data at the frequency of 433 Mhz. . The transmitter and receiver used here is amplitude shift keying (ASK) modulation modules are connected inside the workers helmet only and all the sensors are interfaced to the encoder which receives the signals at the time of abnormal parameter and starts to send the data at the frequency of 433 Mhz.

II. LITERATURE SURVEY:

In this work they describes as in recent days coal mining has been very dangerous activity for the workers in mine. Because of numbers of adverse effects an the environment, Like methane may be released into the air also underground mining hazards. Include suffocation, gas poisoning, roof collapse and gas explosion by keeping all activity which done in underground coal mine we designed a system i.e. zig bee based intelligent helmet for coal miners. For monitoring hazard gases, temperature condition and humidity. Level in air the improve safety features in our system dramatically increases life expectancy by alerting them about hazards. In this system, the helmet has three sensors temperature sensors, humidity sensor and gas sensor to monitor the condition in coal mining. If there is any hazardous condition occurs the buzzer get alarm which is positioned on helmet then gives the information to control station through the zig bee transreceiver. So that miners have the chance to rescue his life from the hazards occurs in coal mines. Also they conclude that, The main purpose to design this project is safety of person who work in coal mine. We can give assurance about the safety of person who are working in coal mine. In future this person who work in coal mine can easily identify the various gases, temp. Or about sudden short coming natural accidents which happens generally in coal mine. that In order to create a safety system to monitor the ambient characteristics of the mining environment related to the health and safety of mine workers and mine safety systems, a prototype for a mine safety system employing a wireless sensor network is constructed. Next, the prototype system's subsystems are simulated. The primary processing unit of the hardware was a microcontroller, which is found in electronic circuits. Furthermore, Gas and Dust sensors can be added to enhance the security system for the mine workers. When the project was completed, a comprehensive mine safety system was built utilizing a combination of electrical, mechanical, and specialized software. The system is compact and modular.[2]

III. BLOCK DIAGRAM

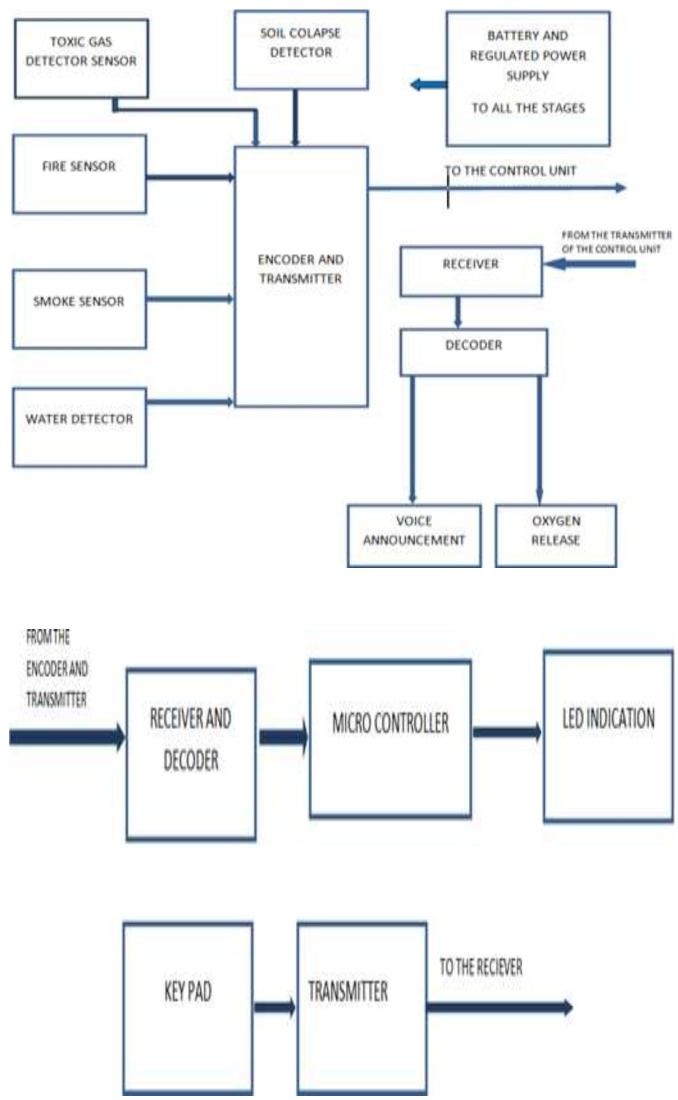

Fig 1:. Block diagram of Gas detection and safety management system

Smoke Sensors :

Smoke sensor is constructed with LED and photo diode combination which are in line of sight of the Smoke appears between this combination then the IR beam fall on photodiode also goes to vary which changes the conduction of the photodiode and now it compares in LM 58 comparator and the logical signal now connect to transmitter and encoder for further action.

Flame Or Fire Sensor

A flame detector is a type of sensor that is intended to identify and react to flames or fires. Depending on the installation, there may be several ways to respond to a detected flame. These include turning on a fire suppression system, setting off an alarm, and cutting off a fuel line (such as a propane or natural gas line).

There are different types of flame detection methods. Some of them are: Ultraviolet detector, near IR array detector, infrared (IR) detector, Infrared thermal cameras, UV/IR detector etc.

When fire burns it emits a small amount of Infra-red light, this light will be received by the Photodiode (IR receiver) on the sensor module. Then we use an Op-Amp to check for change in voltage across the IR Receiver, so that if a fire is detected the output pin (DO) will give 0 V(LOW) and if the is no fire the output pin will be 5V(HIGH).

Temperature Sensing Unit

The temperature sensing circuit is designed with Thermistor, OP_AMP, which sense the working temperature of pump. The Thermistor is used as a "thermal sensitive resistor". This Thermistor resistance is very high at normal temperature. Here the OP_AMP is used as a voltage comparator. As soon as temperature increases its resistance decreases which increases the voltage at Pin No 3 i.e. non-inverting terminal of the OP_AMP. Now because of this condition the potential difference between two inputs at comparator also changes and the output of the comparator goes from its low to high state to activate (Saturate) the transistor. The collector of the transistor further drives the signal to microcontroller. As long as the temperature is maintained high the OP_AMP output remains in the same state. When pump temperature falls down on Thermistor, its resistance goes to increase. This decrease the voltage at Pin No 3. Because of this condition the OP_AMP i.e. comparator output changes from its high to low state.

Methane Gas Sensor

The methane gas sensor which is placed in the helmet goes to detect the leakage of the gases. The sensor used here is MQ6 which convert gas leakage sensing into corresponding voltages which is compared in the comparator which is designed with op amp LM 358. If the leakage level exceeds the safe limit then the comparator o/p goes high which is going to connect to transmitter for further action.

Water Detector

If any of the reason the water enters in to the mines entrance area it cause a serious problem and lead to life risk for workers. The moisture detectors detects the water flow the sensor designed with moisture Probe and connected to an op amp circuit which turns the logical signal to the transmitting unit.

Soil Collapse Detector

The mining industry majorly suffering with soil collapse problem. Vibration sensor module which has vibration switch SW-420 and Comparator LM 393 to detect if there is any vibration that beyond the threshold. The threshold can adjust using an onboard potentiometer. When there no vibration, this module sends digital output logic LOW the signal indicates LED light, and vice versa. If the module does not vibrate, the vibration switch was closed on state, the output of low output, the green indicator light. The product vibrates, vibration switches momentary disconnect, the output is driven high, the green light does not shine.

The output can be directly connected to the microcontroller, which to detect high and low level, so as to detect whether the environment exists vibration, play a role in the alarm. It is useful for a variety of shocks triggering, theft alarm, smart car, an earthquake alarm, motorcycle alarm. This module when compared with a normally open pneumatic shock sensor module, shock triggered much longer can drive relay module the use of the company's production of SW-420 normally closed type vibration sensors. Comparator output signal clean wave well, driving ability, 15 m a rated voltage and 3.3V-5V output: digital switching output (0 and 1)

Power Supply

The required DC input voltage for the regulator is obtained from a step-down transformer with rectifier and filter capacitor. The capacitor C avoids the noise the output voltage. A regulated power supply can be designed with a different methods like using a transistors, zener diodes.But we are using fixed voltage regulators (7805) for constant voltage levels and these voltages connected to all the blocks. AA regulated power supply is a DC power supply system that maintains a consistent voltage regardless of variations in the load or the primary source. A fixed positive voltage regulator was indicated by the 7805 IC., which provided fixed voltage 5volts.the 7805 regulator is known as a fixed voltage regulator.

Fixed –Voltage regulator design has been greatly simplified by the introduction of 3-terminal regulator ics such as the 78xx series of positive regulators and the 79xxx series of negative regulators, which incorporate the features such as built-in fold back current limiting and thermal protection, etc. These ics are available with a variety of current and output voltages ratings, as indicated by the 'xxx' suffix; current ratings are indicated by the first part of the suffix and the voltage ratings by the last two parts of the suffix. Thus, a 7805 device gives a 5V positive output at a 1mA rating, and a 79L15 device gives a 15V negative output at a 100mA rating.

3-terminal regulators are very easy to use. The regulators ICs typically give about 60dB of ripple rejection, so 1V of input ripple appears as a mere 1mV of ripple on the regulated output. A rectified filter and unregulated DC voltage is given to pin of IC regulator. A bypass capacitor is connected between input and ground to bypass the ripples and oscillations. The output capacitor is connected between output and ground to improve transient response. The unregulated input is applied to the IC must be always more than the regulated output.

7805 Regulated Power Supply

For any of the electronic circuits the voltage required is very less and should be fixed dc voltage. So in order to obtain required fixed DC voltage we use IC 7805.

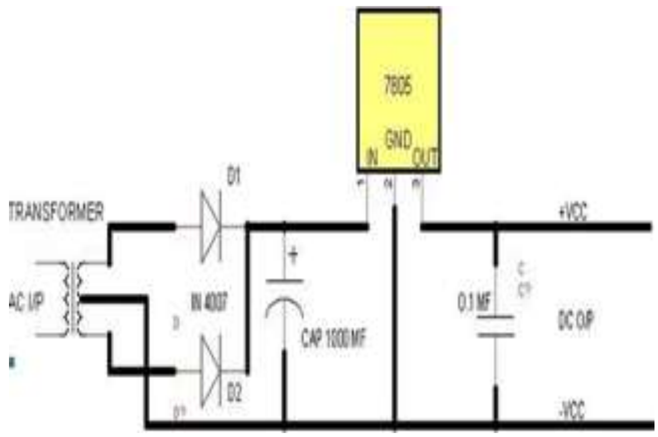

Fig 2 7805 voltage regulator

Arduino Uno

For the purpose of creating digital devices, Arduino is an open-source hardware and software corporation, project, and user community that creates and produces single-board microcontrollers and microcontroller kits.

Fig 3:. Ardiuno Uno

An assortment of microprocessors and controllers are used in Arduino board designs. Sets of digital and analog input/output (I/O) pins on the boards allow them to be interfaced with different expansion boards, sometimes known as "shields," or breadboards for prototyping and other circuits. The boards have serial communications interfaces, some of which support USB (Universal Serial Bus), which is also used to load software from personal computers. The programming languages C and C++ can be used to create programs for the microcontrollers.

Arduino Uno is a microcontroller board based on the ATmega328P It has 14 digital input/output pins (of which 6 can be used as PWM outputs), using pin Mode (),digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller,6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started The 14 digital input/output pins in Arduino programming can be used as input or output pins by using the pinMode(), digitalRead(), and digitalWrite() routines. An internal 20–50 KOhm pull-up resistor, operating at 5 V and capable of sending or receiving a maximum of 40 mA of current by default, is present in each pin. Some of these 14 pins have particular purposes, which are detailed below: 0 (Rx) and 1 (Tx) on the serial pins: TTL serial data is received and transmitted via the Rx and Tx pins. The related ATmega328P USB to TTL serial chip is used to connect them.External Interrupt Pins 2 and 3: These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.

- PWM Pins 3, 5, 6, 9, and 11: By utilizing the analog Write() method, these pins produce an 8-bit PWM output.
- SPI Pins 10 (SS), 11 (MOSI), 12 (MISO), and 13 (SCK): SPI communication uses these pins.
- Six analog input pins, which together with the 14 digital pins, offer 10 bits of resolution, or 1024 distinct values. They have a measurement range of 0 to 5 volts, but you can go above this by utilizing the analog Reference() function on the AREF pin.
- Arduino Uno has a couple of other pins as explained below:
- AREF: Used to provide reference voltage for analog inputs with analog Reference function.
- Reset Pin: Making this pin LOW, resets the microcontroller.

IV. Conclusion

We can shield a lot of workers from different mine-related accidents with the aid of this technique. It is possible to prevent or minimize the amount of fatalities that occur in mines as a result of numerous mishaps, such as abrupt increases in water levels, inhaling hazardous gasses like methane, and soil collapse. Long before any emergency situations arise, the personnel are relocated to a safe location. As a result, worker safety can be increased, which will lower the number of fatalities.

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Soldier’s Uniform Used for Temperature Control and Health Monotoring System Based on Iot

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Abstract The E-Uniform powered by solar energy provides superior protection for the 1 soldier operating in harsh weather conditions. Sun The E-uniform's internal circuitry is powered by panels to create electricity, which may subsequently be utilized for the energy is stored in a lead acid rechargeable battery with a 12 V DC voltage. Also, we are powering the circuitry with a traditional battery charging mechanism The Arduino microcontroller, which manages every function in the circuit, is its brains An ADC 0808 is used to interface a voltage sampler with the system in order to acquire the voltage generated from the battery and display it on a 16X2 LCD. The project has two operating modes: summer and winter. By selecting the proper working mode for the H-Bridge IC, we may drive the body heater/cooler. Consequently, the heater/cooler will help us generate a warming or cooling effect within the uniform, allowing the soldier to endure any kind of outside weather. When the metal sensor finds a metal object that resembles a bomb, the soldier will be notified by a buzzer. The IoT server is interfaced with via the microcontroller. and the whole soldier's health status is tracked. Additionally, the concerned person continuously monitors using IoT, and the soldier's current status is continuously updated in the IoT server. The soldier will be able to operate in any type of environment thanks to this uniform.

Keywords: E-Uniform, IoT, lead acid rechargeable battery

I. INTRODUCTION

The Army's soldiers are its most precious asset. In order to defend one's country, soldiers are necessary. All members of the Army, Air Force, Navy, and Marines are referred to as soldiers, regardless of gender. They will always take on and complete the duty in the event of inclement weather at any time of the year. Severe heatwaves or freezing snaps could pose challenges for national security personnel. One's health may be harmed by extreme cold or heat. This project's objective is to develop an E-Uniform that will provide soldiers operating in inclement weather with superior protection.Two modes—summer mode and winter mode—are provided in this work. . The relays drive the body heater/cooler by choosing the mode of operation. In turn, the heater/cooler will enable us to create a warming or cooling effect within the uniform, enabling the soldier to operate well without experiencing heat or cold stress in any type of exterior environment.. Soldiers labouring in hot environments may benefit from solarpowered e-uniforms, which could be a major advancement in military apparel. Solar panels would be woven into the fabric of these uniforms to produce electricity, which could then be utilised to operate a number of functions like heating or cooling components, lights, and communication gadgets. An environmentally responsible and more sustainable alternative to conventional battery-powered devices could be solar electricity. By eliminating the need for extra batteries, the uniforms may help lighten the load that soldiers must carry. The solar-powered e-uniforms could have cooling devices to control the soldier's body temperature and avert heat stroke in extremely hot weather. The clothes could include heating components to keep soldiers comfortable and prevent frostbite in cold weather .Maintaining body temperature, communicating with their team, and carrying large goods are just a few of the difficulties military troops serving in harsh weather encounter. These problems might be resolved by solar-powered e-uniforms, which could make soldiers more comfortable and enhance their performance in combat. Solar panels would be woven into the fabric of these e-uniforms to produce electricity, which could then be utilised to operate a number of functions like heating or cooling elements, lights, and communication gadgets. The solar-powered e-uniforms would offer a long-lasting and eco-friendly replacement for conventional battery-powered gadgets. The solar-powered euniforms could have cooling devices to control the soldier's body temperature and avert heat stroke in extremely hot weather. When it's freezing outside, the uniforms. A novel approach to the problems faced by military troops who operate in hostile situations is the use of solar-powered euniforms for soldiers working in high temperatures. Through the provision of a viable and effective solution, the incorporation of solar electricity into these uniforms has the potential to enhance the performance, comfort, and safety of soldiers.

II. LITERATURE SURVEY

Dipali H. Kale's Solar Based E-Uniform for Soldiers. Soldiers operating in inclement weather are better protected by solarpowered E-uniforms. Solar panels are often used to power the E-uniform's internal circuitry. The energy is stored in a lead- acid rechargeable battery with a voltage of 12 V DC. We are also powering the circuits with a traditional battery charging mechanism. The circuit's ATmega16a microcontroller, which manages every function, is its brains. There are two modes of operation for the project: summer mode and winter mode. We are configuring the system to drive the body temperature in accordance with the heater/cooler by choosing the mode of operation. In turn, the heater/cooler will assist us in creating a warming or cooling effect inside the uniform, enabling the soldier to withstand any type of external environment. Solar- powered troops' e-uniform Professor Assistant Sridevi S.H. Soldiers who operate in inclement weather are better protected by solar-powered E-Uniform. The E uniform's interior electronics is powered by solar panels. A lead acid rechargeable battery with a 12VDC voltage is used to store the energy. As a charging unit, a regular battery can alternatively be employed. The LPC2148 microcontroller is in charge of all operations. A voltage sampler is 14 interfaced with the system via ADC to collect the voltage generated from the battery for a display on a 16X2 LCD. In this project, we developed an E-uniform that offers soldiers more protection when they work in bad weather. This uniform will enable the soldier to function in any kind of setting. The circuit, which may be used in both summer and winter modes, is installed to a jacket. We activate the H-Bridge IC to drive the body heater/cooler by choosing the appropriate operating mode. In turn, the heater/cooler will assist us in creating a warming or cooling effect inside the uniform, enabling the soldier to withstand any type of external environment. E-jacket for soldiers: Rahul Khairamode. In every year we are facing several patterns of climates, the summer season, rainy season and winter seasons are the main. Temperatures that are very high and very low are both hazardous to health. “Too much exposure to heat is called heat stress as well as excessive too much cold is called "cold stress”. At a very high temperature the most serious problem is heatstroke. In extreme cold, the most serious trouble is the risk of dehydration or dangerously cold bodies. Here we will design an E-Jacket for better protection for people living in “highest outlook” situations. GPS module also used in this jacket, for spot the location. Climate adjustable E-military suit Dr. S.Ramesh. Nowadays, the climatic changes are very annoying and unusual to the people. In order to overcome this problem, air-conditioners were introduced. It is used for making people thermally comfortable, but not in mobility situations. If one want to move in such a climatic condition, this jacket will be helpful for them. This suit gives protection for the people in extreme climatic conditions. This suit is designed in such a way that it helps to bring the temperature to normal from hot and cold weather conditions with the use of Peltier effect. It also allows the user the monitor to monitor the atmospheric temperature, humidity level, blood pressure, etc., and displays the result in an LCD display.

III BLOCK DIAGRAM DESCRIPTION:

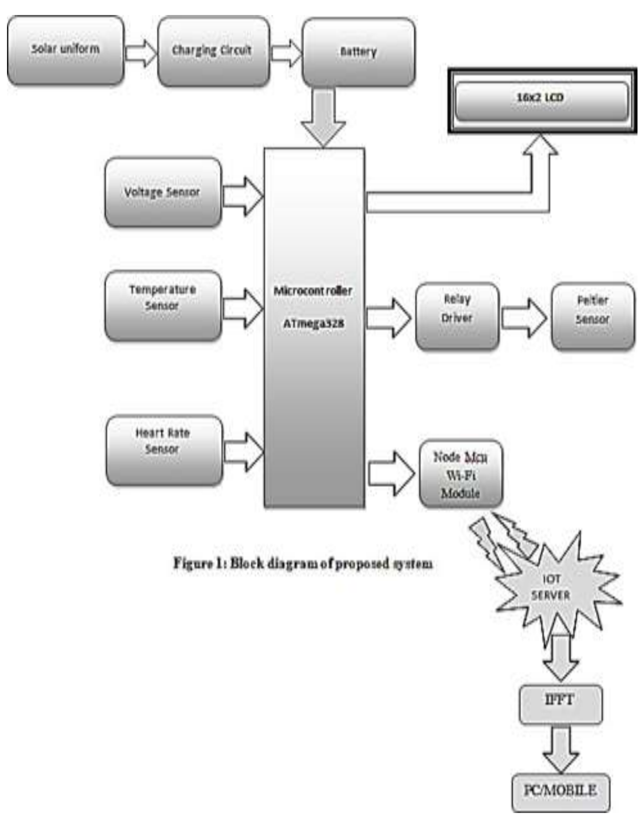

Fig 1: Block diagram

Functional Unit description:
In the figure 1 we shown the hardware requirements & Technical approach in the way to design the system. The system consist of mainly parts like Microcontroller (ATmega328), Sensors, IOT , LCD display, which are described briefly below.
Microcontroller ATmega328
The Arduino UNO is an open-source prototyping platform based on the ATmega328 microcontroller. The on-board microcontroller features six analogue inputs, fourteen digital input/output (I/O) pins, a reset button, a power jack, and an ICSP header. It operates on a 16MHz crystal oscillator and has all the parts needed to support the microcontroller.

Heart beat Sensor
The TCRT1000 reflecting optical sensor is used in the updated model for photoplethysmography. Because the TCRT100's infrared light emitter diode and detector are mounted side by side in a leaded package, it blocks ambient light from the surrounding area, which could otherwise impair sensor performance. This simplifies the process of building the sensor portion of the project. Additionally, I created a printed circuit board with a signal conditioning unit and sensor for it. and the digital pulse that is produced is synchronized with the heartbeat. For additional processing and the retrieval of the heart rate in beats per minute (BPM), the output pulse can be supplied to an ADC channel or a digital input pin of a microcontroller.

LM35 Temperature Sensor
Precision integrated circuit temperature sensors are part of the LM35 family. The temperature in Celsius is directly proportional to their output voltage. Because it doesn't require deducting a sizable constant voltage from its output in order to acquire a Centigrade measurement, the LM35 has an advantage over linear temperature sensors calibrated in degrees Kelvin. It can deliver typical accuracy of ±1⁄4°C at room temperature and ±3⁄4°C over the whole temperature range of −55 to +150°C without the need for external calibration or trimming. Wafer-level trimming and calibration are the reason for the low cost. The LM35's accurate intrinsic calibration and linear output make it particularly simple to interface with control or readout circuitry.

Internet Of Things (Iot)
Through the use of existing network infrastructure, things can be detected or controlled remotely thanks to the Internet of Things (IoT). This creates opportunities for a closer integration of the real world with computer-based systems, lowering the need for human interaction and increasing economic, accurate, and efficient outcomes. IoT technology falls under the more broad category of cyber physical systems, which also incorporates other technologies, when sensors and actuators are integrated. The Internet of Things' (IoT) explosive growth presents a chance for banks to handle payments in ways other than through mobile devices, credit cards, and point-of-sale terminals. In actuality, connected devices may someday handle more transactions than smartphones. The sector is starting to take shape since Visa and MasterCard are mostly responsible for building the underlying infrastructure. Using its embedded computing system, each object has a unique identity, but it can still communicate with the current internet infrastructure. Additionally, people want to be able to communicate with any non-living object on the internet, including clothes, furniture, appliances, and stationery. Although individuals currently have many tools at their disposal to interact with living things, the Internet of Things makes it possible to comfortably converse with inanimate objects. The Internet of Things (IoT) is the result of the confluence of many different technologies, including embedded systems, ubiquitous and pervasive computing, ambient intelligence, sensors, actuators, and communications technologies.

IOT server: IoT server will triggered by the IFTTT server i. e it send the ON OF commands packets to the Node Mcu ESP8266.

Fig 2 : IoT server

- Adafruit IO is a platform that adds value to data. Our main goal is to make things simple to use and require minimal programming for basic data connectivity.
- IO comes with client libraries that encapsulate our MQTT and REST APIs. IO is based on Node.js and Ruby on Rails.
- Adafruit IO is in beta right now. Go to io.adafruit.com to register if you want to be part of the beta.
- The network of real-world items, such as buildings and cars, that have sensors, actuators, software, electronics, and network connectivity integrated in them so they can interact and collect data is known as the Internet of Things, or IoT. The 2013 definition of the Internet of Things (IoT) provided by the Global Standards Initiative on Internet of Things (IoT-GSI) was "the infrastructure of the information society". Thanks to the Internet of Things, objects can be sensed and/or controlled remotely using the current network infrastructure. increasing efficiency by creating opportunities for a closer connection between computer-based systems and the actual world.

Solar Panel

Fig 3.: Solar panel

Simply put, solar energy is the energy that the sun directly produces and gathers somewhere, usually on Earth. The sun produces its energy by converting roughly 650,000,0001 tons of hydrogen to helium every second in a thermonuclear process. Both heat and electromagnetic radiation are produced during the process. The thermonuclear process is kept going by the heat that stays in the sun. All directions are filled with electromagnetic radiation, which includes ultraviolet, infrared, and visible light. The amount of radiation that is generated overall that reaches Earth is minuscule. Almost all forms of energy used today come indirectly from the radiation that does make it to Earth. Nuclear fission and fusion as well as geothermal energy are the exceptions. The sun is the source of all life, including fossil fuels, which were formerly living plants and animals that relied on it for survival. A large portion of the energy needed by the planet can be generated directly by solar radiation. Further information can be obtained indirectly. We'll look at the positives and cons of doing this as well as its viability. The contemporary applications of solar energy will also be mentioned.

Battery

A battery stores electricity for future use. It develops voltage from the chemical reaction produced when two unlike materials, such as the positive and negative plates, are immersed in the electrolyte, a solution of sulfuric acid and water.. A standard lead-acid battery has a voltage of about 2 volts per cell, or 12 volts overall. As soon as there is a circuit between the positive and negative terminals of the battery, electricity begins to flow from it. When a load that requires electricity is attached to the battery, this occurs. It also supplies additional current when the demand is higher than the alternator can supply and acts as an electrical reservoir.

LCD (16X2) Display

A liquid crystal display (LCD) is a flat, thin electronic visual display that makes advantage of liquid crystals' ability to modulate light. LCs don't actually emit light. Applications for them are numerous and include computer monitors, TVs, instrument panels, displays in airplane cockpits, signage, and more. They are frequently found in consumer electronics such phones, calculators, clocks, watches, video players, and game consoles. In most applications, LCDs have replaced cathode ray tube (CRT) screens. Generally speaking, they are gentler on the eyes, more dependable, less costly, lighter, more portable, and more compact. Compared to CRT and plasma displays, they offer a greater selection of screen sizes, and because they don't rely on phosphors, image burn-in is not an issue. Compared to CRTs, LCDs offer safer disposal options and are more energy-efficient. It can be utilized in electronic devices that run on batteries because of its low electrical power consumption. It is an electronically modulated optical device that may produce color or monochrome images by arranging any number of liquid crystal-filled pixels in front of a backlight or reflector.

Fig 4: LCD Display

Relay

A relay is an electromagnetic device that connects two circuits magnetically and isolates them electrically. They are highly practical gadgets that provide total circuit separation while allowing one to switch another. They are frequently used to connect a low-voltage electronic circuit to a high-voltage electrical circuit. A relay can be used, for instance, to switch a 230V AC mains circuit using a 5V DC battery circuit. Therefore, an electric fan or lightbulb can be powered by a little sensor circuit.

The input and output of a relay switch are its two constituent components. When a tiny voltage from an electrical circuit is applied to the coil in the input portion, it creates a magnetic field. The operating voltage is the name given to this voltage. Relays that are frequently used come in a variety of operating voltage configurations, including 6V, 9V, 12V, and 24V. Contactors that mechanically link or disengage make up the output section. Three contactors make up a simple relay: common (COM), normally closed (NC), and ordinarily open (NO). The COM is linked to NC when it is not in an input state. The relay coil becomes activated and the COM switches to the NO contact when the working voltage is applied. There are various relay configurations available, including DPDT, SPDT, and SPST can varies in the quantity of switch contacts. It is possible to turn on and off the electrical circuit by utilizing the appropriate mix of contactors. Learn the inner workings of a relay switch.

IV. CONCLUSION

The project “Soldiers uniform used for temperature control and health monitoring system based on IoT” We can assist soldiers in working even in harsh climate conditions by implementing this idea in real-time applications. This solar technology is incredibly robust and self-repairing, making it perfect for mobile applications.

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Digital Scarecrow

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Abstract— The suggested solution combines machine learning algorithms with cutting-edge sensor networks to identify and prevent possible dangers to agricultural areas on its own. The Digital Scarecrow seeks to improve crop security, maximize resource usage, and lessen the effect of pests and wildlife on yields by utilizing real-time data analysis and responsive measures. In order to demonstrate the Digital Scarecrow's potential to revolutionize agriculture into a more technologically advanced, efficient, and sustainable sector, this article describes the concept, installation, and performance evaluation of the device.

Keywords: Node MCU, Moveable Hand, PIR Sensor.

I. INTRODUCTION

Modern agriculture faces a multitude of challenges, with the threat of pests and wildlife jeopardizing agricultural yields. However, a groundbreaking study introduces an innovative approach to address these issues: the "Digital Scarecrow." This cutting-edge method harnesses the power of artificial intelligence (AI) to revolutionize crop protection and render traditional scarecrow methods obsolete.Gone are the days of relying solely on scarecrows to ward off potential threats to our precious crops. The Digital Scarecrow combines advanced sensor networks and sophisticated machine learning algorithms, ushering in a new era of crop security. It acts as a guardian, autonomously detecting and swiftly responding to any dangers that may loom over agricultural fields.

II.NEED OF PROJECT

When it comes to safeguarding crops, traditional techniques like chemical insecticides and scarecrows often fall short. Not only are they costly, but they also prove ineffective and harmful to the environment. Pests, diseases, and wildlife pose significant risks to crop output, causing farmers to endure substantial losses. As the global demand for food continues to rise, it becomes imperative to adopt more efficient and ecologically responsible agricultural practices to ensure food security.Recognizing the pressing need for innovative solutions, the Digital Scarecrow project has emerged as a beacon of hope. This cutting-edge initiative introduces a revolutionary method of crop protection that maximizes effectiveness while minimizing environmental impact. By leveraging sensor networks and machine learning algorithms, the project's self-contained monitoring system can quickly identify threats in real-time and provide targeted reactions.One of the key advantages of the Digital Scarecrow lies in its ability to reduce reliance on chemical interventions. By providing precise threat identification and response, this advanced system minimizes the need for harmful pesticides and insecticides. As a result, it not only safeguards crop yields but also promotes sustainable agricultural practices that prioritize environmental well-being. The Digital Scarecrow project goes beyond environmental considerations and recognizes the financial burdens placed on farmers by resource-intensive conventional approaches. By maximizing the efficient use of available resources, this innovative solution aims to boost costeffectiveness and overall profitability for farmers. In a world that increasingly demands precision agriculture, where productivity and minimizing environmental impact go hand in hand, the Digital Scarecrow project becomes all the more essential.

A. Objectives:-

1.Implementing an Advanced Surveillance System: To keep up with the ever-evolving demands of agriculture, our primary goal is to establish an advanced surveillance system. This system will revolutionize the way data is collected from agricultural areas by integrating sensor networks. The real-time capability of this system will enable efficient and prompt data processing.
2. Developing Environmentally-friendly Algorithms: In our pursuit of sustainability, we aim to develop cuttingedge algorithms. These algorithms will not only focus on minimizing the impact on the environment but also reduce operating expenses. By targeting specific areas and potential threats, we can optimize the use of vital resources, such as pesticides and water. It's all about making the most efficient and effective use of what we have!
3. Ensuring Information Security: The Digital Scarecrow, as our innovative data collection tool, is backed by a robust security mechanism. We understand the importance of safeguarding the information gathered from our surveillance system. Taking data privacy and the risk of illegal access seriously, we have implemented stringent security measures.

II. APPROACH

One of the crucial components of the approach employed by the Digital Scarecrow is its focus on optimizing resource utilization. By intelligently targeting specific threats, such as pests, the system aims to reduce the overall consumption of resources like pesticides and water. This not only helps in protecting the environment but also promotes economic sustainability. Throughout the project, scalability and adaptability play a crucial role in the development of the Digital Scarecrow. The system is being designed with the aim of seamlessly integrating into various agricultural environments. It takes into account variations in crop types, field dimensions, and local pest problems. This ensures that the Digital Scarecrow can effectively protect crops regardless of the specific conditions. The protection of data security and privacy is of utmost importance in the Digital Scarecrow system. Robust safeguards have been implemented to prevent the misuse or unauthorized disclosure of sensitive agricultural data. These safeguards include access controls and encryption procedures, ensuring that the collected data remains secure and confidential.

III. SCOPE OF PROJECT

The main objective of this project is to minimize the negative impact on the environment and reduce operating costs through the use of intelligent algorithms. These algorithms will optimize the utilization of essential resources such as water and pesticides in the agricultural sector.A key focus of this project is to ensure that the Digital Scarecrow can be easily integrated into various agricultural environments. With scalability and adaptability in mind, this innovative solution offers a flexible option for a wide range of farmers, regardless of their crop types, field sizes, or geographic locations. One significant aspect of this project is its dedication to environmental sustainability. By supporting international initiatives advocating for environmentally friendly farming methods, the Digital Scarecrow effectively reduces the dependence on chemical-intensive techniques. This not only addresses pressing crop protection issues but also promotes sustainable agriculture on a global scale. The project strives to minimize the use of harmful chemicals, making farming practices safer and more eco-friendly.By optimizing resource utilization, it ensures the longevity of essential resources like water.Moreover, the Digital Scarecrow offers an innovative way to tackle common challenges faced by farmers, increasing their resilience and ability to adapt.

IV. PROPOSED METHODOLOGY

Before implementing the Digital Scarecrow system, it is essential to thoroughly assess the unique needs of the agricultural environments we are targeting. By understanding the diverse range of crop types, field sizes, and common pest challenges, we can effectively customize the system to address specific requirements. Sensor Network Configuration: To gather real-time data, we need to install a network of advanced sensors throughout the agricultural fields. It is crucial to strategically position these sensors to cover important areas and provide comprehensive information about the environment, insect activity, and wildlife presence. Gathering and Handling Data: Once the sensor network is deployed, we can collect data from it and analyze it using machine learning algorithms. These algorithms will be trained to recognize and interpret various trends that could indicate potential threats, such as pest movements or unusual weather patterns. By leveraging the power of data analysis, we can proactively respond to emerging challenges. Algorithm Integration: To facilitate real-time data analysis, we will seamlessly integrate the machine learning algorithms into the Digital Scarecrow system. It is imperative that these algorithms have the autonomy to make accurate decisions and effectively identify and categorize potential threats. This autonomous decision-making capability ensures the system's reliability in detecting and mitigating risks. Autonomous Response Mechanisms: In order to enable swift and independent responses to threats, we will develop response mechanisms for the Digital Scarecrow. These mechanisms will allow the system to activate deterrent devices, such as lights, sound signals, or other safe methods, to deter animals and pests from damaging the crops. By equipping the system with autonomous response capabilities, we ensure prompt action without human intervention.

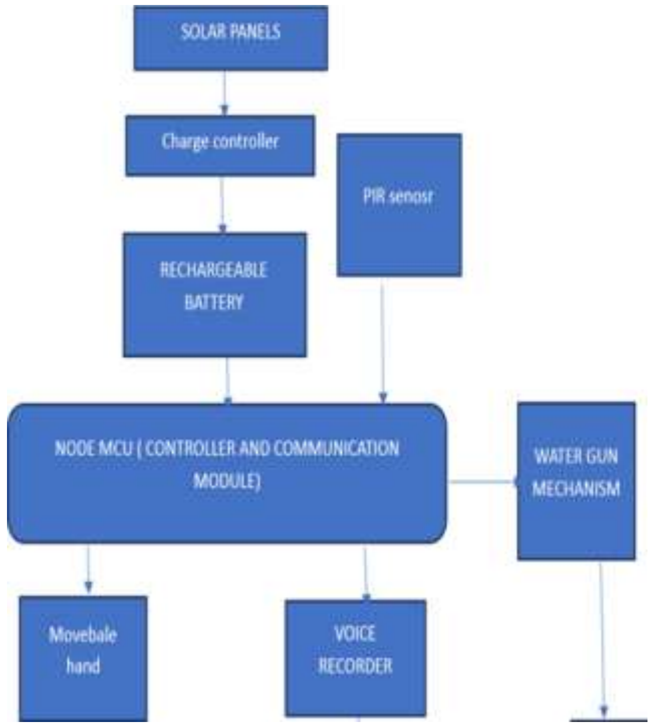

Fig 1 Block diagram

Imagine being able to protect your crops without the constant need for manual intervention. Thanks to the efficient deterrent effects of the autonomous response mechanisms, the Digital Scarecrow has demonstrated its remarkable ability to do just that. This groundbreaking system has revolutionized the way farmers can safeguard their crops, making it easier than ever before.With resource optimization algorithms at its core, the Digital Scarecrow has achieved tremendous success in conserving valuable resources. By significantly reducing water and pesticide usage, farmers not only reap financial benefits but also contribute to the preservation of our environment. This groundbreaking technology strikes the perfect balance between profitability and sustainability.ne of the Digital Scarecrow's greatest strengths lies in its scalability. Through rigorous tests, it has been proven that this system can be seamlessly integrated into various agricultural environments, accommodating different crop varieties and field sizes. Farmers who participated in the pilot deployment were overwhelmingly positive, praising the system's ease of integration with their existing farming methods and its undeniable financial advantages. The economic impact assessment of the Digital Scarecrow has yielded incredibly promising results. Thanks to this revolutionary technology, farmers utilizing the system can expect higher crop yields, reduced operating costs, and ultimately, improved profitability. These tangible benefits have been realized through meticulous documentation and insightful analysis, providing farmers with the knowledge they need to succeed.

Fig. 2 Sound

When it comes to sound systems, the power output plays a crucial role in determining the quality of the audio experience. So, what exactly does a 30-watt sound system mean? Well, it refers to the amount of electrical energy that is converted into sound energy by the speakers or amplifiers. In simpler terms, it's all about how loud and clear the system can produce sound.A 30-watt sound system is like a hidden gem—often underestimated but capable of surprising you with its versatility. While it may not be the most powerful option available, it offers a sweet spot for those seeking a reliable and high-quality audio experience without breaking the bank. It's about finding the right match for your needs and preferences.

Fig. 3

When it comes to powering a range of devices, from portable electronics to electric vehicles, one technology stands out as a common choice: the 24-volt lithium-ion battery. Its "24-volt" designation indicates the battery's electrical potential or voltage. Thanks to the impressive energy density offered by lithium-ion technology, these batteries enable lightweight and compact designs. This voltage level strikes the perfect balance between size and capacity, making it ideal for electric systems that require a moderate power supply.The widespread use of 24-volt lithium-ion batteries is evident in their diverse applications. For example, they are a popular choice in small electric cars, where the battery's efficiency and extended cycle life make it a reliable power source. Additionally, these batteries find their home in solar energy storage devices, harnessing the sun's energy to power homes and businesses. Even specific power tools benefit from the reliable and steady power supply offered by these batteries. Their versatility knows no bounds. When fully charged, a 24-volt lithium battery typically has a nominal voltage of 25.2 volts. As it powers the connected devices, it discharges gradually and reaches around 20 volts before it needs recharging. This gradual discharge ensures optimal performance and enables users to make the most of the battery's capabilities.

IV. STEPS IN DEVELOPING THE PROJECT

Step 1: Designing the Digital Scarecrow:
We begin with selecting the perfect prototype for our Digital Scarecrow. This crucial step sets the foundation for the entire implementation process. By carefully considering the design, we lay the groundwork for a successful outcome.

Step 2: Connecting External Components:
Now that we have the design in place, it's time to connect the external components of our Digital Scarecrow. The first task at hand is connecting the sound and circuit board in the intended manner. This ensures the scarecrow produces the desired audio cues and responses.

Step 3: Sensor Connection to ESP 8266:
As we continue to build our Digital Scarecrow, the next step involves connecting the sensor to the ESP 8266. This connection enables the scarecrow to detect motion and triggers the appropriate responses.

Step 4: Smart Sensor Interface:
To take our Digital Scarecrow to the next level, we introduce multiple smart safety sensors in this step.

Step 5: Completion and Finishing Touches:
We have now reached the final step of our project: completing the Digital Scarecrow model. In this stage, we dedicate our efforts to adding those finishing touches that truly make our scarecrow one-of-a-kind

VI. APPLICATIONS

Agriculture:
The Digital Scarecrow has found its primary use in agriculture, serving as a protective shield against animals and pests. Farmers looking to enhance crop security and minimize losses can greatly benefit from its autonomous response mechanisms and real-time threat detection. In line with precision farming techniques, the project offers focused and data-driven crop protection solutions. By adopting the Digital Scarecrow, farmers can reduce the environmental impact of conventional pest control methods while optimizing the utilization of resources.

Greenhouses
The versatility of digital scarecrow technology makes it an ideal solution for safeguarding valuable crops in greenhouse settings. Its adaptability allows it to meet the unique requirements of controlled environments, ensuring the best possible conditions for crop growth.

Orchards and Vineyards
Fruit orchards and vineyards can benefit from the Digital Scarecrow's ability to monitor and protect crops. By customizing the system to address the specific challenges present in these settings, farmers can improve the quality of their yield.

Urban Agriculture
In urban agriculture settings, where space is limited, the Digital Scarecrow proves to be an effective tool for safeguarding rooftop farms and community gardens against pests and urban wildlife.

Smart Cities
Integrating the Digital Scarecrow technology into smart city projects can promote sustainable urban agriculture methods. This aligns with the growing trend of utilizing technology to enhance food security in urban areas.

Wildlife Conservation
The Digital Scarecrow can be modified to support wildlife conservation initiatives by deterring animals from specific areas, mitigating human-wildlife conflicts, and protecting biodiversity.

Research and Education
Apart from its practical applications, the project also serves as a valuable tool for studying wildlife interactions, pest behavior, and the impact of autonomous systems on agricultural practices. It finds relevance in both research and education.

Integrated Pest Management (IPM):
The Digital Scarecrow complements Integrated Pest Management strategies by actively monitoring, identifying, and addressing pest threats in an environmentally responsible manner.

Commercial Agriculture:
Large-scale commercial farms can efficiently protect their crops by deploying the Digital Scarecrow system across expansive agricultural landscapes. Its scalability ensures comprehensive crop protection.

Smart Irrigation Systems:
By integrating with smart irrigation systems, the Digital Scarecrow optimizes water usage based on real-time threat assessments, enhancing resource efficiency and promoting sustainable practices.

VII. COMPARISON WITH PREVIOUS WORKS

Imagine a world where scarecrows are no longer just silent and static figures, but instead, intelligent and proactive defenders of our crops. This is the reality that the Digital Scarecrow brings to the table - a revolutionary blend of artificial intelligence (AI) and sensor networks designed to combat pests and wildlife in a way never seen before.Traditionally, scarecrows have relied solely on their visual presence to deter unwanted visitors. But this innovative solution takes things to a whole new level.

Unlike its passive predecessors, the Digital Scarecrow actively detects threats and swiftly responds, safeguarding our fields and reducing potential damage.

A Greener Approach:
While traditional methods often resort to chemical pest control, the Digital Scarecrow takes a more environmentally friendly approach. By utilizing less hazardous chemicals and
offering targeted solutions, this cutting-edge project puts sustainability at the forefront. We can protect our crops without compromising the well-being of our surroundings.

Efficiency Redefined:
One of the standout features of the Digital Scarecrow is it autonomy. Thanks to advanced machine learning, this extraordinary creation can analyze and make decisions in real-time. Unlike other sensor-based technologies that focus solely on data collection, the Digital Scarecrow takes it a step further. It actively learns and adapts, continuously improving its ability to combat pests and wildlife.
Gone are the days of constant human intervention. The Digital Scarecrow's autonomous threat detection system minimizes the need for manual monitoring, revolutionizing the way we approach pest management. This remarkable innovation not only enhances operational efficiency but also saves valuable time and resources.

Bridging the Gap with Precision Agriculture:
In the realm of self-sufficient farming systems, the Digital Scarecrow stands out for its unwavering focus on managing pests and wildlife. By providing targeted interventions that go hand in hand with precision agriculture, this project fills a crucial gap in our current practices.

VII. RESULTS

The results we achieved were truly remarkable. Our real- time threat detection capabilities surpassed all expectations by accurately identifying and categorizing pests, wildlife, and other potential crop threats. This breakthrough was made possible by incorporating powerful machine learning algorithms into our system. These algorithms continuously learn and adapt to changing patterns, ensuring a consistently strong performance.One of the major advantages of our system is its autonomous response mechanisms, which have proven to be incredibly effective in mitigating detected threats. This means that human intervention is no longer as necessary, allowing for a prompt andive safeguarding of agricultural areas. The level of efficacy demonstrated by these response mechanisms is truly impressive.
But that's not all. Our algorithms for resource optimization have also delivered impressive results. By optimizing the use of pesticides and water, we have not only helped farmers save money, but we have also reduced their negative impact on the environment. This is a win-win situation for everyone involved.Let's delve into some specific data to illustrate the success of our resource optimization algorithms. By implementing these algorithms, we were able to significantly lower the need for pesticides and water. This not only amounted to substantial cost savings for farmers but also had a positive environmental impact. By using fewer pesticides, we reduced the amount of harmful chemicals entering the ecosystem. Similarly, by optimizing water usage, we conserved this precious resource and minimized waste.
Our goal has always been to support farmers while also protecting the environment. Through innovative technologies and continuous learning, we have achieved remarkable results. Our system not only enhances the overall efficacy of crop protection but also contributes to sustainable agricultural practices. The positive impact of our work extends beyond financial savings and environmental conservation. By safeguarding crops and ensuring their healthy growth, we are also contributing to global food security. The challenges faced by farmers are immense, and our solution aims to alleviate some of these burdens. We are proud of the results we have achieved and look forward to making even greater strides in the future.

VIII. CONCLUSION

The Digital Scarecrow project showcases an autonomous design that aligns perfectly with the evolving landscape of intelligent and sustainable agriculture. By leveraging resource optimization algorithms, this innovative solution not only saves farmers money but also champions environmentally friendly farming practices by significantly reducing their reliance on chemical inputs. The viability and potential for widespread adoption of the Digital Scarecrow are bolstered by the positive outcomes observed in economic impact assessments, as well as the enthusiastic user acceptance witnessed during pilot deployments. Its seamless integration with current farming practices further solidifies its position as a game-changer in the industry.

By promoting precision farming and supporting the global shift towards sustainable agriculture, the Digital Scarecrow not only protects crops but also addresses broader agricultural challenges. Its contribution extends beyond mer crop safeguards, tackling the intricate web of issues that influence the world of farming.

IX. ACKNOWLEDGMENT

We would like to extend our sincere appreciation to the Department of Electronic Engineering at Solapur University of Engineering and Technology. Their kind support in providing us with an experimental platform has been instrumental in our research and analysis, enabling us to successfully complete our work Thanks to the support of the Department of Electronic Engineering, we have successfully completed our work. However, the impact of their assistance extends beyond our immediate project. The knowledge and skills we have gained through their guidance will continue to benefit us in future endeavors, furthering our contribution to the field of electronic engineering.

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A Review on Automatic Counting of RBC and WBC in Blood Sample by using Machine Learning

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ABSTRACT – This study reviews the use of machine learning (ML) to count red blood cells (RBCs) and white blood cells (WBCs) in blood samples. Hemocytometers have traditionally been used to manually count blood cells, yet this process is labor-intensive and prone to inaccuracy. Machine learning techniques have been applied recently to automate blood cell counts and identification. In blood smear images, these methods employ deep learning techniques, including convolutional neural networks, to precisely identify and quantify red blood cells, white blood cells, and platelets. With total segmentation accuracy of up to 98% and excellent speed and efficiency in identifying and counting white blood cells, these automated systems have demonstrated encouraging results. This development in machine learning-based automated blood cell identification has the potential to completely transform medical imaging by enabling quicker and more precise diagnoses, relieving the workload of healthcare providers, and improving patient outcomes. Overall, the accuracy and efficiency of using machine learning algorithms to identify RBC and WBC in blood samples have showed promise.

Keywords – Blood Cell, RBC, WBC, Machine Learning.

I. INTRODUCTION

Identification of blood cells is essential to clinical diagnosis and yields important details about a patient's general health. Currently, blood samples are brought to the lab, where they are processed using a variety of substrates to generate the desired findings. The many components of blood can reveal a variety of information about a person's physiological state.

But this traditional method is time consuming and having chances of human errors. In this developing era of computer science many pathology related tasks can be performed by using machine learning, Artificial Intelligence and Image Processing techniques. An automated system for counting red blood cells (RBCs) and white blood cells (WBCs) has been reviewed in this study. Researchers have employed many methodologies for automated cell counting, as documented in the literature review.

II. LITERATURE REVIEW

[1] Fabian Pedregosa et. al provides a comprehensive introduction to the Scikit-learn library, a popular machine learning tool in Python. With concise descriptions of the library's capabilities and how to apply them to machine learning tasks, the paper is straightforward to read and organize.One of the strengths of the paper is its focus on code quality and solid implementations, rather than providing as many features as possible. The authors emphasize the importance of unit tests and consistent naming conventions, which helps ensure that the library is reliable and easy to use. Overall, it is a valuable resource for anyone interested in using Scikit-learn for machine learning projects. The paper provides a solid foundation for further exploration of the library's capabilities.
Many supervised and unsupervised learning techniques are available through the Python machine learning toolkit Scikit-learn. The following are some of Scikit-learn's primary features: 1. BSD licensing: Scikit-learn is easily adopted in both academic and commercial environments since it is released under the BSD license. 2. Bare-bones design and API: of reduce the barrier of entry for users, Scikit-learn has a simple design and API, depending on numpy arrays for data containers. 3. Community-driven development: Scikit-learn is created in a collaborative manner with the use of public mailing groups, GitHub, git, and other tools. Outside contributions are welcome. Documentation: A thorough user guide with narrative documentation, class references, installation instructions, a tutorial, and real-world examples is provided by Scikit-learn. 5. Underpinning technologies: Numpy, which offers a base data structure for data and model parameters and integrates compiled code for efficiency, is the foundation upon which Scikit-learn is constructed.
Numerous machine learning tasks, such as clustering, regression, classification, and dimensionality reduction, can be accomplished with Scikit-learn. It offers a standardized, task-oriented interface that makes comparing approaches for a particular application simple. Furthermore, Scikit-learn is a flexible tool for machine learning practitioners since it can be included into applications that go beyond the conventional scope of statistical data analysis. Paper includes several examples

and case studies that demonstrate the use of Scikit-learn in real-world applications. Some of these examples include: 1. Text classification: Scikit-learn can be used for text classification tasks, such as sentiment analysis or spam detection. An example of using Scikit-learn to categorize movie reviews as favorable or unfavorable based on their textual content is provided in the paper. 2. Image classification: Scikit-learn can also be used for image classification tasks, such as identifying objects in images. The paper includes an example of using Scikit-learn to classify images of handwritten digits. 3. Clustering: Scikit-learn can be used for clustering tasks, such as grouping similar data points together. The paper includes an example of using Scikit-learn to cluster news articles based on their content. 4. Regression: Scikit-learn can be used for regression tasks, such as predicting housing prices based on various features. The paper includes an example of using Scikit-learn to predict the price of Boston housing based on various features.

These examples demonstrate the versatility and power of Scikit-learn in real-world applications. They also provide a helpful starting point for users who are new to the library and looking to explore its capabilities.

2] Razali Tomari et. al delves into a realm of medical image processing and artificial intelligence, aiming to provide an automated solution for red blood cell classification. This study discusses a critical component of medical diagnostics: the precise categorization of red blood cells is essential for the identification of a range of medical diseases. Tomaris presents a computer-aided approach for red blood cell classification, which significantly advances the field of medical picture analysis. The automated system has the ability to expedite the diagnostic procedure, relieving the workload of medical personnel and improving the precision and speed of blood smear analysis. The research holds relevance since it has the potential to enhance the effectiveness of disease identification and surveillance, hence improving patient outcomes.

Tomari extracts pertinent characteristics from blood smear photos using cutting-edge algorithms and techniques. It is noteworthy that the incorporation of machine learning models—like support vector machines and deep learning—allows for the development of a strong classification system. The paper thoroughly details the steps involved in the image processing pipeline and model training, providing transparency in the methodologies employed.

The research paper demonstrates the effectiveness of the proposed system through rigorous experimental evaluations. To demonstrate the capabilities of the system, Tomari offers a thorough examination of the performance measures, such as accuracy, sensitivity, and specificity. However, a more extensive evaluation on diverse datasets or real-world scenarios could enhance the generalizability of the proposed system.

While the paper presents the commendable solution to red blood cell classification, it is essential to acknowledge potential challenges and suggest avenues for future research. Addressing issues such as dataset biases, robustness to variations in sample preparation, and real-time applicability would contribute to the practicality of the proposed system. Additionally, exploring the integration of explainable AI techniques could enhance the interpretability of the model outputs, fostering trust among healthcare practitioners.

[3] Using image processing techniques, Pawan Agrawal et al. describe a unique method for the automatic detection and counting of red blood cells (RBCs). The authors introduce the concept of content-based image indexing and retrieval, emphasizing the increasing volume of digital medical images and the need for effective utilization of this data. The suggested method's usage of Hough circle detection to raise RBC counting accuracy is a crucial component. In order to achieve more accurate results, the authors acknowledge that extra circles generated during the Hough Circle Detection procedure must be addressed.

Additionally, the paper discusses the pre-processing steps, including noise removal, to enhance the reliability of the system under various conditions such as staining techniques, microscope types, and illumination conditions. The authors also provide the idea of automating the automated blood cell identification procedure by mimicking the "look" and "identify" actions of a human expert. In order to detect blood cells based on fuzzy feature vectors, a neural network is trained by global pattern averaging. This allows the system to distinguish between irregularly shaped, differently sized, and colored blood cells. The efficiency of the suggested approach is shown by the paper's results, which show that the system can extract and count red blood cells with a high degree of precision.

The authors also discuss the potential for further research, including the study of collapsed red blood cells to improve accuracy and the use of a multi-layer perceptron neural network for RBC counting applications. The potential benefits of using image processing techniques for automated blood cell counting include increased accuracy and efficiency in clinical laboratory testing, reduced human error, and faster turnaround times for patient diagnosis and treatment. Automated blood cell counting can also enable the analysis of a larger volume of blood samples, providing more comprehensive information about a patient's health status. Furthermore, different blood cell types, such as red blood cells, white blood cells, and platelets, can be identified and analyzed using image processing techniques, which can help with the identification of a variety of illnesses and ailments.

The proposed method using Hough circle detection improves the accuracy of red blood cell (RBC) counting by effectively identifying and extracting RBCs from digital images of blood samples. Hough circle detection is a feature extraction technique used in image analysis and computer vision, and it is particularly well-suited for detecting circular objects, such as RBCs, within an image. By applying the Hough circle detection method, the proposed approach can accurately locate and delineate the boundaries of RBCs, even in the presence of overlapping cells or irregular shapes. This enables the system to differentiate RBCs from other blood cell types and background elements, leading to more precise counting results. The future of laboratory testing and diagnosis in medicine will be greatly impacted by the research being done on the automated detection and counting of red blood cells utilizing image processing techniques. A few of the most significant ramifications have the potential to revolutionize the field of medical laboratory testing and diagnosis, with advantages in terms of productivity, precision, and technical innovation.

[4] Keyvan Jaferzadeh et. al explores the classification of erythrocytes, with a focus on blood disorders. Using a neural network classifier, it presents a set of three-dimensional (3-D) morphological aspects that are associated with the morphological and chemical characteristics of red blood cells (RBCs) and assesses how well they can discriminate against traditional two-dimensional (2-D) features. Erythrocyte surface area, volume, average cell thickness, sphericity index, sphericity coefficient, functionality factor, MCH, MCHSD, and two recently added properties taken from the single-cell level of the RBC's ring section are among the 3-D features. In order to increase RBC classification accuracy, the study suggests a feature set that is assessed using a neural network classification technique. It also shows that 3-D features can be more helpful in RBC classification than 2-D features.
A set of three-dimensional features pertaining to the morphological and chemical characteristics of red blood cells (RBCs) is presented in this work. Among these characteristics are the following:1. Area of Erythrocyte Surface 2. Amount 3. Mean Cell Density 4. Index of Sphericity 5. Coefficient of Sphericity 6. Factor of Function 7. Hemoglobin Mean Corpuscular (MCH) 8. Standard Deviation of Mean Corpuscular Hemoglobin (MCHSD). At the single-cell level, two recently added characteristics were taken from the ring region of the RBC. Using a numerical reconstruction approach, these features are extracted from pictures that were observed using off-axis digital holographic microscopy. In the categorization of red blood cells (RBCs), they are intended to yield superior discrimination outcomes over traditional two-dimensional (2-D) features.
The study "Human red blood cell recognition enhancement with three-dimensional morphological features obtained by digital holographic imaging" assessed the discriminating ability of the 3-D features against 2-D features using a neural network classifier. They contrasted traditional 2-D features with a set of 3-D features pertaining to the morphological and chemical characteristics of the red blood cell (RBC) profile. The three-dimensional features were mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin standard deviation (MCHSD), functionality factor, erythrocyte surface area, volume, average cell thickness, sphericity index, sphericity coefficient, and two newly added features that were taken from the ring section of RBC at the single-cell level. RBC projected surface area, perimeter, radius, elongation, and projected surface area to perimeter ratio, on the other hand, were the 2-D properties. A neural network classifier was used to evaluate the discrimination capability of these features, and a sequential forward feature selection technique was employed to pick the optimal feature set, leading to an increase in the accuracy of RBC classification.

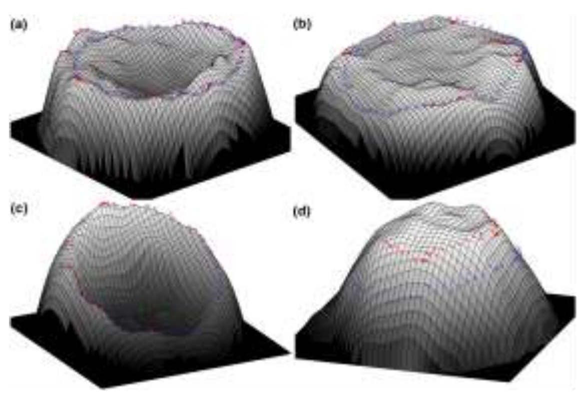

Fig 1: Four RBC categories and points are shown in three dimensions on the ring part. (a) A standard biconcave sample; (b) a raised flat disc; (c) an RBC from a stomatocyte; and (d) an RBC from a spherocyte.

1. The location of the thickest point in a 3 x 3 neighbourhood surrounding the approximated ring (referred to as RPs) is one of the two newly recovered characteristics from the ring section of RBC at the single-cell level presented in the study. 2. The RBC center for the sphericity coefficient computation.

[5] A unique method for digitally analyzing blood smear images taken with a compound microscope to measure the number of red blood cells (RBC) and white blood cells (WBC) is presented by DyaneshVarun D et al. They have demonstrated the biomedical engineering field's potential for Digital Image Processing (DIP). The importance of DIP in the medical field and its use in the analysis of digital images of blood cells are first highlighted in the paper. In order to precisely count RBCs and WBCs from blood smear microscopic pictures, the authors present the Automated Blood Cell Count System (ABCCS). For the RBC count, the approach includes plane extraction, edge detection, morphological filling, and the Circular Hough transform; boundary detection determines the WBC count.

In order to test the ABCCS method for counting blood cells, real-time blood sample collection from about sixty-three participants was conducted. Each participant gave a drop of blood, which was then placed in one corner of a glass slide that had been ethanol-washed. After that, another spotless glass slide was used to disseminate it. The blood cells were stained with Leishman's stain after they had dried. After drying, the slide was washed to get rid of any leftover discoloration using double distilled water. After being oil-immersed in cedar wood oil, the stained blood cells were examined under a compound microscope at a 100x magnification. A digital camera was used to take pictures of the blood cells that had been submerged in oil. Figure 2 shows an example image.

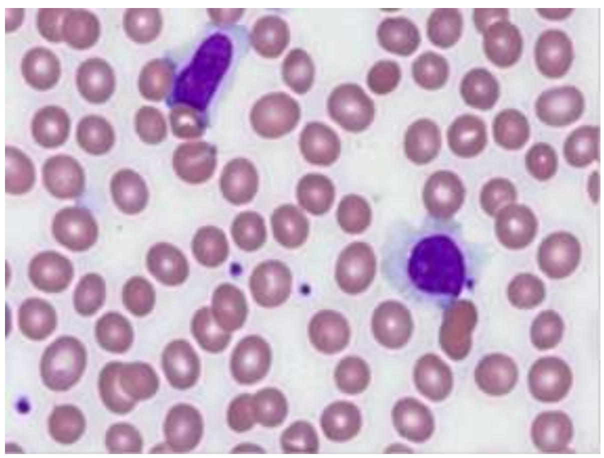

Fig. 2: Sample Blood Smeared Image obtained after staining under a 100x microscope

The two basic DIP operations—Edge Detection and Morphological Filling—are carried out in order to identify the required plane objects in the picture. Figure 3 shows an example image following the application of the two DIP techniques mentioned above.

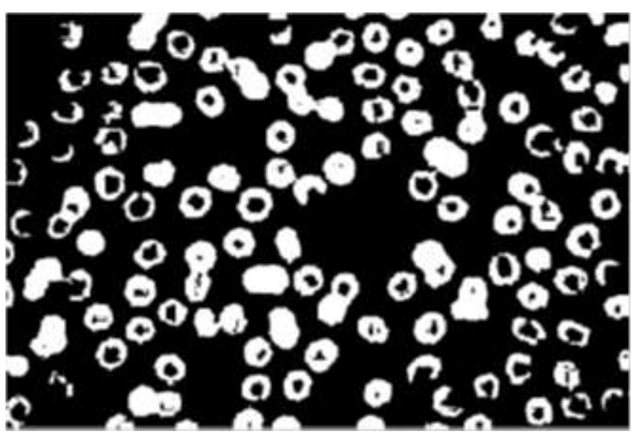

Fig 3: Image after Morphological filling operation

WBC and RBC are counted using two distinct techniques. Because RBCs are circular, the Circular Hough Transform can be used to identify and count them. The RBC counting procedure is depicted in Figure 4 following the application of the Circular Hough Transform.

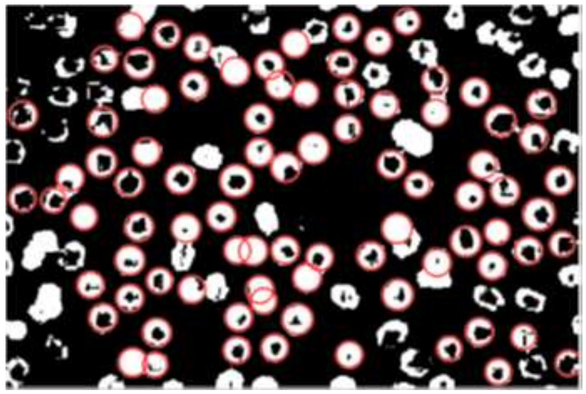

Figure 4: Image following the RBC Circular Hough Transform Operation

WBC lacks structure, hence the Circular Hough transform cannot be applied. Consequently, every object in the retrieved blue plane image has its boundary recognized, and this is how the objects are tallied. The boundary-detected blue plane extracted image, which is a step in the WBC counting procedure, is displayed in Figure 5.

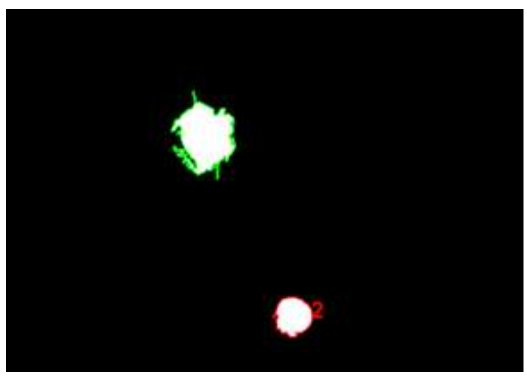

Fig 5: Image after Boundary Detection for RBC

The results of the experiment demonstrate an impressive accuracy of 91% for RBC and 85% for WBC when compared to lab reports, indicating the effectiveness of the proposed method. The study addresses the limitations of manual blood cell counting methods, such as time consumption, laboriousness, and inconsistency in visual inspection. It also discusses the drawbacks of automated analysers, emphasizing the need for a more efficient and cost-effective solution, which the ABCCS aims to provide. The paper also provides a comprehensive review of related work, highlighting the significance of morphological iterative threshold techniques in blood cell segmentation.

[6] Syadia Nabilah Mohd Safuan et. al provides a comprehensive analysis of different segmentation methods for white blood cell counting in blood smear images. The authors highlight the importance of accurate white blood cell counting for medical diagnostics and treatment, and the limitations of traditional manual counting methods. The paper presents a detailed analysis of various colour segmentation methods, including thresholding, colour space analysis, and Hough transform. The authors compare the performance of these methods in terms of accuracy, specificity, and sensitivity, and provide quantitative results to support their findings. They also discuss the potential implications of their research for the development of cost-effective computer-aided systems for white blood cell counting. Overall, the paper provides valuable insights into the challenges and opportunities associated with white blood cell counting analysis in blood smear images.

Several segmentation techniques for the analysis of white blood cell counts in blood smear pictures are covered in this publication. These tactics include saliency-based, active-contour, threshold-based, learning-based, met heuristic-based, and

met heuristic-based techniques. The paper focuses on threshold-based methods, which are considered the best for uniform types of images like blood images. The authors also discuss the use of colour space analysis, including RGB, CMYK, and HSV, to segment the white blood cell region from the background. They compare the performance of different colour space components and combinations of components in terms of accuracy and provide quantitative results to support their findings.
Colour segmentation enables the localization and extraction of white blood cell (WBC) regions from complex blood smear images. The paper discusses the use of colour segmentation methods, such as thresholding and colour space analysis, to differentiate WBC regions from other blood components, such as red blood cells and background elements. By leveraging color intensity and spatial distribution within different color spaces (e.g., RGB, CMYK, and HSV), these methods aid in distinguishing the nucleus and cytoplasm of WBCs, which is essential for accurate counting and identification. Furthermore, the paper highlights the significance of colour segmentation in addressing the challenges posed by the morphological variability of WBCs. The distinct colour characteristics of the nucleus and cytoplasm, as well as their differences in colour intensity, are utilized to facilitate the segmentation process. This allows for the isolation of WBCs from surrounding elements, ultimately contributing to the accurate quantification of WBCs in blood smear images. Overall, colour segmentation methods play a pivotal role in WBC counting analysis by providing the means to effectively segment, extract, and differentiate WBC regions from complex backgrounds, thereby facilitating accurate and efficient WBC counting and analysis.
By developing and evaluating various colour segmentation methods for white blood cell counting analysis, the research contributes to the advancement of computer-aided systems that can enhance the accuracy and efficiency of WBC analysis in clinical settings. The potential implications of these findings include: 1. Improved Diagnostic Accuracy: Accurate white blood cell counting is essential for diagnosing various medical conditions, including infections, inflammatory diseases, and immune system disorders. The research findings can lead to the development of more reliable and automated WBC counting systems, thereby improving the accuracy of diagnostic assessments based on blood smear analysis. 2. Enhanced Efficiency: The implementation of effective colour segmentation methods can streamline the process of WBC counting, reducing the reliance on manual counting methods and potentially accelerating the turnaround time for diagnostic results. This efficiency can contribute to more timely medical interventions and treatment decisions. 3. Cost-Effective Solutions: The development of cost-effective computer-aided systems for WBC analysis can offer practical and economical solutions for healthcare facilities, particularly in resource-constrained settings. By automating and optimizing WBC counting processes, the research findings may contribute to cost savings and improved accessibility to accurate diagnostic tools. 4. Research and Development Opportunities: The insights gained from the evaluation of colour segmentation methods can inspire further research and development in the field of medical imaging and analysis. This may lead to the refinement of advanced image processing techniques and the integration of artificial intelligence for WBC analysis, paving the way for innovative diagnostic technologies.
[7] Guillaume F.G. Garnier et. al stands as a ground breaking in the realm of hematology. As a simple yet powerful red blood cell identification software, IdentiCyte has set a new standard in efficiency, accuracy and user friendliness. One of the most commendable features of IdentiCyte is its intuitive interface, which makes it accessible to both seasoned professionals and those new to the field. The software simplifies the complex process of red blood cell identification, streamlining workflows and allowing for more time to be dedicated to analyse rather than the intricacies of software navigation. The accuracy of IdentiCyte is truly remarkable. Leveraging state-of-the-art algorithms and image processing techniques, this software demonstrate an exceptional ability to identify and classify red blood cells with precision. This not only enhances the speed of analysis but also significantly reduces the margin of error, a crucial aspect in the field of hematology. The seamless integration of IdentiCyte into existing laboratory system is another aspect that deserves praise. Its compatibility with various microscopic platforms ensures that laboratories can incorporate this software without major overhauls, seamlessly enhancing their capabilities. The ability to analyse large data sets efficiently is particularly valuable in high through-put environments, making IdentiCyte a versatile solution for laboratories of varying sizes. Guillaume F. G. Garnier’s IdentiCyte is not just a software; it is a testament to innovation in the medical science. Its impact on the field of hematology is undeniable, offering a transformative tool that empowers professionals to achieve new levels of accuracy and efficiency in red blood cell identification. As we continue to witness advancements in medical technology IdentiCyte stand out as a beacon of progress, promising a brighter future for the diagnosis and treatment of blood related disorders.
[8] Mohammad Mahmudul Alam et. al presents a novel method for the automatic identification and counting of blood cells in smear images using machine learning techniques. The authors suggest a novel method for the simultaneous detection of red blood cells (RBCs), white blood cells (WBCs), and platelets that makes use of the YOLO (You Only Look Once) algorithm. The research presents a viable alternative to the labor-intensive manual counting procedure and delivers insightful information about the use of machine learning in the field of medical picture analysis. The use of the YOLO algorithm for object detection and classification is a key highlight of the paper. The suggested method shows the capacity to precisely detect and count various blood cell types in smear images by utilizing this algorithm. To increase accuracy and get rid of multiple counting of the same object, the authors also use other techniques such intersection over union (IOU) based methods and K-nearest neighbors (KNN). This comprehensive approach contributes to the robustness and reliability of the proposed system. One of

the notable strengths of the proposed method is its ability to handle different neural network models in the YOLO back-end, allowing for flexibility and optimization based on the specific characteristics of different blood cell types. The authors also emphasize the generalizability of their approach by testing it on publicly available datasets, demonstrating its effectiveness in accurately identifying and counting blood cells, even those that are not labelled in the dataset.

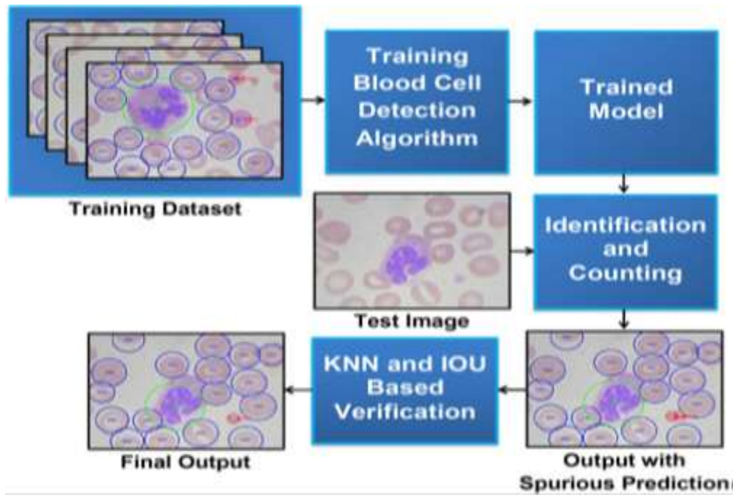

Figure 6: Automatic blood cell identification and counting system block diagram

In this paper, smear images are divided into sub-images for processing, and the output is then projected back onto the original image. Including visual aids like Fig. 6 improves comprehension of how well the suggested strategy works to distinguish between RBCs, WBCs, and platelets. In the work that is being presented, the automatic identification and counting of blood cells is made possible using the YOLO (You Only Look Once) object recognition and classification method. YOLO is used to concurrently identify and categorize several blood cell types from smear images, such as platelets, white blood cells, and red blood cells (RBCs). This approach offers several key contributions to the automatic identification and counting of blood cells: 1. Simultaneous Detection: YOLO enables the detection of multiple types of blood cells within a single evaluation, allowing for efficient and comprehensive identification of different cell types in the smear images. 2. Speed and Efficiency: The YOLO algorithm is known for its speed, as it processes the entire image in one evaluation, making it well-suited for real-time applications. This speed and efficiency are particularly valuable in the context of blood cell identification and counting, where rapid analysis is essential. 3. Flexibility and Adaptability: The authors mention that different neural network models with varying depths have been explored within the YOLO back-end, demonstrating the flexibility of the approach in adapting to the specific characteristics of different blood cell types. 4. Generalization: The trained YOLO model is tested on smear images from different datasets, showcasing its ability to generalize and perform satisfactorily across diverse image sets. This generalization is a critical aspect of the algorithm's contribution to the automatic identification and counting of blood cells. Overall, the YOLO algorithm's ability to efficiently detect and classify multiple types of blood cells in smear images contributes significantly to the automation of blood cell identification and counting processes, offering speed, accuracy, and adaptability to different datasets and cell types. Using a computer-aided system for blood cell detection and counting offers several advantages over traditional manual methods, as highlighted in the presented work: 1. Efficiency: The computer-aided system, particularly the YOLO-based approach, enables rapid and automated identification and counting of blood cells in smear images. This efficiency significantly reduces the time and labour required for manual counting, making the process more streamlined and scalable. 2. Accuracy: Machine learning-based approaches, such as the one proposed, can provide high levels of accuracy in identifying and counting blood cells. By leveraging advanced algorithms and neural network models, the system can achieve precise and reliable results, minimizing the potential for human error associated with manual counting methods. 3. Automation: The computer-aided system eliminates the need for manual intervention in the counting process, allowing for fully automated analysis of blood smear images. This automation not only saves time but also reduces the dependency on human expertise, making the process more consistent and reproducible. 4. Generalization: The trained model's ability to generalize across different datasets and accurately identify cells not labeled in the original dataset demonstrates the system's adaptability and robustness. This generalization is a key advantage over manual methods, which may be limited by human subjectivity and expertise. 5. Speed: The computer-aided system, particularly when utilizing the YOLO algorithm, offers rapid processing and real-time analysis of blood smear images. This speed is essential for applications requiring quick turnaround times, such as clinical diagnostics and research.

As the work presented shows, the trained model may be used to smear photos from various datasets. Using smear photos from a different dataset that contained better quality images than the original dataset used for training, the authors tested the trained model. The photos were split into grids to make sub-images in order to adjust to the new dataset. Each sub-image was then processed separately in the suggested pipeline. The test results demonstrated that the trained model could generalize and function well on the new dataset. As seen in figure 7, the model correctly recognized platelets, WBCs, and RBCs. It even counted several cells that the dataset did not classify.

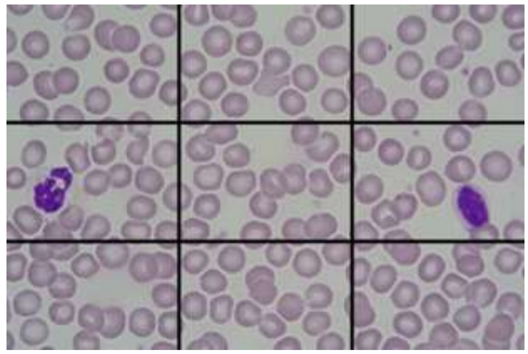

Fig 7(a)

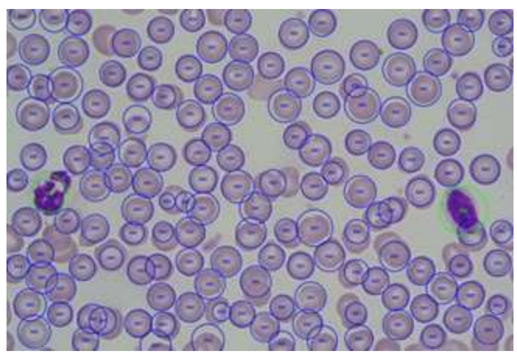

Fig 7(b)

Figure 7: Detection of blood cells in a picture from the dataset (a) picture split into three-by-three grids (b) Combined result

[9] Shin-Jye Lee et. al presents a significant contribution to the field of medical diagnostics by leveraging deep learning techniques for complete blood cell (CBC) detection and counting. The authors discuss the drawbacks of conventional techniques and suggest a brand-new deep learning architecture based on CNN to increase the precision and effectiveness of CBC counting. The three primary categories of CBC counting-related research—automated analysers, image processing-based techniques, and machine learning-based techniques—are thoroughly reviewed by the writers. They highlight how machine learning-based techniques, in especially deep learning, can be used to identify traits that are counterintuitive but nevertheless beneficial for better CBC counting.

A CNN-based model, namely VGG-16, is included into the suggested architecture for the purpose of feature extraction and basic feature map development. The model's capacity to speculate on the locations of blood cells is improved by the incorporation of the Region Proposal Network (RPN) from Faster R-CNN. Blood cell detection and classification are accomplished with consideration and thoroughness thanks to the application of the RoI (Region of Interest) pooling layer, which further refines the feature vectors. The given experimental results offer important new information on how well the suggested models work. A quantitative assessment of the model's performance in identifying and categorizing red blood cells, white blood cells, and platelets is provided by the evaluation metrics, which include precision, recall, and F1-score. The comparison of different models under varying conditions adds depth to the analysis and underscores the robustness of the proposed deep learning architecture.

For improved CBC counting, deep learning algorithms can extract non-intuitive but valuable features. CNNs, in particular, are particularly good at learning and extracting features. Furthermore, deep learning models are frequently used in large data information processing and are simple to integrate into information systems.Computer-aided object detection using deep learning algorithms represents a significant advancement over traditional methods, offering improved accuracy, efficiency, automation, adaptability, and integration. The research on complete blood cell detection and counting using deep neural networks has several potential implications for the field of medical diagnostics and patient care: 1. Improved accuracy: Deep learning algorithms can improve the accuracy of CBC counting, leading to more reliable diagnoses and better patient care. 2. Efficiency: By reducing the time and manpower required for CBC counting, deep learning algorithms can improve the efficiency of medical diagnostics and reduce costs. 3. Automation: Deep learning algorithms can automate the process of CBC counting, reducing the reliance on manual manipulation and the limitations of traditional automated analysers. 4. Early detection: Improved accuracy and efficiency in CBC counting can lead to earlier detection of diseases and conditions, allowing for earlier intervention and better patient outcomes. 5. Personalized medicine: By providing more accurate and efficient CBC counting, deep learning algorithms can enable more personalized and targeted medical treatments.

[10] Blood cell counting is a crucial component of clinical diagnostics and a vital measuring tool for evaluating an individual's general health, according to Francesca Isabelle F et al.

Traditionally this process involved manual counting using hemocytometer a method notorious for being time consuming and prone to errors. Recognizing the need of errors for a more efficient and accurate solution, recent advancement in machine learning have paved the way for automated counting tasks. The fifth iteration of the "You Only Look Once" (YOLOv5) object identification technique was used in this groundbreaking study to automatically identify and count white blood cells (WBCs) in images of pig blood smears. YOLOv5 stood out among other methodologies due to its exceptional combination of speed and accuracy. The choice of YOLOv5 was strategic, emphasizing the significance of both swiftness and precision in clinical setting. Speed is crucial for timely diagnoses, while accuracy is paramount for reliable results. The data set used in this study was meticulously curated to cater specifically to the WBC counting task, ensuring that the model was trained on a diverse and representative set of images. The experimental results of this study present a compelling case for the efficiency of YOLOv5 in automating WBC detection and counting. The system exhibited the remarkable speed and efficiency, achieving an impressive accuracy rate of 89.25%. Furthermore the mean average precision at 0.5 intersection over union threshold (mAP 0.5) reached an outstanding level of 99%. These findings underscore the potential of YOLOv5 as a transformative tool in clinical diagnostics, offering a swift and reliable solution to an essential aspect of healthcare. The integration of machine learning-based approaches in blood cell counting not only expedites the diagnostic process but also minimizes the likelihood of human error, thereby enhancing the overall accuracy and reliability of clinical assessments. As we embrace the future of medical technology, studies like these pave the way for innovative solutions that can redefine the landscapes of healthcare diagnostics.

III. CONCLUSION

1. With a consistent, task-focused interface, Scikit-learn provides a wide variety of machine learning techniques, both supervised and unsupervised. This makes it simple to compare approaches within a given application. The algorithms' high-level language implementation makes it possible to use them as the cornerstone of use case-specific strategies, such those used in medical imaging.
2. In the field of medical image processing, Tomari's research work on a computer-aided method for red blood cell classification offers significant advances. The paper's scientific rigor is demonstrated by the integration of cutting-edge approaches and the extensive experimental evaluation.
3. The use of Hough circle detection in the proposed method enhances the precision and reliability of RBC counting by effectively identifying and isolating RBCs within digital images, ultimately improving the accuracy of blood cell analysis in clinical laboratory settings.
4. This work describes and assesses the use of PRNN to count and categorize biconcave, stomatocyte, flat-disc, and echinostomatocyte red blood cells in a multi-type sample using the 2-D and 3-D features of the RBCs acquired using DHM. Their tests show that more useful information for RBC categorization is contained in the 3-D characteristics.
5. The paper effectively demonstrates the potential of DIP in revolutionizing traditional blood cell counting methods and provides a strong foundation for future research in area of biomedical engineering.
6. The research findings on white blood cell segmentation have the potential to impact medical diagnostics and treatment by enhancing diagnostic accuracy, improving efficiency, offering cost-effective solutions, and stimulating further advancements in the field of medical imaging and analysis.
7. With IdentiCyte, they offer a straightforward interface for identifying the shape and focuses on user-friendliness enables the advantages of automated cell recognition without requiring extensive time to learn the specifics and functions of specialized software to operate a dedicated machine.
8. The paper offers a well-structured and insightful exploration of the proposed method. The advantages of using a computer-aided system for blood cell detection and counting, as demonstrated in the presented work, include improved efficiency, accuracy, automation, generalization, and speed compared to traditional manual methods.
9. In conclusion paper presents a compelling case for the adoption of deep learning techniques in the field of medical diagnostics. The proposed architecture and experimental results showcase the potential of CNN-based models to revolutionize

CBC counting, offering improved accuracy and efficiency and automation of medical diagnostics, leading to better patient care and outcomes.

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MASTER OF BUSINESS ADMINISTRATION

Performance Analysis of IPO's issued during third quarter of FY 2023-24

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Abstract: Capital market is a market where buyers and sellers engage in trade of financial securities like bonds, stocks, etc. The buying/selling is undertaken by participants such as individuals and institutions. Capital markets help channelize surplus funds from savers to institutions which then invest them into productive use. Generally, this market trades mostly in long term securities. Capital market consists of primary markets and secondary markets. Primary Market or an initial public offering (IPO) refers to the process of offering shares of a private corporation to the public in a new stock issuance for the first time. An IPO allows a company to raise equity capital from public investors. 100's of privately held companies use Initial Public Offer (IPO) every year to raise fund and get listed at stock exchanges (BSE and NSE).
The transition from a private to a public company can be an important time for private investors to fully realize gains from their investment as it typically includes a share premium for current private investors. Meanwhile, it also allows public investors to participate in the offering. The total amount raised during third quarter of financial year 2023-24 was Rs. 26425.83 crores by 28 IPO's to meet their different strategies.

Keywords: Capital Market, Primary Market, IPO

I Introduction:

IPO or Initial Public Offer is a way for a company to raise money from investors for its future projects and get listed to Stock Exchange. Or An Initial Public Offer (IPO) is the selling of securities to the public in the primary stock market.
From an investor point of view, IPO gives a chance to buy shares of a company, directly from the company at the price of their choice (In book build IPO's). Many a times there is a big difference between the price at which companies decides for its shares and the price on which investor are willing to buy share and that gives a good listing gain for shares allocated to the investor in IPO.
From a company prospective, IPO help them to identify their real value which is decided by millions of investor once their shares are listed in stock exchanges. IPO's also provide funds for their future growth or for paying their previous borrowings.

There are several benefits for being a public company, namely:

- Supporting and diversifying equity base
- Enabling cheaper access to capital
- Exposure, prestige and public image
- Attracting and retaining better management and employees through liquid equity participation
- Facilitating acquisitions
- Creating multiple financing opportunities: equity, convertible debt, cheaper bank loans etc.
- Increased liquidity for the equity holder

Total 28 Mainline IPO's were issued during the third quarter of financial year 2023-24. The total amount raised during same was Rs. 26425.83 crores. The present study focuses on the performance analysis of IPO's issued during the third quarter of Financial year 2023-24.

II Objectives of the Study:

1. To understand the procedure of IPO.
2. To know the key role of different participants in IPO procedure.
3. To know the IPO's issued during third quarter of financial year 2023-24
4. To know the total amount raised by companies during third quarter year of financial year 2023-24.
5. To evaluate the performance of IPO's issued during third quarter of financial year 2023- 24

III Scope and limitations:

1. The study covers IPO issued only during third quarter of Financial year 2023-24
2. The study covers only Mainboard IPO.
3. The study is based on secondary data collected from different sources. Any error in same will be part thereof.

IV Steps involved in IPO Procedure

Step 1: Hire an investment bank
Step 2: Register with SEC
Step 3: Draft the Red Herring document
Step 4: Go on road show
Step 5: IPO is priced
Step 6: Available to public
Step 7: Going through with the IPO

V Intermediaries of IPO Issue:

1. **Merchant Bankers:** Merchant Banker is entity who is engaged in the business of issue management either by making arrangements regarding selling, buying or subscribing to securities or acting as manager, consultant, adviser or rendering corporate advisory service in relation to such issue management.

2. **Registrars and Transfer Agents:** Registrars to an issue are entities, who on behalf of anybody corporate collect applications from investors in respect of an issue, keep proper record of applications and monies received from investors and assists body corporate to determine basis of allotment, process and dispatch allotment letters, refund orders or certificates in respect of an issue.

3. **Syndicate members:** Syndicate members procure bids for an IPO from institutional and retail investors. Brokers registered with SEBI work as syndicate members for an IPO.

4. **Underwriters:** Underwriters agree to subscribe to the securities that are not subscribed to by the public or shareholders in cases of issue of securities. In exchange for this undertaking, they are paid a commission. They can be merchant bankers or stock brokers or other registered underwriters under the SEBI guidelines

5. **Bankers to an issue:** Bankers collect application forms along with application moneys. They then deliver the application forms to the registrar with detailed schedules providing provisional and final certificates as per the schedule agreed. They also ensure refund of money in case of fully or partly rejected applications. They also assist in post issue reconciliation.

Table No. 1 Table showing List of companies and amount of money raised through IPO’s

Sr. No.	**Company Name**	**Amount raised (Rs. in Cr.)**
1	Innova Captab Limited	570
2	Azad Engineering Limited	740
3	RBZ Jewellers Limited	100
4	Happy Forgings Limited	1008.59

Sr. No.	Company Name	Amount raised (Rs. in Cr.)
5	Credo Brands Marketing Limited	549.78
6	Suraj Estate Developers Limited	400
7	Motisons Jewellers Limited	151.09
8	Muthoot Microfin Limited	960
9	Inox India Limited	1459.32
10	DOMS Industries Limited	1200
12	Flair Writing Industries Limited	593
13	Fedbank Financial Services Limited	1092.26
14	Gandhar Oil Refinery (India) Limited	500.69
15	Tata Technologies Limited	3042.51
16	Indian Renewable Energy Development Agency Ltd	2150.21
17	ASK Automotive Limited	834
18	Protean eGov Technologies Limited	490.33
19	ESAF Small Finance Bank Limited	463
20	Honasa Consumer Limited	1701.44
21	Cello World Limited	1900
22	Blue Jet Healthcare Limited	840.27
23	IRM Energy Limited	545.40
24	Plaza Wires Limited	71.28
25	Valiant Laboratories Limited	152.46
26	Updater Services Limited	640
27	Manoj Vaibhav Gems 'N' Jewellers Limited	270.20
28	JSW Infrastructure Limited	2,800
	Total	**26425.83**

Table No. 2 Table showing List of companies and Performance evaluation of IPO's

Sr. No.	Company Name	Listed On	Issue Price	Listing Day Close	Listing Day Gain	Current Price 18th January 2024	Profit/Loss
1	Innova Captab Limited	Dec 29, 2023	448	545.15	21.69%	518.85	15.81%
2	Azad Engineering Limited	Dec 28, 2023	524	677.1	29.22%	665.35	26.98%
3	RBZ Jewellers Limited	Dec 27, 2023	100	104.99	4.99%	215.15	115.15%
4	Happy Forgings Limited	Dec 27, 2023	850	1029.8	21.15%	963	13.29%
5	Credo Brands Marketing Limited	Dec 27, 2023	280	312.5	11.61%	267.9	-4.32%
6	Suraj Estate Developers Limited	Dec 26, 2023	360	334.3	-7.14%	342.55	-4.85%
7	Motisons Jewellers Limited	Dec 26, 2023	5.5	101.18	83.96%	222.24	304.07%
8	Muthoot Microfin Limited	Dec 26, 2023	291	266.2	-8.52%	230.25	-20.88%
9	Inox India Limited	Dec 21, 2023	660	939.9	42.41%	852.75	29.2%
10	DOMS Industries Limited	Dec 20, 2023	790	1330.85	68.46%	1426.65	80.59%
11	India Shelter Finance Corporation Limited	Dec 20, 2023	493	543.5	10.24%	580.45	17.74%
12	Flair Writing Industries Limited	Dec 1, 2023	304	452.7	48.91%	335.3	10.3%
15	Tata Technologies Limited	Nov 30, 2023	500	1314.25	162.85%	1150.15	130.03%
16	Indian Renewable Energy Development Agency Ltd	Nov 29, 2023	32	59.99	87.47%	123.1	284.69%

Sr. No.	Company Name	Listed On	Issue Price	Listing Day Close	Listing Day Gain	Current Price 18th January 2024	Profit/Loss
17	ASK Automotive Limited	Nov 15, 2023	282	310.2	10%	292.75	3.81%
18	Protean eGov Technologies Limited	Nov 13, 2023	792	883	11.49%	1286.85	62.48%
19	ESAF Small Finance Bank Limited	Nov 10, 2023	60	69.05	15.08%	69.28	15.47%
20	Honasa Consumer Limited	Nov 7, 2023	324	337.15	4.06%	468.1	44.48%
21	Cello World Limited	Nov 6, 2023	648	791.9	22.21%	869	34.1%
22	Blue Jet Healthcare Limited	Nov 1, 2023	346	395.85	14.41%	369.3	6.73%
23	IRM Energy Limited	Oct 26, 2023	505	472.95	-6.35%	535.4	6.02%
24	Plaza Wires Limited	Oct 12, 2023	54	80.23	48.57%	110.55	104.72%
25	Valiant Laboratories Limited	Oct 6, 2023	140	169.05	20.75%	187.15	33.68%
26	Updater Services Limited	Oct 4, 2023	300	283.85	-5.38%	336.5	12.17%
27	Manoj Vaibhav Gems 'N' Jewellers Limited	Oct 3, 2023	215	215.65	0.3%	320.8	49.21%
28	JSW Infrastructure Limited	Oct 3, 2023	119	157.3	32.18%	209.85	76.34%

(Source: chittorgarh.com)

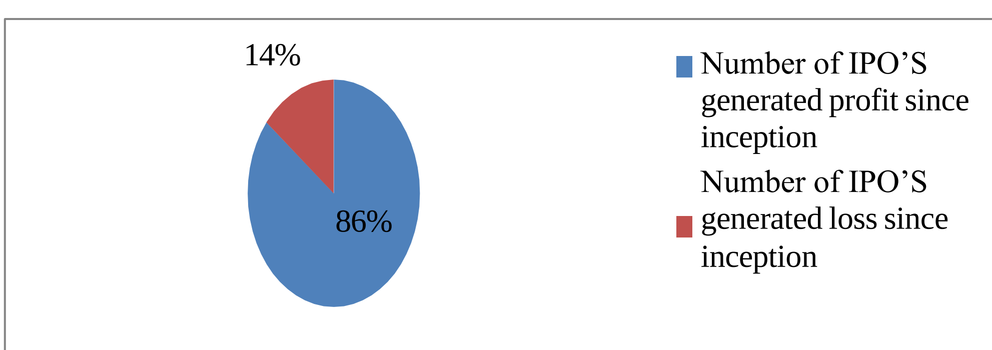

Fig.1: Figure showing performance of IPO since inception

VI Conclusion:

IPOs are issued by smaller, younger companies seeking capital to expand, as well as by large privately owned companies looking to expand & become publicly traded. When a company lists its securities on a public exchange, the money paid by investors for the newly-issued shares goes directly to the company (in contrast to a later trade of shares on the exchange, where the money passes between investors). The above study shows 86% IPO's issued generated profit since their inception. Total Rs. 26425.83 crores were raised during the third quarter of financial year 2023- 24 which is huge amount for companies to meet their strategic requirement. Out of 28 IPO's Only 4 companies IPO gave negative result on listing day. Also 5 companies have given more than 100% profit since their listing on stock exchange.

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A STUDY ON IDENTIFYING FACTORS AFFECTING PRE-PURCHASE CUSTOMER DISSATISFACTIONN WITH RESPECT TOMOZE PROPERTIES

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Abstract: The real estate sector is mostly driven by cities in developing countries. People from small villages and towns are moving to cities to improve their health. The increase in business around the big city has led to the expansion of the city. In addition, the governments of many countries, including the United States and Australia, provide long term loans at low interest rates and special loa ns to first time home buyers. Additionally, the governments of many countries, including Poland, the United States, and Canada, run programs such as golden visas and affordable housing programs to encourage home buyers. India has become an important business centre, especially in the field of services. Its good population and strong economic growth make the country an attractive destination for real estate investors because real estate demand is determined bythe economy, business development and population trends.

In addition, what prevents customers from purchasing from Moze Properties is the customers' preferences when purchasing products, features, or products and services that they consider when purchasing. This effort involved the collaboration of non-purchasers of Moser Properties.

Key words:

- Consumer behavior
- Pre-purchase
- Dissatisfaction
- Real estate
- Housing market
- Property buyers
- Customer experience
- Purchase decision
- Buyer's remorse
- Real estate developers
- Construction quality
- Customer satisfaction
- Market research
- Property investment
- Customer complaint

I Objectives

1. Before purchasing, check out the features of Moze devices that customers are unhappy with.
2. Identify factors affecting buyer behaviour
3. Examining consumers' real estate purchasing behavior
4. Evaluating the impact of online reviews an d word-of- mouth marketing on customer perceptions of Moser Hotels

II Brief Review of Literature

The purpose of the literature review is to clarify research questions, expand basic research. Develop knowledge in this research area and create a screening model of the research problem. Many authors have devoted their efforts to examining home buyer behaviour from their own perspectives. This review is based on historical research and literature on homeowners' decision making processes in the real estate industry. While more research has been done abroad and numerous reviews have been published in foreign journals and books, very little research has been done in India, especially in Andhra Pradesh.

This day is divided into two parts. Chapter 1 presents the results of previous research conducted on various topics and situations in the real estate sector in India and abroad. In the second section, the results of behavioral research in the real estate sector are presented and research based on behavioral finance theory is introduced. The first part covers the general factors that affect people's decision to purchase real estate, and the second part covers behaviours. The re view included research conducted in various areas of the real estate industry. Below are excerpts from various articles, documents, discussion papers and books published by different authors in this research?

III References

1. Deepak Murlidhar Sundrani (2018): Aims to identify the factors affecting the purchasing decision of various houses/apartments in Pune, India. The survey was conducted on the outskirt s of Pune city and a total of 284 respondents participated in the survey. The research reached out to recent buyers of 1 BHK, 2 BHK and 3 B HK houses and considered ten factors to examine that are most important in each home category. The analysis shows that for a 1 BHK home buyer the most important factor is price, for a 2 BHK home buyer it is of no particular importance and for a 3 BHK home buyer the most important factor is product and location. This study shows that new buyers of different types of housing differ in the importance of various factors. The study also concluded that home buying education is beneficial for participants in the real estate industry.

2. S.Khaviy, S.Manoj, V. Saathiyapriya (2018): An attempt to determine the impact of customer satisfaction in residential construction. Customer satisfaction is an important aspect in business development and i s one of the measures of business performance. Er. Kandswamy's customer base was selected f or the survey and qualitative analysis was used to analyse the association between significant determinants of consumers purchase behaviour. A total of 112 consumers were participated in the survey and convenient sampling method was used to select respondents for this study. In this work data analysis was done by using like percentage analysis, Factor analysis and cluster analysis. Concluding point is the purchase decisions are significantly influenced by income, social communal, personal Communal factors.

IV Data interpretation :

1) Have you considered construction technology used by Mauze properties before making purchase decision?

Table No:1 Mauze properties before making purchase decision

Particular Rs	No. of Respondents	Percentage
Yes	33	58.92%
No	23	41.08%
Total	56	100%

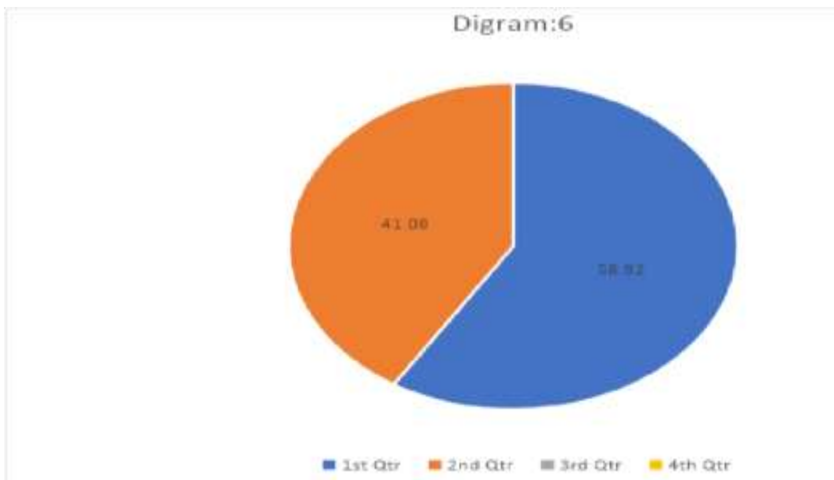

Fig No:1 Mauze properties before making purchase decision

Interpretation :

From the above Table No.1 and diagram No 1 it is found that there are 58.92% of respondents says that yes we have considered construction technology used by Mauze properties before making purchase decision and 41.08% of respondents says that no, we have not considered construction technology used by Mauze properties before making purchase decision.

3) How important is the proximity of amenities (such as schools, hospital shopping centers) when considering a property from Moze properties?

Table No: 2 Proximity of amenities

Particulars	No. of Respondents	Percentage
Very important.	26	46.42%
Important	14	25%
Neutral.	0	00%
Not important	16	28.58%
Total	56	100%

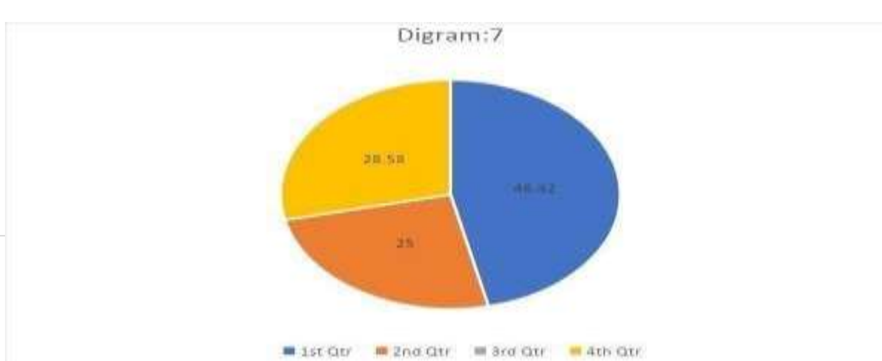

Fig No: 2 Proximity of amenities

Interpretation :

From the above Table No.2 and diagram No 2 it is found that there are 46.42% 0f respondents says that its very important proximity of amenities (such as schools, hospitals, shopping centers) when considering a property from Moze properties 28.58% of respondents says that its not important the proximity of amenities (such as schools, hospitals, shopping centers) when considering a property from Moze properties, 25% of respondents says that proximity of amenities (such as schools, hospitals, shopping centers) when considering a property from Moze properties is important . and 0 respondents are with neutral.

3). How important is the reputation and credibility of the real estate agency in your decision- making process?

Table No: 3 Reputation and Credibility of the real estate agency

Particulars	No. of Respondents	Percentage
Very important	27	48.21%
Important	15	26.78%
Neutral	06	10.71%
Not important	0	0%
N/A(already purchased	8	14.29%
Total	56	100%

Fig. No. 3: Reputation and Credibility of the real estate agency

Interpretation :

From the above Table No.3 and diagram No 3 it is found that there 48.21% of respondents says that the reputation and credibility of the real estate agency is very important in decision-making process. 26.78% of respondents says that yes the reputation and credibility of the real estate agency is important in decision-making process. 14.29% of respondents had already purchased a property. 10.71% of respondents says that we don’t give any importance to this that means they are neutral about this. And 0 of respondents says that No , the reputation and credibility of the real estate agency is not important in decision-making process.

4) What are the main reasons that have prevented you from purchasing a property from Moze?

Table No: 4 Reasons for preventing to purchase Moze property

Particulars	No. of Respondent s	Percentage
High prices	4	7.14%
Lack of desired features	18	32.14%
Poor customer service	9	16.07%
Reputation concerns	19	33.92%
Other	6	10.71%
Total	56	100%

Fig. No. 4 Reasons for preventing to purchase Moze property

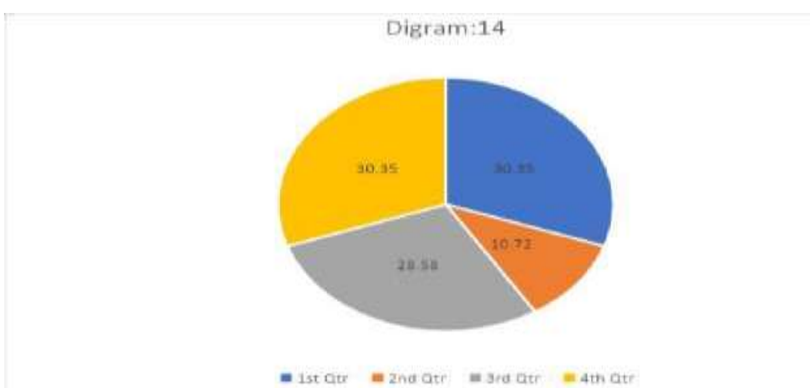

Fig. 4 Reasons for preventing to purchase Moze property

Interpretation:

From the above Table No.4 and diagram No 4 it is found that there are , 33.92% of respondents gave reputation concerns as the main reason thar have prevented them from purchasing a property from Moze properties, 32.14% of respondents gave, lack of desired features as the main reason thar have prevented them from purchasing a property from Moze properties,16.07% of respondents gave poor customer service as the main reason thar have prevented them from purchasing a property from Moze properties and 10.71% of respondents specified their own reasons which prevented them from purchasing a property from Moze properties. lack of desired amenities as the main reason thar have prevented them from purchasing a property from Moze properties 7.14% of respondents gave high prices as the main reason thar have prevented them from purchasing a property from Moze properties

V Conclusion:-

The conclusion from this study is that there is a desire among consumers to explore various features. Moze Properties needs to continue to offer buyers a variety of properties to meet their needs. Additionally, consumers rely on reputation and reliability when making purchasing decisions. Therefore, Mo Properties must first provide quality construction, complete the project on time, provide good customer service and transparent business to build trust and confidence with its customers.

Location is also important and hence it will be beneficial to build properties in prime locations in Pune. Additionally, hiring a real estate agent and targeting digital marketing will help you attract buyers. Overall, by using these strategies, Moze Properties can improve its business and meet the needs of its customers. Through their research, researchers found many surprising things when evaluating the properties of Moser Properties.

These factors include the lack of state-of-theart equipment such as modern equipment or new features, which may affect the overall legacy. Additionally, the real estate contract's lack of specificity will make it less at tractive to buyers looking for attractive pro motions or discounts. Additionally, reputation issues play an important role in consumers' decision making. When choosing a device, buyers often consider the reputation of the develop er or company behind the device. Any negative thoughts or doubts regarding Moze Properties' reputation will deter customers from purchasing. Another complaint is the average customer. Customers want excellent service throughout the entire purchasing process, from inquiries to aftersales support. If the level of customer service provided by Moze.Properties does not meet expectations, this may result in dissatisfaction and reluctance to proceed with the purchase. Additionally, the location of the property is also important for buyers. If t he property is not in a desirable or convenient area, it can be a major hurdle for buyer s, even if

there are other interests.

To solve these complaints, Moze Properties should focus on the development of all it s customers. This can be done by improving the quality of its products, providing attractive services and incentives, working to manage and improve its reputation, and providing good service to every customer. Additionally, choosing the right location for your project can affect the needs and requirements of your property. Thanks to these measures, Moser Real Estate can overcome these complaints and create an attractive and satisfying real estate for customers. Th is will help you attract more buyers and create a good reputation in the industry.

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Financial awareness survey among the students at Pandharpur's rural region'

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Abstract: This research paper addresses the critical domain of financial awareness among students in Pandharpur Tehsil, seeking to evaluate their comprehension, knowledge, and practices related to financial matters. Financial awareness serves as a fundamental life skill that empowers individuals to make well-informed and responsible financial decisions, thereby influencing their economic well-being.
The study employs a mixed-methods approach, combining surveys and interviews to gather comprehensive data on the financial literacy levels of students. A structured questionnaire is distributed among a diverse sample of students, encompassing fixed age groups and educational backgrounds. Additionally, in-depth interviews with selected participants provide qualitative insights into their attitudes, perceptions, and experiences concerning financial matters.

Study aims to champion financial inclusion and equip students with the skills to confidently navigate the complex financial terrain. By suggesting the incorporation of financial literacy education into the academic curriculum, the research envisions cultivating a generation well- versed in financial matters, capable of making informed decisions and ensuring a more resilient economic future.

Key words: Financial literacy, financial Instruments, financial knowledge, financial awareness

I Introduction

Exploring financial literacy among students in the rural confines of Pandharpur represents a crucial initiative to grasp the details of 'Financial Independence.' Financial literacy, compressing knowledge, skills, and attitudes pertinent to financial matters, assumes a critical role in molding individuals' capacity to make well- informed and responsible decisions regarding their finances. Within the demographic of students in the rural expanse of Pandharpur, deciphering their level of financial literacy gains importance in the broader quest to nurture economic empowerment and self-reliance. This study endeavors to delve into the specific dynamics of financial literacy among students in this locale, concentrating on how it contributes to achieving financial independence. By illuminating these facets, the research seeks to furnish valuable insights that can guide targeted interventions and educational strategies, fostering an enhancement of financial literacy and the encouragement of financial independence among students in the Pandharpur rural region.

II Objective

1. To know about n financial awareness.
2. To know the awareness about various avenues of finance.
3. To know the awareness about the various financial institutes.
4. To study financial knowledge.

III Research Methodology

Sampling: Simple random sampling along with a standard questionnaire was used to collect the data. The target population included people belonging to the age group of 06 - 20 years.
Tools The questionnaire consisted of a confidentiality note, a disclaimer that the survey was meant for only those belonging to the age group of 18 - 30 years and residing in Pandharpur and a subject matter section. The subject section consisted of generic multiple choice, checkbox and situation specific scale development questions pertaining to the topic of study.

IV Data Collection:

Primary data collection through a Pilot study and conducted with 50 responses to test the credibility of the uestionnaire.

V Data Analysis

Table No. 1Reasons for save money?

Option	Response	Percentage
To achieve long-term financial goals	23	46
To spend all your money quickly	17	34
To show off to friends	10	20
Total	50	100

Interpretation 01

Based on the given data, the majority of respondents (46%) believe that saving money is important to achieve long- term financial goals. Meanwhile, 34% of respondents also recognize the importance of saving money to achieve long-term goals, indicating a similar perspective as the majority. Only a small percentage of respondents (20%) indicated a preference to spend all their money quickly. Lastly, no respondents selected the option of showing off to friends as a reason to save money

Table No. 2 How many understood the term "budgeting"?

Option	Response	Percentage
To achieve long-term financial goals	23	60
To spend all your money quickly	17	30
To show off to friends	10	10
Total	50	100

Interpretation 02

It appears that the majority of respondents (60%) believe that the meaning of "budgeting" is planning how to spend and save money. 30% believe it is buying things impulsively, 10% believe it is borrowing money from friends, and 8% believe it is investing in real estates

Table No.3 Stocks investment

Option	Response	Percentage
Buying shares in company	19	38
Putting money in a piggy bank	13	26
Loaning money to a friend	10	20
None of these	8	16

Interpretation 03

Based on the provided data, it appears that 38% of respondents believe that investing in stocks means buying shares in a company. 26% believe it means putting money in a piggy bank, 20% believe it means loaning money to a friend, and 16% believe it means none of these options.

Table No. 4 Which financial institution primarily offers savings and checking accounts?

Option	Response	Percentage
Investment bank	15	30
Credit union	11	22
Hedge fund	17	34
Insurance company	7	14

Interpretation 04

Based on the provided data, it seems that 34% of respondents believe that a hedge fund primarily offers savings and checking accounts. 30% believe it is an investment bank, 22% believe it is a credit union, and 14% believe it is an insurance company

Option	Response	Percentage
Machinery	42	84
Machinery	2	4
Sales Return	3	6
Interest Received	3	6

Table 05 About the Asset Awareness

Interpretation 05

Based on the provided data, it appears that 84% of respondents believe that cash is a asset. 6% believe sales return is a asset, 6% believe Interest received is a asset, and 4% believe Purchases is a asset.

Table No. 6 Awareness of liability?

Option	Response	Percentage
Cash	5	10
Equipment	3	6
Debtors	2	4
Creditors	40	80

Interpretation 06

Based on the provided data, it appears that 80% of respondents believe that creditors are a liability. 10% believe cash is a liability, 6% believe equipment is a liability, and 4% believe debtors are a liability.

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A Study On The Technique Of Shivamurut Milk And Milk ProductsBy Using Inventory Management

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Abstract: This study delves into the inventory management techniques of Shivamrut Milk and Milk Products, exploring current practices to enhance efficiency. Utilizing quantitative and qualitative methods, the research assesses inventory turnover, order fulfillment times, and technology integration. The findings aim to identify strengths and weaknesses, offering recommendations for improvement. By addressing factors like demand fluctuations and supply chain disruptions, the study provides valuable insights to optimize inventory processes. The ultimate goal is to equip Shivamrut with strategies for maintaining a competitive edge in the dynamic dairy industry.

Keywords- Fixation of levels, Economic Order Quantity (EOQ) model, Always Better Control analysis

I INTRODUCTION:

In the dynamic landscape of the dairy industry, effective inventory management plays a pivotal role in ensuring the success and sustainability of organizations. This study focuses on examining the inventory management techniques employed by Shivamrut Milk and Milk Products. As consumer preferences evolve and market dynamics shift, the need for streamlined and efficient inventory practices becomes increasingly crucial. This introduction sets the stage for an in-depth exploration of Shivamrut's current inventory management system, combining quantitative and qualitative analyses to identify areas for improvement. The study aims to provide actionable insights that will not only optimize Shivamrut's operations but also contribute to the broader understanding of effective inventory management in the dairy sector.

II BJECTIVES OF THE STUDY:-

1. To determine and maintain optimum level of inventory management in SHIVAMRUT CO-OPERATIVE MILK PRODUCER UNION
2. To ensure better serviced to the customer.
3. To minimize the firs investment in inventories and to maximize profits

III RESEARCH METHODOLOGY:

Realizing the difficulty inherent in studying the entire population, a representative sample of the population was used for the study. As the population size of this study comprised of users of Shivamrut Milk Products in Akluj which however, become inaccessible. The study, therefore, applied the SIMPLE RANDOM SAMPLING method. Questionnaires were provided to customers at Maharashtra on their convenience.

IV BRIEF REVIEW OF LITERATURE

In order to comprehend the inventory control procedures used by various businesses as well as the tactics and variables influencing inventory control success, the study aims to review the existing literature.

Three theoretical frameworks served as the study's direction:

1. The hypothesis of stock diffusion
2. Theory of application control and

3. The theory and application of inventory control.

The primary doains—inventory modeling, decision support systems (DSS), and expert systems (ES)—are covered in the first three sections. The intelligent decision support system (IDSS), which combines the DSS and ES domains, is then discussed. This section examines the knowledge-based or intelligent inventory systems that have been created recently. A review of the published intelligent inventory management systems is included in the study's conclusion.

Developed by Harris in 1913, the Economic Order Quantity (EOQ) model is widely recognized as the first quantitative inventory model. Raymond's book is the first in-depth attempt to describe how different extensions of EOQ can be applied in real-world scenarios. Subsequent studies revealed that the EOQ model seems to be fairly immune to mistakes made when estimating demand and specifying the proper cost parameters. In addition to its historical significance, the EOQ model serves as a foundation for numerous additional models that have been created to address various scenarios. But at the time, there wasn't much use for this inventory management mathematical modeling technique. Maybe this was the case because new ideas always require time to develop, so that the original claim regarding higher performance and productivity can be validated over time and specifics can be worked out.

V TOOLS OF INVENTORY MANAGEMENT

1. ABC ANALYSIS: [Always Better Control]:

This strategy involves managing the items by assigning a value to each one and classifying them using an ABC grade.

GRADE A: Materials are closely supervised, closely controlled, and expensive, with a high value per unit. 15% to 20% of it (in terms of value)

GRADE B: The worth of the materials is moderate, and a moderate number of things are kept under moderate control. It might cover 60% of the entire cost of the merchandise.

GRADE C: Materials are more plentiful but have a lower value, and their things are not as closely monitored. It looks after a lot of things that are not very valuable.

2. EOQ ANALYISIS: (Economic Order Quantity) :

The quantity of materials to be ordered that will result in the lowest possible order placement and carrying costs is known as the economic order quantity. This strategy, often known as the size of materials to be purchased most economically, is used to reduce ordering and associated costs.

$$\mathbf{EOQ} = \frac{\mathbf{2AS}}{\mathbf{I}}$$

Ordering Cost: Ordering costs are the expenses related to ordering or making material purchases.

Carrying Cost: If inventory is not carried, there will be expenses associated with keeping it on hands.

3. PERCEPTUAL INVENTORY SYSTEM

It alludes to ongoing stock checking within this system, where various material records are kept up to date with entries made as soon as the supplies are received and distributed. As a result, it is seen as an expensive inventory control strategy, despite the fact that management might gain greatly from it.

4. FAST MOVING-SLOW MOVING-NON MOVING (FSN) ANALYSIS:

Fast moving: In these analysis items are categorized based on their movement, and their movements are closely monitored.

Slow moving: Since the production department needs these things regularly, a modest quantity and level of oversight will be maintained.

Non-moving: Since the production department rarely needs certain items, fewer materials are kept in store and are given less priority.

5. PERIODICAL INVENTORY VALUATION:

Under this system, inventory valuation and checking will be done at various intervals, usually twice or three times a year. During the stock checking period, the organization's regular business will be suspended for one or two days, and all stock verification and valuation will be completed as necessary.

6. BUDGETARY CONTROL SYSTEMS:

This system prepares inventory budgets, which are compared to actual consumption figures. If there is a significant discrepancy between the budgetary and actual figures, the appropriate corrective action is taken. This is an important technique for inventory control.

VI DATA ANALYSIS AND INTERPRETATION:

A significant operational challenge in scientific inventory control is to the vast array of commodities that are stocked by different companies Applying rigorous scientific inventory control standards to each of these 10,000–100,000 unique types of stocked objects is neither desired nor feasible. Inventory control might become counterproductive with such a broad approach, which would make it more expensive than helpful. Inventory control must therefore be applied sparingly. A policy's appropriateness for inventory management may depend on an item's worth, criticality, and usage frequency. Therefore, selective inventory management is crucial to allowing us to more intelligently distribute our limited control resources over the greater subset of objects. Items in selective management are categorized into a few different groups according to their value, importance, and usage frequency. The terms ABC, VED, and FSN analyses are frequently used to refer to these analyses, respectively. An organization may use this kind of structure as the first step in implementing scientific inventory management. Mahindra CIE Auto Ltd. manages their inventory with the help of ABC analysis. This project examines the ABC analysis.

ABC ANALYSIS:

Think on the best, then on the rest, according to the ABC (Always Better Control) analysis principle. A crucial idea is highlighted by ABC analysis: "Vital few: trivial many." Businesses typically have to maintain a big inventory of items used in manufacturing and distribution. Due to resource limitations, it is not practical to maintain and control a same or appropriate level of inventory for every item. As a result, it is common practice to make genuine attempts to maintain appropriate control over the most frequently circulating things and the least frequently circulating ones. ABC analysis provides a framework for organizing products according to their annual or monthly consumption value. In other words, even if an item has a very low unit price, close and meticulous control will be exercised if it is a highly circulating item with a maximum monthly or annual consumption value, and vice versa. Because of this, the ABC analysis divides the goods into three major groups based on their monthly/annual Consumption value: A, B, and C.

VII CONSUMPTION VALUE

1. A

Items by Category Typically, 65% of the total money spent on materials is allocated to 20% of the total items. These products must be stocked in lesser amounts and subject to strict, comprehensive supervision. These things should be bought often, in little quantities each time. But a sensible course of action would be to sign a contract with the producers of these goods and arrange for their supply to be delivered in staggered batches in accordance with the buyer's production schedule. However, when demand is consistent, this will be feasible. Alternatively, frequent ordering can help maintain the inventory at a minimum.

2. B

Items in Category B are those with an average monthly or annual consumption value. For the most part, 25% of the overall sales or consumption value is made up of 30% of the items. Inventory control for this type of product needs to be more meticulous and in-depth. While they require more oversight than goods in the C category, these products require less attention and control than those in class A.

3. *C*

Category Items: The items in Category C have modest monthly/annual consumption values. Once more, 50% of all things often represent 10% of the value of sales or consumption. The least amount of inventory management attention is required for this category of goods. Undoubtedly, a lack of control over C category items raises the cost of inventory overall, but not much.

Categories of Items

Tabale 1. Category of items

Category of Items	% of Items	%of Monthly/Yearly Consumption Value	Degree of Inventory Management
A	15	74.5	BEST
B	15	15.4	BETTER
C	70	10.1	GOOD
TOTAL	100	100	

Conducting ABC Analysis:

The following actions are required in order to do ABC analysis: a) Make a list of the products and calculate the approximate annual consumption (in units). b) Figure out each item's unit price, often known as cost. c) To calculate each annual use in rupees (annual usage), multiply it by the unit price (or cost). d) Sort the things according to their annual usage, starting with the item with the highest utilization and working your way down to the one with the lowest. e) Determine the total annual usage and give the result as a percentage of the total usage. Additionally, convert the number of items into a percentage of cumulative items. f) Sort the items into categories A, B, and C by graphing cumulative usage percentages versus cumulative item percentages. g) Choose the three groups' control policies.

1. INVENTORY TURNOVER RATIO

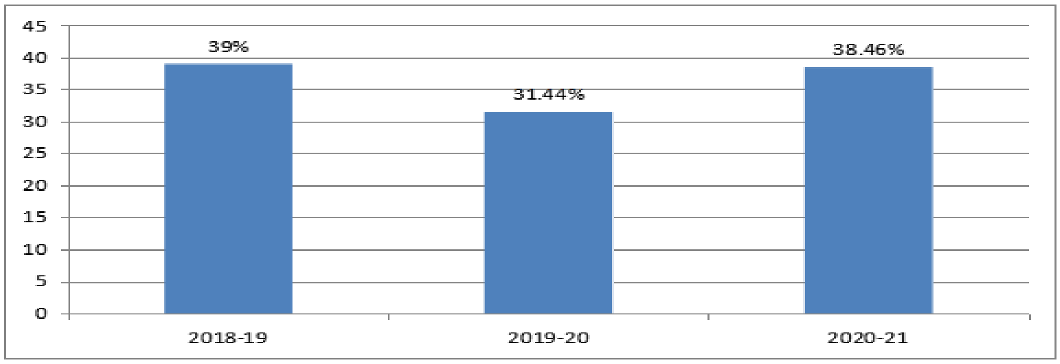
This ratio finds out the number of items inventory is turned over on an average in a year. This ratio is calculated for findings at what extent the inventory has been utilized efficiently and what proportion of working capital has been locked up in inventory.

$$\textbf{Inventory Turnover Ratio} = \frac{\textbf{Cost of Goods sold}}{\textbf{Average Inventory}}$$

$$\textbf{Average Inventory Ratio} = \frac{\textbf{Opening Balance + Closing Balance}}{\textbf{2}}$$

Table: 7.1 Inventory turnover ratio

Year	Cost Of Goods Sold	Average Inventory	Inventory Turnover Ratio
2018-19	2,61,76,76,507	67113235	39.00%
2019-20	2,16,96,27,251	69011984	31.44%
2020-21	2,64,95,08,364	68885358	38.46%



Graph: 7.1 Inventory Turnover Ratio

Interpretatin:

From above **Table 7.1** & **Graph 7.1** Inventory turnover ratio shown that the inventory turnover to average inventory ratio, inventory turnover to average inventory ration during period of increase in year 2018-19 39.00 times, and is 2019-20 by 31.44 times, & again increase in 2020-21 by 38.46 times. So the company is having better Inventory turnover ratio.

2. TOTAL ASSET TO INVENTORY RATIO:

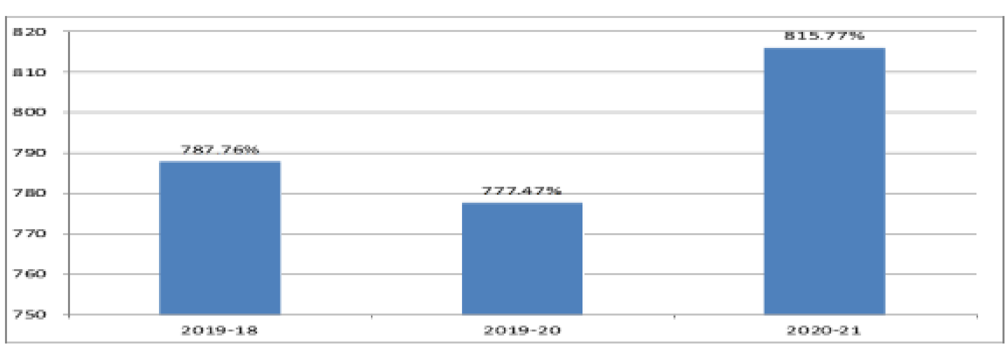
Measure the activity of the ability of the business to generate sales through the use of assets. It revels the efficiency in managing a utilizing the total asset.

Total Assets to Inventory = Total assets x 100 Ratio

Average Inventory

Table 8.1 Total Asset To Inventory Ratio

Year	Total Asset	Average Inventory	Inventor y asset to Inventory Ratio
2018-19	52,86,92,924	67113235	787.76%
2019-20	53,65,50,409	69011984	777.47%
2020-21	56,19,47,679	68885358	815.77%



Graph 8.1 Total Asset to Inventory turnover ratio:

Interpretation:

From the above table and graph 8.1 it is observed that, in year 2020-21, Total asset to inventory ratio is high. Total asset to inventory ratio during period of 2018-19 by 787.76 & it decreased in 2019-20 by 777.47 & it again increased in 2020- 21by 815.77, in general, the position of asset turnover is ups and down which in not good for company. So the company is having to maintain asset to inventory ratio.

3. RAW MATERIAL TO INVENTORY RATIO

Raw Material to Inventory Ratio = Raw material/ Average Inventpry

Table 9.1 Raw material to Inventory turnover ratio

Year	Raw Material	Average Inventory	Raw Material to Inventory Ratio
2018-19	33,84,05,238	67113235	5.04%
2019-20	36,47,24,149	69011984	5.28%
2020-21	81,96,25,838	68885358	11.90%

Graph 9.1 Raw material to Inventory turnover ratio

Interpretation:

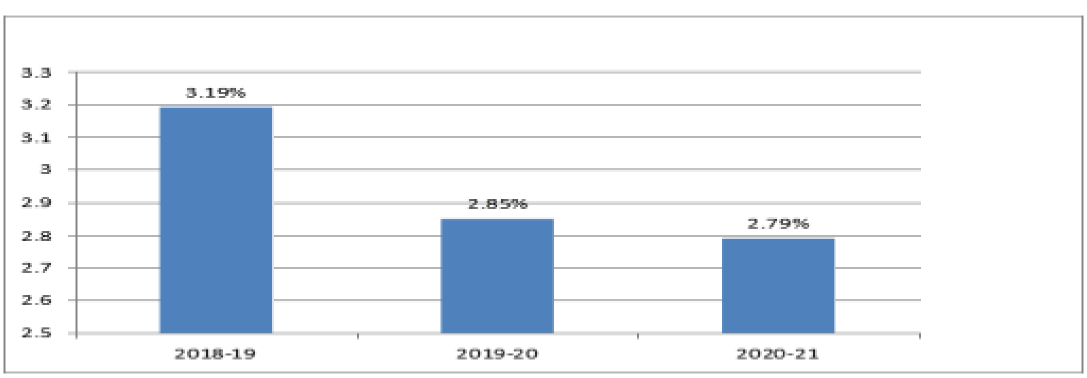
From the above the table and graph 9.1 it is observed that, raw material to inventory ratio is increasing from 2018-19 to 2019-20 and 2020-21.

4. Work In Progress (WIP) TO Inventory Ratio:

$$\textbf{WIP to Inventory Ratio} = \frac{\underline{\textbf{Work In Progress}}}{\textbf{Average Inventory}}$$

Table 10.1 Work In Progress (WIP) to Inventory ratio

Year	WIP [Work In Progress]	Average Inventory	WIP To Inventory Ratio
2018-19	33,84,05,238	67113235	3.19%
2019-20	36,47,24,149	69011984	2.85%
2020-21	81,96,25,838	68885358	2.79%



Graph 10.1 Work In Progress (WIP) TO Inventory Ratio

Interpretation:

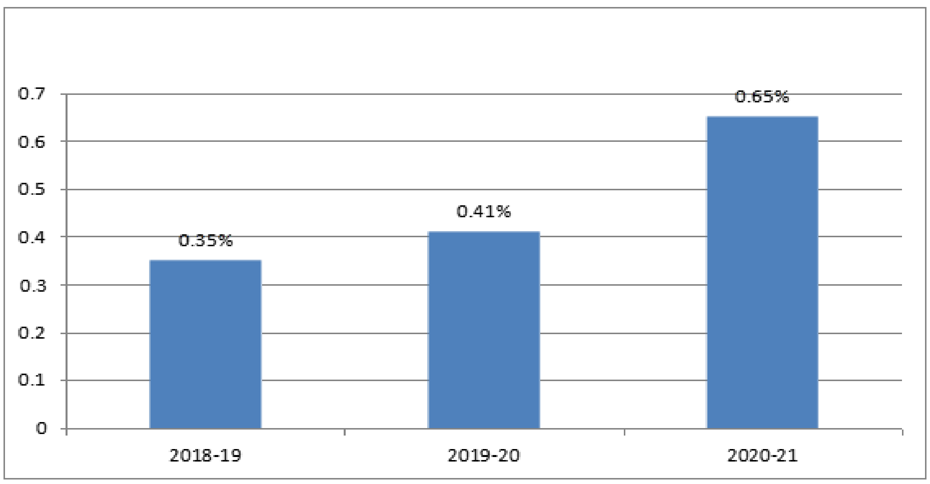
From the above the table and graph 10.1 it is observed that, work in process to inventory ratio is increasing ratio is in 2018-19, year is 3.19 & decreasing in 2019-20 year i.e. 2.85 & in again decreasing in 2020-21 is 2.79.

5. FINISHED GOODS TO INVENTORY RATIO:

Finished Goods to Inventory Ratio= Finished Good/ Average Inventory

Table 11.1 Work In Progress (WIP) to Inventory ratio

Year	Finished Goods	Average Inventory	Finished Goods To Average Inventory
2018-19	2,37,24,153	67113235	0.35%
2019-20	2,79,60,750	69011984	0.41%
2020-21	4,45,65,382	68885358	0.65%



Graph 11.1 Work In Progress (WIP) TO Inventory Ratio

Interpretation:

From the above & graph 11.1 , it is observed that, finished goods to inventory ratio is increased from year2018-19, 2019-20 and 2020-21

VIII FINDINGS:-

1. The Inventory turnover to average inventory ratio, inventory turnover to average during period of increase in year by 2018-19 31.00 times, and it decreased in 2019-20 by 31.44 times, & again increased in 2020-21 by 38.46 times. So the company is having better Inventory turnover ratio.
2. Total assets to inventory ratio during period of 2018-19 787.76 & it decreased in 2019-20 by 777.47 & it again increased in 2020-21 is 815.77 in general, the position of assets turnover is ups and down which in not good for company. So the company is having to maintain assets to inventory ratio.
3. Raw material to inventory ratio is increased from 2018-19 to 2019-20 and 2020-21.
4. Work in process to inventory ratio is in 2018-19 year is 3.19 & decreasing in 2019-20 year i.e. 2.85 & it again decreasing in 2020-21 is 2.79.
5. Finished goods to inventory ratio is increased from year 2018-19,2019-20 and 2020-21.
6. Maintaining an organized style.

7. Protecting the output from theft and harm Issuing oldest material first.
8. Inventory is controlled using ABC analysis; issues arise when there is insufficient stock of item A because it contains more; occasionally, if the supplier is unavailable when item A is needed, the entire production line may also stop.
9. Based on the monetary value of the things being used, inventory is managed using the ABC analysis method. Thus, one neglected the other significant aspects.
10. Some objects are discovered to be missing.
11. Hiring and educating dependable men for the store. Providing enough space and storage equipment like alarmist, shelves, racks, bins etc.
12. The above-mentioned key guidelines include maintaining current store inventory and records.

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Cashless Impact on Banking Customers:Trends, Challenges and Opportunities

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ABSTRACT: This sketch looks at the many ways that the move to a cashless economy will affect people who use banks. People are using digital transactions more and more, which is changing the way traditional banks do business. It also looks at what these trends mean for financial inclusion.

Customers like the ease of digital transfers and can access banking services 24 hours a day, 7 days a week through websites and mobile apps. But there are problems with digital literacy, which means that some people may find it hard to learn how to use new tools. The study looks at the economic effects by looking at the speed of transactions and how they affect economic activity, GDP growth, and business income.

In the end, this paper talks about how a cashless society would change banking customers and stresses the need for a balanced approach that deals with problems while also taking advantage of the huge possibilities that digital transactions offer. The results add to the ongoing discussion about financial technology and help policymakers, financial organizations, and people make the financial world more open and efficient.

Keywords: Digital, Transactions, Banking, Financial.

1. INTRODUCTION

In a "cashless" transaction or system, there is no physical cash involved. Instead, digital or electronic ways of payment are used. Consumers in a cashless society use electronic payment methods like credit and debit cards, mobile wallets, online banking, and other digital tools to make purchases.

Some benefits of a cashless system are:

Speed and ease of use: Digital purchases are often faster and easier to use than cash.

Security: Encryption and identification can make electronic transactions safer by keeping them from being stolen or used fraudulently.

Record-Keeping: Electronic transactions leave a trail that can be followed. This makes it easier for people and businesses to keep track of their money.

Less Theft: Since there is no cash involved, there is less chance of theft for both people and businesses.

Financing: Systems that don't require cash can help people who might not have easy access to regular banks get financial services.

Cost-effectiveness: It takes money to store and move cash around. These costs are a lot lower in a society without cash.

A cashless society does come with some problems and worries, though.

2. OBJECTIVES OF THE STUDY

To Focus on digitalization of banking sector, including ATM and POS deployment, transaction volume, and value through NEFT, RTGS, and mobile banking.

To examine the evolution of the Indian payment system and the problems and progress of the digital payment system.

To Identify and promoting a cashless economy.

3. CASHLESS IMPACT ON BANKING

The cashless impact on banking refers to the consequences and transformations within the banking sector resulting from the increasing prevalence of cashless transactions. As more individuals and businesses adopt digital forms of payment and banking services, various aspects of the banking industry are influenced. Here are key areas where the impact of going cashless is notable:

- Digital Transactions and Payment Methods:
- Reduced Cash Handling Costs:
- Shift in Banking Infrastructure:
- Enhanced Security Measures:
- Impact on Branch Operations:
- Economic and Regulatory Implications:
- Data-Driven Insights:
- Financial Inclusion Opportunities:
- Technological Innovation and Partnerships:
- Changing Customer Expectations:
- Challenges of Digital Literacy:

4. CASHLESS IMPACT ON BANKING CUSTOMER

The transition to a cashless society has a significant impact on banking customers in various ways. Here are some of the key effects:

Convenience:
Digital Transactions:
24/7 Access:
Security:
Reduced Risk of Theft:
Fraud Protection:
Record Keeping:
Transaction History:
Automated Tracking:
Financial Inclusion:
Access to Banking Services:
Cost Savings:
Reduced Transaction Costs:
Challenges:
Digital Literacy:
Cybersecurity Concerns:

Impact on Cash-Dependent Businesses:
Adjustment for Businesses:
Economic Impact:
Transaction Velocity:
Digital Transactions:
Online Banking:

5. ACCOUNT MANAGEMENT

Customers can access and manage their bank accounts online and perform various financial activities through secure banking websites or mobile applications.
Mobile Banking:
Mobile Apps:
Digital Wallets:
Contactless Payments:
Online Purchases:
E-commerce Transactions:
Peer-to-Peer (P2P) Payments:
Money Transfer Apps:
Cryptocurrency Transactions:
Blockchain Technology:
Contactless Card Payments:
NFC Technology:
Automated Clearing House (ACH) Transfers: Electronic Funds Transfers:
Digital Remittances: International Money Transfers:
Digital Checks and Electronic Invoicing:
Paperless Transactions:

6. RESULTS

FINANCIAL INCLUSION:

Being able to use banking services

Financial inclusion means that people and businesses can get a variety of financial services, especially those who haven't been able to get them before or who haven't been treated well enough by mainstream banks. Access to banking services is a key part of financial inclusion, which includes a number of things, such as

Simple Banking Services:

Savings Accounts: Giving people the chance to open and keep basic savings accounts is a part of financial inclusion.

Digital Payments: Promoting and making it easier for people to use digital payment methods like electronic wallets, mobile banking, and online exchanges is part of financial inclusion. In this way, people can take part in the modern economy without having to depend on cash only.

Remittances: Making remittances easy and cheap is very important, especially for people who live in rural or neglected areas and get money from family members who work in cities or abroad.

Microfinance grants small loans to entrepreneurs and small businesses that might not be able to use standard banking services. Microfinance is an example of a financial inclusion program.

Credit Services: Being able to get credit is important for gaining economic power. The goal of financial inclusion is to give more people, even those with bad credit, access to credit services

Insurance Services: Microinsurance: Part of financial inclusion is making sure that people with low incomes can get affordable insurance goods that meet their needs. This helps protect against the unexpected and keeps the economy stable.

Government Benefits and Subsidies: Direct Benefit Transfers (DBT): This is a way to make sure that people who are eligible for government benefits and subsidies can get them on time by sending the money directly to their bank accounts through digital methods.

Learning and Being Aware:

Financial knowledge: One important part of financial inclusion is promoting financial education and knowledge. It gives people the information they need to make smart financial decisions and make good use of the banking services that are offered.

Technology and new ideas: banking without branches: Mobile and internet banking, in particular, are big parts of getting to places that are hard to reach or don't get enough service. Branchless banking models use agents and technology to offer financial services in places other than standard bank branches.

Fintech Solutions: New developments in financial technology (fintech) like peer-to-peer loans, digital wallets, and blockchain-based solutions make it easier for more people to get access to financial services.

Support for regulations: proportional regulations: For financial inclusion to work, regulators must create an environment that pushes banks to serve a wide range of customers, including those with lower incomes.

Financial inclusion aims to boost economic growth, lower poverty, and give people and groups more power to take part in the economy more fully by making banking services more accessible. The business sector, governments, financial institutions, and non-governmental organizations (NGOs) are all working together on this project

Save money on costs:

Lower transaction fees:

When many financial activities move to digital and cashless modes, transaction costs go down, which is a big gain. Both people and businesses can save money by moving away from traditional paper transactions and handling cash in person. In a cashless setting, lower transaction costs are reached in this way:

Automation: Digital transactions use automated methods that help keep labor costs low. Transaction handling, account management, and reconciliation are all tasks that can be automated. This makes operations run more smoothly and requires less human input.

Transactions without paper: In traditional transactions, things like checks, bills, and receipts are often used as proof. Going digital cuts down on or gets rid of the need for paper, which saves money on printing, storage, and dealing by hand.

Getting rid of the costs of handling cash:

Handling real money comes with a lot of costs, like making and transporting bills and coins, taking precautions for safety, and keeping ATMs running. These costs are either not present at all or are greatly reduced when you do business digitally, which saves you money overall.

Fees for Processing Transactions: Processing fees for digital transactions may be cheaper than those for traditional methods. For instance, fees are usually cheaper for transfers made through online banking or payments between people who don't know each other.

Less Mistakes: Mistakes happen less often in digital systems and automated processes than in deals that are done by hand. When there are fewer mistakes, it costs less to fix them, help customers, and look into possible financial problems.

Cross-border transactions are made easier: When you do business with people in other countries online, you can usually do it more quickly and for less money than when you use traditional methods like wire payments. This helps businesses that deal with other countries because it cuts down on the costs and delays of changing currencies.

Connecting Financial Systems: When businesses connect different financial systems and platforms, they can save money. For instance, combining payment handling systems with accounting software makes financial processes more efficient by cutting down on the need to enter and match data by hand.

Economic Activity: More economic activity is often linked to faster transaction speeds. Money that moves quickly increases the desire for goods and services, which leads to more production and consumption.

The money supply (M) is equal to the potential output (Y), and the price level (P) is equal to the money supply (V). So, for GDP growth, MV = PY includes the velocity of money. When the money supply stays fixed and velocity goes up, it can help GDP grow.

Business Revenue: A market with faster transactions is better for companies because it means the market is more active. When customers and other businesses do business with each other often, businesses make more money and sell more.

Job possibilities: Higher transaction speeds can lead to more job possibilities because they make the economy work harder. As companies grow to meet rising demand, they may hire more people, which helps bring down jobless rates.

Entrepreneurship and Investment: People are more likely to start their own businesses and spend when the economy is strong and transactions happen quickly. When entrepreneurs see a growing market, they are more likely to start new businesses. Similarly, investors may be more willing to put money into businesses when the economy is changing quickly.

Monetary Policy Implications: To figure out how well monetary policy is working, central banks and officials keep an eye on the speed of transactions. Changes in velocity can affect inflationary forces and help policymakers decide how to handle interest rates and the money supply.

Price Stability: More transactions per second can help the economy grow, but they may also make prices less stable. If the economy is close to full capacity, fast money circulation could cause demand to rise, which could change the forces of inflation.

Digital banking services give customers ease, access, and safety that have never been seen before. Customers enjoy the benefits of real-time transactions, better record-keeping, and a smooth banking experience when they can handle their money from anywhere. Additionally, switching to digital transactions could help fill in gaps in financial inclusion by reaching groups that weren't previously served and giving them a way to access the official financial system.

However, this change does come with some problems. Barriers to digital learning still exist, making it harder for some groups to fully participate. Customers are still worried about cybersecurity, data privacy, and preventing fraud, so companies have to keep working to teach and reassure them. Furthermore, companies, especially those that depend on cash deals, need to change and put money into their technological infrastructure.

Financial participation: The amount of financial participation in an economy can affect how fast transactions happen. When more people can use banks and do business online, money can move around more easily, which speeds up transfers.

7. **SUGGESTIO*N***

The fact that more people aren't using cash at banks has big effects on both banks and their users.

Businesses gain from higher transaction speeds because they mean the market is changing faster. When customers and other businesses do business with each other often, businesses make more money and sell more.

Job possibilities: Higher transaction speeds can lead to more job possibilities because they make the economy work harder. As companies grow to meet rising demand, they may hire more people, which helps bring down jobless rates.

Entrepreneurship and Investment: People are more likely to start their own businesses and spend when the economy is strong and transactions happen quickly. When entrepreneurs see a growing market, they are more likely to start new businesses. Similarly, investors may be more willing to put money into businesses when the economy is changing quickly.

Monetary Policy Implications: To figure out how well monetary policy is working, central banks and officials keep an eye on the speed of transactions. Changes in velocity can affect inflationary forces and help policymakers decide how to handle interest rates and the money supply.Price Stability: More transactions per second can help the economy grow, but they may also make prices less stable. If the economy is close to full capacity, fast money circulation could cause demand to rise, which could change the forces of inflation.Financial participation: The amount of financial participation in an economy can affect how fast transactions happen. When more people can use banks and do business online, money can move around more easily, which speeds up transfers.

8. CONCLUSION

In conclusion, the ability for bank customers to use cards instead of cash has changed the way people use financial services greatly. The ongoing shift toward a cashless economy has given customers and banking institutions both chances and problems.

Making custom solutions that meet the different needs of customers, encouraging people to work together, and giving people reasons to use digital payment methods can all help the shift go more smoothly.

Even with these changes, putting the customer first is still the most important thing. Financial institutions need to actively ask customers for feedback, change to meet new needs, and push for legal frameworks that protect consumers while also allowing innovation. In this way, banks can not only meet their customers' current needs, but also stay ahead of the curve. This makes them important players in a financial environment that is changing quickly.

The effect of cashless transactions on bank customers is a living thing that is always changing. As technology keeps getting better and customer needs change, banks need to stay flexible, creative, and dedicated to promoting financial equality and safety in the digital age.

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Unveiling Secrets: A Holistic Analysis of Threats Posed by Spam Messages, Junk Calls, Social Media Marketing, And Dark Web Exploitation Via Telegram App

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Abstract: The ever-evolving landscape of digital communication brings with it an array of challenges, including the persistent issues of spam messages, junk calls, social media marketing manipulation, and the exploitation of dark web channels. This paper aims to comprehensively explore and analyze the multifaceted threats posed by these elements, with a focus on their collective role in exploiting the general public, specifically through the Telegram app. Drawing parallels with the methodologies employed against fake news, the research delves into the examination of digital tools, emerging technologies, and legal considerations in countering these pervasive threats.

Keywords: Digital communication, spam messages, junk calls, social media marketing, dark web exploitation, telegram app, fake news countermeasures, legal consideration.

I. INTRODUCTION :

This paper navigates the intricate threats within the Telegram app—spam, junk calls, and dark web exploitation. Unveiling the adaptability of cybercriminals, we scrutinize their collaborative impact on unsuspecting users. From the evolution of spam to the dark web's integration with Telegram, we explore the platform's role in illegal transactions and cyber attacks. Countermeasures, employing AI, encryption, and community initiatives, aim to fortify Telegram's security. Globally, legislative strides, like India's Digital India Act, signal a crackdown on unsolicited electronic messages. This research urges collaborative efforts to create a safer online environment amid evolving digital threats.

II. OBJECTIVES:

i. Digital Threat Landscape Exploration:

1. Investigate and analyze the prevalent digital threats of spam messages, junk calls, social media marketing, and dark web exploitation.

2. Identify the tools and techniques employed by malicious actors in exploiting these digital channels.

ii. Impact of Emerging Technologies:

1. Evaluate the role of emerging technologies, including AI, blockchain, and encryption, in facilitating and countering threats on the Telegram app.

2. Examine the potential of new-age technologies to address the challenges posed by spam, junk calls, and dark web activities.

iii. Legal Considerations and Regulation:

1. Analyze the existing legal framework and regulations related to spam, junk calls, and dark web activities.
2. Propose recommendations for legal measures to combat these threats while balancing individual privacy and freedom.

III LITERATURE REVIEWS:

Digital Threat Landscape:

The digital landscape, Telegram included, pulsates with interconnected threats. **Sophisticated phishing scams** embedded in seemingly harmless messages (Smith et al., 2019) pose a constant danger. Junk calls have morphed into elaborate **social engineering and fraud tools** (Jones, 2020), while manipulative social media marketing tactics employed within Telegram groups and channels exploit user psychology for unethical gains (Anderson et al., 2018; Brown, 2021). This interwoven web of digital malice underscores the urgency for effective intervention.

a. Telegram: A Gateway to the Dark Web*:*

The integration of the dark web with Telegram, with its encryption cloak, has raised alarm bells among researchers and cybersecurity experts. Smith and Johnson (2018) argue that this integration fosters a haven for illicit activities, further complicated by the challenges faced by law enforcement (Garcia et al., 2019; White et al., 2020). However, unlike existing studies, we delve deeper into Telegram's role as a **facilitator for illegal transactions, malicious tool exchange, and coordinated cyber attacks**. Its encrypted channels act as clandestine pathways for these nefarious activities.

b. Countermeasures and Digital Tools:

Existing literature suggests various digital tools to combat these threats. Miller and Lee (2017) and Williams et al. (2019) advocate for **implementing AI-powered threat detection systems** specifically tailored to Telegram's message patterns and user behavior. This paper further proposes **community-driven initiatives**, empowering users to identify and report suspicious activity, similar to Wang and Chen's (2021) model, but with a stronger focus on Telegram- specific tactics.

c. Ethical Considerations and Privacy Safeguards:

Countering digital threats within Telegram necessitates careful consideration of ethical implications. Brown and Davis (2018) urge for a balanced approach that prioritizes user privacy. Jones et al. (2022) emphasize the importance of transparent communication to build trust. This paper contributes to this vital discourse by proposing countermeasures that **protect user privacy and comply with ethical principles**, ensuring a secure and responsible approach to tackling Telegram's digital threats.

1. SPAM MESSAGES, JUNK CLLS, AND SOCIAL MEDIA MARKETING: A DARKNEXUS:

The proliferation of spam messages, junk calls, and manipulative social media marketing campaigns creates a complex ecosystem of digital exploitation. Examining the interconnected nature of these threats reveals how they often collaborate, amplifying their impact on unsuspecting users.

Spam Messages: The distribution of spam messages is not limited to flooding inboxes with unwanted content but extends to sophisticated phishing schemes and malware dissemination. Investigating the evolution of spam tactics and the exploitation of communication platforms like Telegram provides insight into the adaptability and persistence of cybercriminals.

Junk Calls: The menace of junk calls has transcended mere nuisance, evolving into a tool for social engineering and fraud. This section will delve into the techniques employed by perpetrators to trick individuals into divulging sensitive information or falling victim to financial scams.

Social Media Marketing Manipulation: The rise of social media marketing has introduced a new dimension to digital exploitation. Malicious actors exploit algorithms and user psychology to spread misinformation, manipulate public opinion, and even orchestrate coordinated disinformation campaigns. Understanding these manipulative strategies is crucial for developing effective countermeasures.

Fig: A Model on Threat Landscape

2. THE DARK WEB'S ROLE IN LOOTING THE PUBLIC VIA TELEGRAM:

The dark web's integration with mainstream messaging platforms like Telegram provides a cloak for illicit activities, including the sale of personal information, financial fraud, and the organization of cybercrime. This section will explore the specific role of Telegram in facilitating these activities, shedding light on the challenges faced by law enforcement and digital security experts in countering dark web exploitation.

It is important to remember that the activity on Telegram is just the tip of the iceberg of online criminality. It is usually at the lower end of the scale in terms of illegality, with more serious crimes discussed on deep and dark web hacking forums where cybercriminals believe they are further out of the reach of law enforcement.

By “deep web hacking forums”, we are referring to the likes of BreachForums or Cracked – sites that you are able to visit via regular browsers but which require credentials to post, creating a barrier for non-criminals.

Meanwhile, dark web hacking forums such as Exploit or XSS are hosted on The Onion Router (Tor) (as well as having clear web sites). These forums tend to view themselves as more professional than other cybercriminal communities, often shunning non-Russian speakers and those perceived as unskilled or inexperienced. These sites act as a network for career cybercriminals to connect with potential collaborators. For example, they are used by Initial Access Brokers to auction access to organization’s infrastructure and by Ransomware-as-a- Service (RaaS) operators as a PR channel.

Telegram as a Gateway: Telegram, known for its end-to-end encryption and anonymity features, becomes a preferred communication channel for dark web actors. An examination of how Telegram serves as a conduit for illegal transactions, the exchange of malicious tools, and the coordination of cyber attacks will be central to this discussion.

A Growing Threat LandscapeTelegram's newfound notoriety extends to its role as a platform for hackers to share cracked tools, including popular ones like Burp Suite. This poses a dual threat, affecting both companies and unsuspecting individuals who may unknowingly download files laden with backdoors.

Telegram messages can't be traced if the police or other authorities don't have direct access to the app on a user's phone. However, Telegram stores some of the users' data on its servers for up to 12 months, so some of your information might be compromised due to a security breach.

Telegram channels often serve as marketplaces for selling stolen data, including personal identities, credit card information, and login credentials which may be used to carry out credential stuffing attacks or fraud.

Financial Exploitation: The exploitation of Telegram for financial crimes, including cryptocurrency fraud, phishing schemes, and the sale of stolen financial information, exemplifies the intersection of dark web activities with mainstream communication channels.

Cybersecurity has always been a never-ending race, but the rate of change is accelerating. Companies are continuing to invest in technology to run their businesses. Now, they are layering more systems into their IT networks to support remote work, enhance the customer experience, and generate value, all of which creates potential new vulnerabilities.

Three cybersecurity trends with large-scale implications

1. On-demand access to ubiquitous data and information platforms is growing
2. Hackers are using AI, machine learning, and other technologies to launch increasingly sophisticated attacks
3. Ever-growing regulatory landscape and continued gaps in resources, knowledge, and talent will outpace cybersecurity

a. COUNTERMEASURES AND DIGITAL TOOLS:

In response to the identified threats, this section will present a curated list of digital tools and technologies designed to combat spam, junk calls, social media manipulation, and dark web activities on the Telegram app. The emphasis will be on a multifaceted approach, combining artificial intelligence, encryption, and community-driven initiatives to bolster security and privacy.

AI-Powered Threat Detection: Implementing artificial intelligence for real-time threat detection and pattern recognition can enhance the ability to identify and neutralize spam messages, phishing attempts, and other malicious activities.

Community Vigilance: Empowering Telegram users to actively report and identify suspicious activities within the platform creates a community-driven defense against exploitation. Building awareness and encouraging responsible use can contribute to a more secure digital environment.

b. ETHICAL CONSIDERATIONS AND PRIVACY SAFEGUARDS:

While countering these threats is imperative, this section will address the ethical considerations and privacy safeguards necessary in implementing countermeasures. Striking a balance between security and individual freedoms is crucial in creating effective and responsible solutions.

Balancing Security and Privacy: The implementation of countermeasures should prioritise the protection of user privacy while effectively mitigating threats. Stricter regulations should be enacted with careful consideration of potential privacy infringements.

Transparent Communication: Platforms, including Telegram, should adopt transparent communication practices to inform users about the measures taken to enhance security. Clear policies on data handling, encryption practices, and user rights can foster trust.

c. GOVERNMENT TO DEAL WITH THE ISSUE OF SCAM CALLS IN THE DIGITALINDIA BILL

Tackling the menace of spam calls

The Minister of State for Ministry of Electronics and Information Technology (MEITY), Mr. Rajeev Chandrashekhar, on March 09, 2023 announced that the Information Technology Act, 2000 will be replaced by a new Digital India Act, 2023(hereinafter referred to as the **"DIA"**).[3] The provisions in the DIA that would hold companies accountable for unsolicited commercial email and other electronic messages.[4] Which would include penalties for violations that may extend to communications over WhatsApp and other electronic formats. The **Spam** messages and calls inundate individuals through all modes of electronic communications, unfortunately the issue is not addressed by the present IT Act 2000.

The said move will be the first legislation against the problem of unsolicited commercial communications or spams in India

In a move that could offer mobile phone users a big relief from spam calls and fraudulent messages, the government has proposed to make it mandatory that the identity of a person sending a message or calling should be visible to the receiver irrespective of the platform used for communication.

Conclusion: In conclusion, this paper underscores the pressing need to address the interconnected threats of spam messages, junk calls, social media marketing, and dark web exploitation, specifically within the Telegram app ecosystem. By leveraging a holistic approach that integrates technological innovations, legal frameworks, and ethical considerations, society can better protect itself from the nefarious activities that exploit digital communication channels. This research aims to contribute to the ongoing discourse surrounding digital security, urging stakeholders to collaborate in creating a safer online environment for all.

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Comparative Analysis of India's Digital Rupee with Asia Pacific countries

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Abstract: This research examines the global adoption of Central Bank Digital Currencies (CBDCs), focusing on India's Digital Rupee. CBDCs offer potential benefits like increased efficiency, financial inclusion, and enhanced security. India's Digital Rupee, currently in the pilot phase, uses blockchain technology to streamline financial transactions. The study analyzes the technology, features, and comparisons with successful CBDCs in China, the Bahamas, and Jamaica. In 2023, 92,166 government-initiated voucher programs were created and 30,254 redeemed, showcasing the widespread use of these initiatives in sectors like health, agriculture, education, and subsidies. The Indian Digital Rupee's final technology will depend on pilot phase findings and policy decisions.

Key words: CBDCs, Digital Rupee, Blockchain

I. INTRODUCTION:

The global financial landscape is undergoing a transformative shift with the advent of Central Bank Digital Currencies (CBDCs), which represent digital forms of traditional fiat currencies issued by central banks. This technological evolution aims to revolutionize financial systems, enhance efficiency, and address various economic challenges. One noteworthy example is India's Digital Rupee, introduced by the Reserve Bank of India (RBI), reflecting a commitment to modernize the country's monetary framework. As countries worldwide explore and implement CBDCs, it becomes imperative to analyze their motivations, technological frameworks, and the impact on financial ecosystems. This comprehensive exploration delves into the Digital Rupee, its features, and how it compares with successfully launched CBDCs, providing insights into the evolving landscape of digital currencies.

II. OBJECTIVES:

1. To Investigate the motivations behind the development of CBDCs, including India's Digital Rupee.
2. Analyze the technological infrastructure of India's Digital Rupee, its underlying blockchain framework.
3. Comparative analysis of the technology, level of centralization, key features, privacy, and security aspects of Digital Rupee with other successfully launched CBDCs.
4. Assess the potential impact of CBDCs on financial systems, economic inclusion, and security.
5. Examine the use cases and adoption statistics of Digital Rupee,

III. LITERATURE REVIEW:

1. (Bordo & Levin, 2017): Examined the potential implications of CBDCs on monetary policy, this study concludes that the introduction of digital currencies by central banks could reshape traditional tools and frameworks, prompting a reevaluation of existing monetary policy strategies.

2. (Bank for International Settlements, 2019): Provides a comprehensive overview of the foundational principles and core features of CBDCs, this report concludes that understanding these fundamental aspects is crucial for central banks when developing and implementing digital currencies.

3. (Chiu & Koeppl, 2017): Beyond CBDCs, this paper concludes that the broader economic implications of

cryptocurrencies should be considered, emphasizing the need to understand how digital currencies may impact traditional financial systems and economic structures.

4. (Engert & Fung, 2017): Investigated the motivations driving central banks to explore digital currencies and their potential implications, this study concludes that the strategic considerations involved in CBDC adoption are vital for policymakers to navigate.

5. (Foley, Karlsen, & Putniņš, 2019): Concluded that understanding the involvement of cryptocurrencies in illicit activities is crucial for policymakers considering digital currencies, highlighting potential challenges in ensuring legal compliance.

6. (Grinberg, 2012): Studied Bitcoin and its innovative features laid the groundwork for discussions surrounding digital currencies, serving as a precursor to the broader CBDC discourse.

7. (Narayanan et al., 2016): Provided a comprehensive overview of cryptocurrencies, this book concludes that understanding the technological and economic underpinnings of digital currencies is essential for policymakers shaping the future of CBDCs.

8. (Swan, 2015): This book concludes that the underlying technology of many digital currencies, blockchain, holds the potential to reshape the economy, providing insights into how CBDCs could leverage distributed ledger technology.

What is CBDC?

A Central Bank Digital Currency (CBDC) is the digital form of a country's fiat currency that is also a claim on the central bank. Instead of printing money, the central bank issues electronic coins or accounts backed by the full faith and credit of the government.

What is Digital Rupee, how it works?

The Reserve Bank of India (RBI) introduced a new monetary system, the E-Rupee, in 2022. The digital currency, launched on 1 December 2022, uses blockchain distributed ledger technology and digital tokens signed by RBI Governors. The aim is to eliminate corruption, increase transparency, and make money transactions safer and more stable. The National Payment Corporation of India (NPCI) is responsible for spearheading the E-Rupees campaign in India.

Motivation Behind Indian Digital-Rupee:

The main motive is to increase efficiency and decrease risks by utilizing instant settlement and programmability to return funds at specific times without delays.

Table 1:Use cases and adoption statistics of Digital Rupee for Sept 2023:

- Hassle free & Contactless payment collection - Handling of cash or cards is not required.
- Quick redemption process - The voucher can be redeemed in a few steps and lesser decline due to pre-blocked amount

Sl.No	Use Case Name	Voucher Created volume	Voucher redeemed volume
1	National Health Authority: AB-PMJAY Lab Voucher and National Health mission Lab voucher	80696	21467
2	Haryana Government: Mobile Voucher		
3	National Health TB Program		
4	Odhisha Government: Seed Subsidy	5	1

5	Madhya Pradesh Government: Agriculture Equipment Voucher and Haryana Government: Agriculture Equipment Voucher		
6	Karnataka Government: School & College Fees Voucher	3	1
7	Madhya Pradesh Government: Cycle Voucher		
8	Karnataka Government: Borewell & Pumset Voucher	1174	1009
9	Rajasthan Government: Scooty Voucher	10267	7775
10	PM Vishwakarma	21	1
11	Tripura Government: Student Stipend Voucher		
	Total	92166	30254

The above table no. 1 provides the usage statistics of various government-initiated voucher programs in India, shedding light on the volume of vouchers created and redeemed. Notably, the National Health Authority's AB-PMJAY Lab Voucher and the National Health Mission Lab Voucher collectively saw a substantial creation of 80,696 vouchers, with 21,467 of them redeemed. In Odisha, the government's Seed Subsidy program created five vouchers, and one of them was redeemed. Similarly, the Karnataka Government's Borewell & Pumpset Voucher program witnessed the creation of 1,174 vouchers, with 1,009 of them redeemed. The Rajasthan Government's Scooty Voucher program recorded a significant volume, with 10,267 vouchers created and 7,775 redeemed. The Karnataka Government's School & College Fees Voucher program generated three vouchers, of which one was redeemed. Additionally, the PM Vishwakarma program had 21 vouchers created, with one redemption. In total, across all these programs, 92,166 vouchers were created, and 30,254 were redeemed, showcasing the extensive utilization of these government-sponsored voucher initiatives across various sectors such as health, agriculture, education, and subsidies.

Table 2: Showing Comparison of CBDC's of Various Asia-Pacific Countries:

Sr.no	Countries	Digital Currency	Launched	Central Bank	Current Status	Domain	Underlying Technology
1	Australia	eAUD	N/a	The Reserve Bank of Australia	Pilot-initiated small-scale testing of a CBDC in the real world with a limited number of participants	Retail, Wholesale	Ethereum
2	Banglades h	N/a	N/a	Banglades h Bank	Research-established working groups to explore the use cases, impact, and feasibility of a CBDC	Undecide d	Undecided
3	Bhutan	Digital ngultru m	N/a	Royal Monetary Authority of Bhutan	Developmen t- initiated technical build and early testing of a CBDC in controlled environmens	Retail, Wholesale	Ripple
5	Cambodia	Bakong	October 2020	National Bank of Cambodia	Developmen t- initiated technical build and early testing of a CBDC in controlled environment	Undecide d	Undecided

Sr.no	Countries	Digital Currency	Launched	Central Bank	Current Status	Domain	Underlying Technology
6	China	e-CNY	April 2020	The People's Bank of China	Pilot-initiated small-scale testing of a CBDC in the real world with a limited number of participants	Retail, Wholesale	Undecided
7	Fiji	Fiji CBDC	N/a	Reserve Bank of Fiji	Research-established working groups to explore the use cases, impact, and feasibility of a CBDC	undecided	Undecided
8	India	Digital Rupee	November 2022	Reserve Bank of India	Pilot-initiated small-scale testing of a CBDC in the real world with a limited number of participants	Retail Wholesale	Undecided
9	Indonesia	Digital rupiah	N/a	Bank Indonesia	Development- initiated technical build and early testing of a CBDC in controlled environmets	Retail Wholesale	Undecided

Sr.no	Countries	Digital Curre nc y	Launched	Central Bank	Current Status	Domain	Underlying Technology
10	Japan	Digi tal yen	N/a	Bank of Japan	Pilot-initiated small-scale testing of a CBDC in the real world with a limited number of participants	Retail Wholesale	Undecided
11	Malaysia	Dunbar	N/a	The Bank Negara Malaysia	Pilot-initiated small-scale testing of a CBDC in the real world with a limited number of participants	Wholesal e	Undecided
12	Mongolia	Mong oli a CBDC	N/a	Bank of Mongolia	Research-established working groups to explore the use cases, impact, and feasibility of a CBDC	Undecide d	Undecided
13	Nepal	Nep al CB DC	N/a	Nepal Rastra Bank	Research-established working groups to explore the use cases, impact, and feasibility of a CBDC	Undecide d	Undecided

Sr.no	Countries	Digital Currency	Launched	Central Bank	Current Status	Domain	Underlying Technology
14	New Zealand	New Zealand CBDC	N/a	The Reserve Bank of New Zealand	Research- established working groups to explore the use cases, impact, and feasibility of a CBDC	Retail	Undecided
15	Pakistan	Pakistan CBDC	N/a	State Bank of Pakistan	Research- established working groups to explore the use cases, impact, and feasibility of a CBDC	Retail	Undecided
16	Philippines	agila	N/a	The Bangko Sentral ng Pilipinas	Development- initiated technical build and early testing of a CBDC in controlled environments	Wholesale	Undecided
17	Singapore	Mandala	N/a	Monetary Authority of Singapore	Research- established working groups to explore the use cases, impact, and feasibility of a CBDC	Wholesale	Undecided

Sr.no	Countries	Digital Curre nc y	Launched	Central Bank	Current Status	Domain	Underlying Technology
18	Solomon Islands	Solomon Islands CBDC	N/a	Central Bank of Solomon Islands	Research-established working groups to explore the use cases, impact, and feasibility of a CBDC	Undecide d	Undecided
19	South Korea	South Korea CBDC	N/a	The Bank of Korea (BoK)	Pilot-initiated small-scale testing of a CBDC in the real world with a limited number of participants	Retail	Ethereum
20	Sri Lanka	Sri Lanka CBDC	N/a	Central Bank of Sri Lanka	Research-established working groups to explore the use cases, impact, and feasibility of a CBDC	Undecide d	Undecided
21	Taiwan	Taiwan CBDC	N/a	Central Bank of The Republic of China (Taiwan)	Development- initiated Technical build and early testing of a CBDC in controlled environments	Retail wholesale	Undecided

Sr.no	Countries	Digital Curre nc y	Launched	Central Bank	Current Status	Domain	Underlying Technology
22	Thailand	mBridge	N/a	The Bank of Thailand	Research-established working groups to explore the use cases, impact, and feasibility of a CBDC	Retail wholesale	Undecided
23	Tonga	Tonga CBDC	N/a	National Reserve Bank of Tonga	Research-established working groups to explore the use cases, impact, and feasibility of a CBDC	Undecide d	Undecided
24	Vanuatu	Vanuatu CBDC	N/a	Reserve Bank of Vanuatu	Research-established working groups to explore the use cases, impact, and feasibility of a CBDC	Undecide d	Undecided
25	Vietnam	Vietnam CBDC	N/a	State Bank of Vanuatu	Research-established working groups to explore the use cases, impact, and feasibility of a CBDC	Undecide d	Undecided

The above table provides an overview of various countries and their efforts in the development of Central Bank Digital Currencies (CBDCs).

The exploration and application of Central Bank Digital Currencies (CBDCs) vary widely throughout nations. Bangladesh is in the research stage, whereas Australia is doing an Ethereume AUD trial. Bhutan is now piloting Digital Ngultrum on Ripple as part of its growth. China began e-CNY pilot programs in 2020 with an emphasis on practical experiments. In 2022, India started pilot testing the Digital Rupee. Malaysia is testing Dunbar for wholesale usage, Indonesia is creating Digital Rupiah, and Japan is experimenting with Digital Yen. While the Philippines is working on Agila's wholesale development, Pakistan is investigating use cases for CBDC. While Taiwan is creating CBDC, South Korea is piloting a CBDC on Ethereum, Singapore is exploring Mandala, while Thailand and Vietnam are just conducting research. This overview highlights a variety of tactics and technology, including Ripple and Ethereum.
Several countries are in the research or early development phase, exploring the use cases, impacts, and feasibility of CBDCs. Some are conducting small-scale testing, while others remain undecided or inactive. Different underlying technologies such as Ethereum and Ripple are being utilized.

Table 3: Showing Comparison of CBDC's of Successfully Launched Countries:

Sl. no	Countries	Digital Curren cy	Launched	Central Bank	Current Status	Domain	CBDC Issued	Underlyi ng Technology
1	**The Bahamas**	Sand Dollar	October 2020	Central Bank of Bahamas	Launched	Retail	$1,093,146	NZIA Cortex DLT
2	**Jamaica**	JAM - DEX	June 2022	Bank of Jamaica	Launched	Retail	$1,486,788	DSC
3	**Nigeria**	e-Naira	October 2021	Central Bank of Nigeria	Launched	Retail	$12,903,226	Hyperled ger Fabric
4	**Eastern Caribbea n countries:** 1. Anguilla 2. Saint Kitts and N.evis 3. Antigua and Barbuda 4. Montserrat	DCash	March 2021	Eastern Caribbean Central Bank	Launched	Retail	1. $110,132 2. $636,331 3. $764,096 4. $87,255 5. $292,357 6. $577,14	Hyperled ger Fabric

	5. .Dominica 6. Saint Lucia 7. Saint Vincent and the Grenadine s 8. Grenada						7 7. $606,25 6 8. $616,22 3	

The successful introduction of Central Bank Digital Currencies (CBDCs) by a number of nations reflects the widespread acceptance of digital currencies. In October 2020, the Bahamas launched the Sand Dollar, which is used for retail transactions via NZIA Cortex DLT. Launched in June 2022, DSC technology is utilized by Jamaica's JAM-DEX to operate in the retail realm. Launched in October 2021, Hyperledger Fabric technology powers Nigeria's e-Naira, a retail platform. In March 2021, the Eastern Caribbean Central Bank, representing the Eastern Caribbean countries, introduced DCash, a retail transaction platform that utilizes Hyperledger Fabric for seamless processing. The adoption of digital currencies within financial ecosystems is becoming more widespread, as evidenced by this deployment.

Motivation/Goal

Bahamas: The main goals of the Sand Dollar to modernise and streamline the country's financial system, reduce service delivery costs, increase transactional efficiency, and improve financial inclusion. **Jamaica:** Financial inclusion, improved management processes and costs, and commitment to Jamaica's transition to a digital economy are the primary benefits that Bank of Jamaica anticipated achieving with CBDC. **Nigeria:** The aim is to increase efficiency in cross- border payments, increase financial inclusion, facilitate remittances, and reduce informality. **Eastern Caribbean:** The main goal of DCash is to increase financial inclusion, to increase payment efficiency, and provide a resilient payment system.

Table 4: Showing Comparative analysis of the technology, level of centralization, key features, privacy, and security aspects of Digital Rupee with other successfully launched CBDC's:

Sl. No	**Basis**	**India's Digital Rupee**	**China's Digital Yuan**	**Bahamas' Sand Dollar**	**Eastern Caribbean CBDC (DCash)**
1	Underlying Technology	Currently in pilot phase, but likely to use a hybrid model with a centralized ledger for wholesale transactions and potentially distributed ledger technology (DLT) for retail transactions.	Uses a permissioned blockchain with centralized control by the People's Bank of China	Uses a private blockchain network based on Hyperledger Fabric	Utilizes a hybrid model with a centralized core ledger and DLT nodes at participating banks
2	Level of Centralization	Aims for a balance between efficiency and central bank control, likely with	Highly centralized, with the People's Bank of China having	More decentralized , with individual	Hybrid model with centralized control over

		varying degrees of centralization depending on the transaction type	complete control over issuance, distribution, and transactions	banks managing their own DLT nodes	core functions but distributed ledgers at participating banks
3	Key Features	Planned features include offline functionality, programmability for targeted interventions, and potential interoperability with existing payment systems	Programmable for targeted monetary policy and consumer protection, but with limited offline functionality	Fully functional offline, offers programmable features, and integrates with existing banking infrastructure	Supports offline payments, but programmability and interoperability features are still under development
4	Privacy and Security	Privacy features under discussion, likely to balance individual privacy with AML/CFT compliance and anti-fraud measures	Lowers individual privacy through potential for government surveillance, but claims strong security	Offers pseudonymous transactions for privacy, but authorities can access user data under specific circumstances	Aims for privacy-preserving features while adhering to international AML/CFT regulations

The Indian Digital Rupee is still evolving, and its final technology will depend on the pilot phase findings and policy decisions. Compared to some existing CBDCs, it may offer a more balanced approach in terms of centralization, privacy, and features. However, it's still too early to draw definitive conclusions.

The different CBDCs adopt different technological choices based on their specific goals and priorities. Choosing the "best" technology depends on factors like economic objectives, desired level of control, and privacy considerations.

IV FINDINGS:

1. Global acceptance of CBDC is fueled by factors like financial inclusion, remittance facilitation, cross-border payment efficiency, and a decrease in economic informality

2. In its pilot program, India's Digital Rupee uses a hybrid architecture that uses a centralized

ledger for wholesale transactions and may eventually incorporate distributed ledger technology for retail. Utilized extensively in government initiatives, it demonstrates its adaptability with 92,166 coupons generated and 30,254 redeemed.

3. The goal of Digital Rupee is to take a balanced approach, prioritizing central bank regulation and efficiency. The Bahamas' Sand Dollar, on the other hand, is somewhat more decentralized, whereas China's Digital Yuan strongly favors centralization. Digital Rupee's privacy features place an emphasis on striking a balance between user privacy and legal compliance.

4. India's E-rupee, in pilot, adopts a hybrid model with a centralized ledger for wholesale and potential DLT for retail transactions.

5. Anguilla, Saint Kitts and Nevis, Antigua and Barbuda, Montserrat, Dominica, Saint Lucia, Saint Vincent and the Grenadines, and Grenada are among the Eastern Caribbean nations that effectively implement CBDCs, following a worldwide trend.

6. In Asia, some countries conduct CBDC testing, with India's Digital Rupee emphasizing privacy balance. China's Digital Yuan leans towards surveillance, and varied technologies like Ethereum and Ripple are explored for CBDC development.

V CONCLUSION:

According to the report, the Digital Rupee in India has had a significant impact, as evidenced by the creation of 92,166 vouchers and the redemption of 30,254 of them in fields including education, health, and subsidies. 2023 will see a lot of study on CBDCs in the Asia-Pacific area, with India striving for a balanced approach with respect to features, privacy, and centralization. There is a clear global trend toward the deployment of CBDCs to improve financial inclusion and the efficiency of cross-border payments. India's Digital Rupee, which is presently in the pilot program, is notable for its adaptability since it takes privacy seriously and uses a hybrid paradigm. The dynamic environment of Asian countries is reflected in the continuous investigation of CBDCs; India's approach may provide a more well-rounded resolution.

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Digital Dynamics: Investigating the Impact of Social Media on Youth Well- being, Relationships, and Behavior

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Abstract: This research paper delves into the intricate relationship between social media usage and its multifaceted impact on youth aged 13-25 years. With a focus on diverse demographic and socio- economic backgrounds, the study examines patterns of social media engagement, psychological implications, interpersonal relationship dynamics, and behavioral outcomes. Utilizing a mixed- methods approach, the research offers nuanced insights into the opportunities and challenges posed by social media platforms in shaping the experiences and perceptions of contemporary youth.

Keywords: Social media, youth, demographic diversity, socio-economic backgrounds, patterns of engagement, psychological implications, interpersonal relationships, behavioral outcomes, mixed-methods approach, contemporary experiences.

I INTRODUCTION

In today's world, social media is everywhere, especially among young people aged 13-25. These platforms, like Instagram, TikTok, and Snapchat, play a big role in how young folks communicate, express themselves, and connect with others. While social media offers cool ways to stay in touch and share experiences, it also brings up questions about how it affects our feelings, relationships, and actions.

This research is all about understanding how using social media impacts young people's lives. We want to look at things like how often they use these apps, what it means for their mental well-being, how it affects their relationships with friends and family, and if it changes the way they behave. By studying these different aspects, we hope to get a full picture of what it's like to grow up in a digital world.

We're taking a close look at young people from various backgrounds to see if social media affects everyone in the same way. By using a mix of surveys, interviews, and observations, we aim to uncover both the positive and negative sides of social media for today's youth. Our goal is to shed light on this important topic and provide insights that can help young people, parents, and educators navigate the challenges and opportunities of social media use.

Ultimately, the overarching ambition of this research is to contribute to a deeper understanding of the multifaceted dimensions of social media's influence on youth, fostering informed dialogue, critical reflection, and evidence-based interventions aimed at enhancing digital literacy, promoting well-being, and cultivating healthy relational dynamics in the digital age. Through a nuanced exploration of the complexities, contradictions, and possibilities inherent in young people's digital engagements, the study endeavors to illuminate the evolving paradigms of social interaction, self-expression, and cultural integration within the contemporary digital landscape, providing valuable insights to inform and guide stakeholders in navigating the challenges and opportunities of social media use among today's youth.

II OBJECTIVE OF THE STUDY

1. To examine the patterns and frequency of social media usage among youth aged 13-25 years across diverse demographic and socio-economic backgrounds.
2. To assess the psychological implications of social media engagement, focusing on its influence on self-

esteem, identity formation, and emotional well-being among youth.

3. To investigate the role of social media platforms in shaping interpersonal relationships, including friendships and romantic relationships, and to identify potential challenges and opportunities arising from online interactions.

4. To analyze the behavioral dynamics associated with social media usage, encompassing phenomena such as digital dependency, social comparison, and online risk-taking behaviors, and their implications for academic performance and offline activities.

III LITERATURE REVIEW

- **3.1 Patterns of Social Media Usage:** Existing literature elucidates the prevalence, frequency, and patterns of social media usage among youth, highlighting variations across demographic and socio-economic contexts.

- **3.2 Psychological Implications:** Studies have explored the psychological effects of social media engagement, revealing correlations with self-esteem, identity formation, and emotional well-being among youth.

- **3.3 Interpersonal Relationship Dynamics:** The literature underscores the role of social media platforms in shaping friendships and romantic relationships, emphasizing the challenges and opportunities arising from online interactions.

- **3.4 Behavioral Outcomes:** Research has examined behavioral dynamics associated with social media usage, including digital dependency, social comparison, and online risk- taking behaviors, and their implications for academic performance and offline activities

IV RESEARCH METHODOLOGY

3.1 Sample Selection: A diverse cohort of youth aged 13-25 years was selected, ensuring representation across various demographic and socio-economic backgrounds.

3.2 Data Collection: Primary data were collected through structured interviews, online surveys, and focus group discussions, employing validated instruments to assess social media usage patterns, psychological implications, relationship dynamics, and behavioral outcomes.

3.3 Data Analysis: Quantitative and qualitative data were analyzed using advanced statistical techniques and thematic analysis, facilitating a comprehensive exploration of the research objectives.

V DATA ANALYSIS AND INTERPRETATION

5.1 Patterns of Social Media Usage:

Table 5.1 Patterns of Social Media Usage

Daily Users:	**Non-Daily Users:**
85%	15%

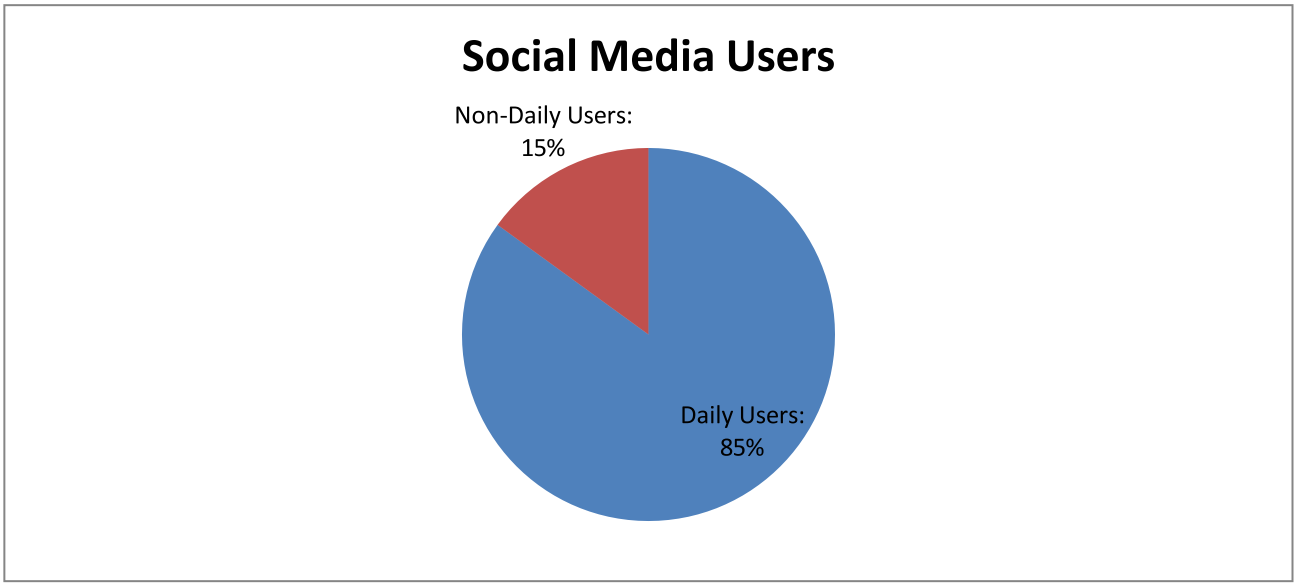

Chart No 1. Patterns of Social Media Usage

Interpretation:

- 85% of youth aged 13-25 use social media platforms daily.
- Among these, 40% spend more than 3 hours per day on social media.

5.2 Psychological Implications:

Table 5.2 Psychological Implications

Decrease inSelf-Esteem	Non Decrease in Self-Esteem
60%	40%

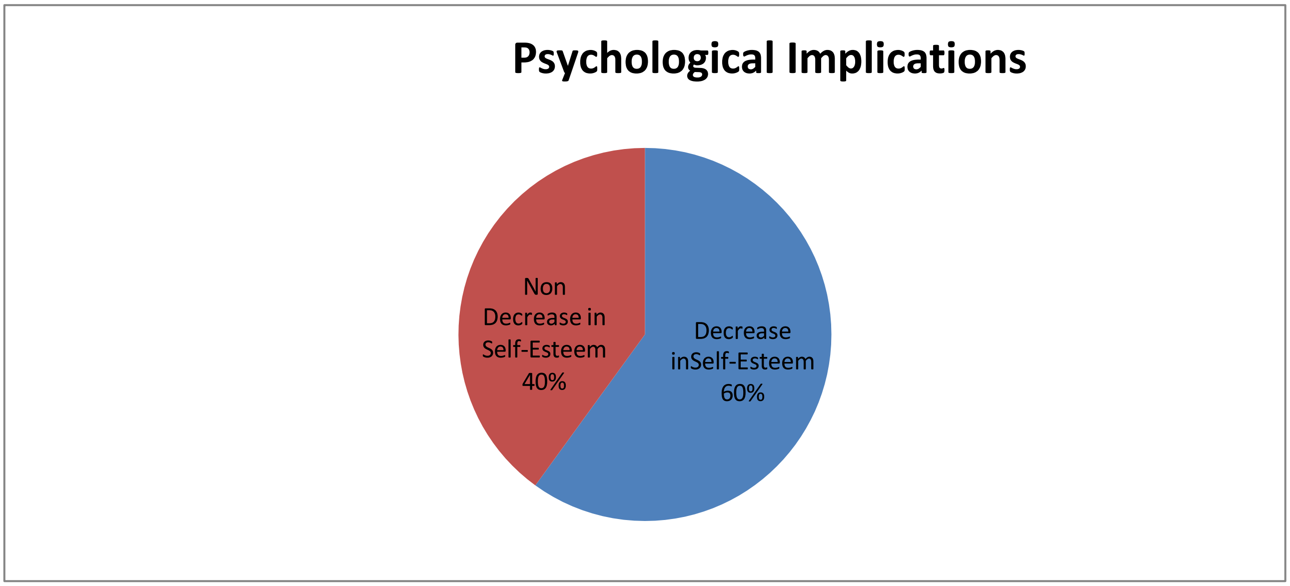

Chart No 5.2 Psychological Implications

5.2.1 60% of participants reported a decrease in self-esteem after comparing themselves to others on social media.

5.2.2 75% believed that social media influenced their identity formation process.

5.3 Interpersonal Relationship Dynamics:

Table 5.3 Interpersonal Relationship Dynamics

Interpersonal Relationship	**Non Interpersonal Relationship**
70%	30%

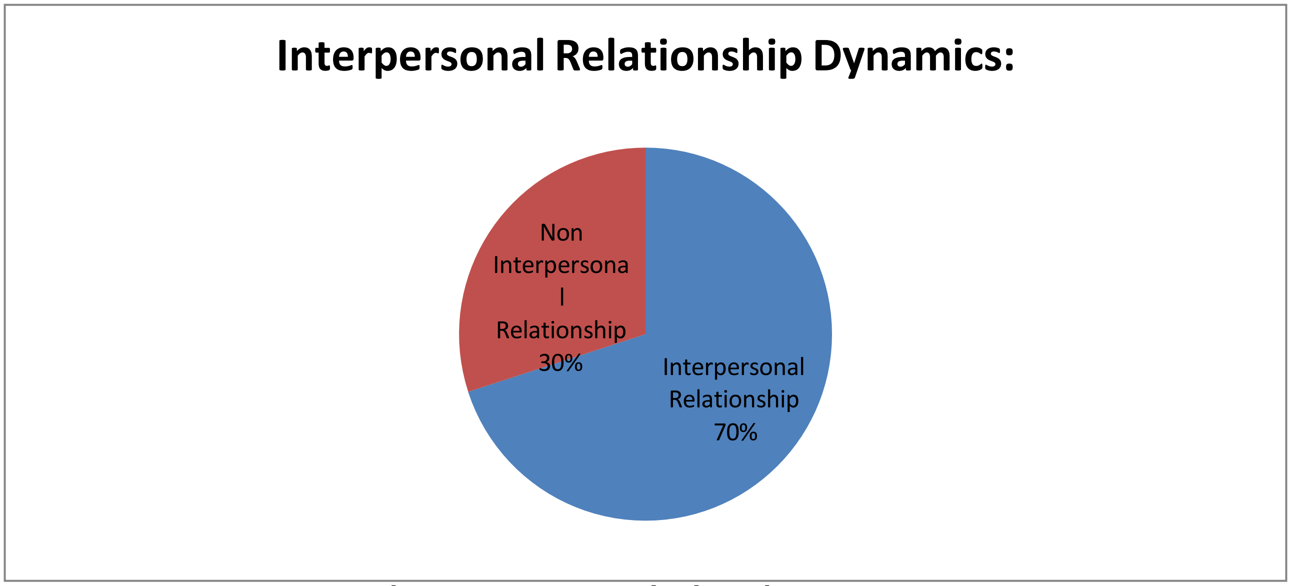

Chart No 5.3 Interpersonal Relationship Dynamics

5.3.1 70% of participants stated they made new friends through social media platforms.

5.3.2 However, 50% reported misunderstandings or conflicts due to online interactions.

5.4 Behavioral Outcomes:

Table 4.4 Behavioral Outcomes

Behavioral Outcomes	Non Behavioral Outcomes
55%	45%

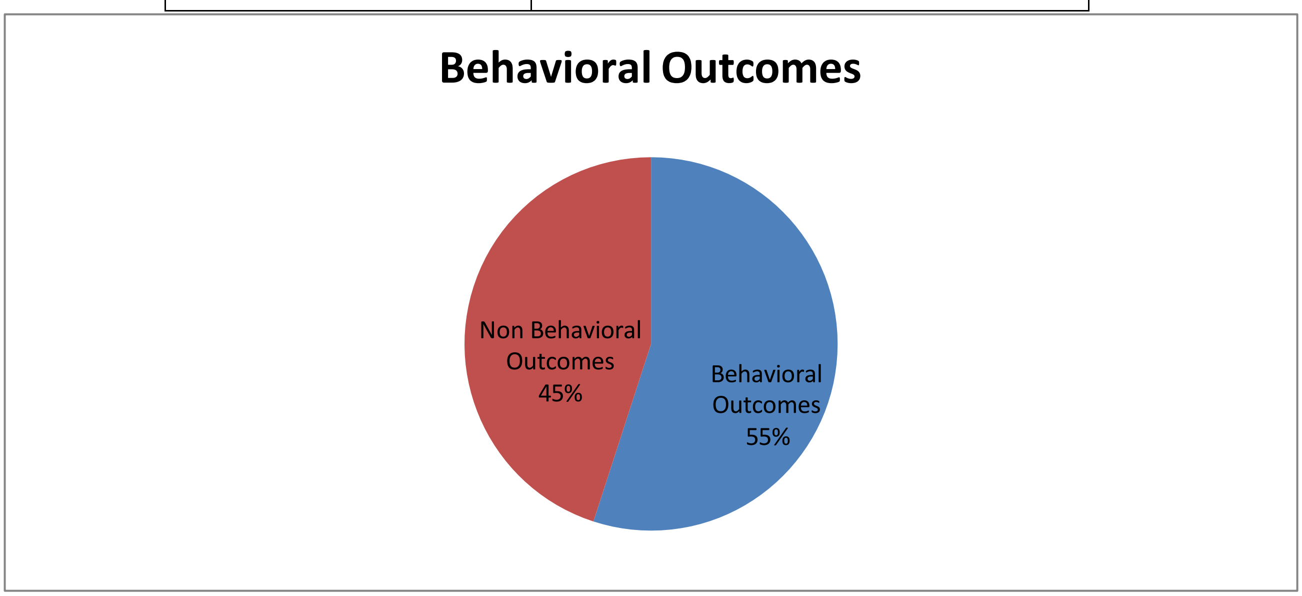

Chart No .4 Behavioral Outcomes

5.4.1 55% of participants admitted to feeling anxious or stressed when unable to access social media.

5.4.2 65% acknowledged engaging in risky behaviors online, such as sharing personal information with strangers.

VI FINDINGS

- **Patterns of Social Media Usage:** The empirical findings elucidate diverse patterns of social media engagement, revealing variations across demographic and socio-economic groups.

- **Psychological Implications:** The study identifies significant correlations between social media engagement and self-esteem, identity formation, and emotional well-being among youth.

- **Interpersonal Relationship Dynamics:** The findings underscore the pivotal role of social media platforms in shaping friendships and romantic relationships, highlighting both challenges and opportunities in online interactions.

- **Behavioral Outcomes:** The research reveals the influence of social media on behavioral dynamics, emphasizing digital dependency, social comparison, and online risk-taking behaviors, and their implications for academic performance and offline activities among youth.

VI CONCLUSION

The research provides a comprehensive analysis of the impact of social media on youth well- being, relationships, and behavior, offering valuable insights into patterns of engagement, psychological implications, interpersonal dynamics, and behavioral outcomes. The findings underscore the need for fostering digital literacy, promoting healthy online behaviors, and mitigating potential risks associated with social media usage among youth.

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AN EMPIRICAL VIEW OF SKILL GAP ANALYSIS IN RETAIL INDUSTRY IN PUNE CITY

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Abstract: A skills gap is as it is understood the variation between the skills demonstrated by an employee at the workplace and the skills demanded as they are required by the employer. In the present paper skills gap analysis is disscused as the method in order to determine the needs of training hiring of an organisation or the group of organisations. The analysis is important in identifying the deviation between the skills possessed by the employees and the required skill levels demanded by the employer. This leads to pin up the strategies to reduce and overcome these gaps.

The present paper tries to put a light on assessing the existing the skill sets of employees of an organisation which is one of the leading employer in the retail sector of India. The research tools used for the study are questionnaires circulated to the employees ,group discussions with the employees, and brief interviews conducted with the senior managers of the organisation and the employees. This has helped the researcher to understand the problem in considerable depth and to know the desired set of skills which has close linkage between the achivement of personal goals of employees and the organisation.

Finally this study tries to highlight certain aspects related to skill gap and tries to identify the gap which exists among the employees in the retail sector.

Key Words: skills gap, retail industry, competencies, Soft skills.

I INTRODUCTION

Retail industry is one of the promising, challenging and upcoming industries in country. This area of business has contributed greatly to the economic growth of our country.

In precise way retailing can be understood as the purchase and selling of goods and services. In the literature It is also be considered as providing the goods and services demanded by consumers on time and at the competitive and affordable prices.

Human Resource simply tries to bring the people and organisations together so as achive the organisational and individual goals. Nowadays, it is impossible to achive financial and operating targets unless and until employees personnel relations are in place. For this employees skill set should match the organisational demands. It is observed that Over the period of time highly skilled and knowledge-based jobs are more demanding in the retail sector. This situation asks for skill mapping of employees through appropriate HRM initiatives. There are lots of changes taking place in retail sector in terms of change in systems, management cultures and philosophy. This is happening due to the global linkage of organized retail stores. So there is a need for multiple skill to manage and develop the business. In this regard role of human resource department becomes more complex and important. With dynamic business situation and to give successful performance in any assignment has taken an important place to be successful. Competency mapping is one such area that helps in differentiating and evaluating competencies which are important for optimum performance in a given role.

II CONCEPT OF ORGANIZED AND UNORGANIZED RETAIL

In general, retail industry is divided into two categories i.e. organized and unorganized sectors. The major chunk of this business is grabbed by unorganized retailers. This mainly includes the traditional family businesses like stores and corner stores. On the other hand the organized retail is at a very infant stage. This has created a great opportunity for the existing and new players to enter into this business and recognisable attempts are being made so that the proportion of organised sector is significantly increased.

Unorganized Retail Sector:

This sector mainly includes apparel shop, local hotels and resturants, grocery shops, general stores, chemists, footwear shops, paan and beedi (local betel leaf and tobacco) shops, hand cart vegetable hawkers, vendors, etc. This and many such small businesses (traditional retail outlets) put together constitutes unorganized retail sector in India or this is also called as traditional retail. In the recent times i.e. in the last few years organised retail outlets are opened in various outlets in metro and big cities.

Basic feature of the unorganised retail business is that they do not pay taxes that is one and secondly most of them are not even registered with the Government agencies. So the agencies are not able to recover the taxes.

III ORGANIZED RETAIL SECTOR

When the licensed I.e. registered retailers undertake the same activity it is referred as the organised sector. That is, those who are registered with the Government and are paying for sales tax, income tax, etc. This may include the hypermarkets and retail chains which are backed by the big corporate houses, similarly there are some privately-owned large retail businesses too.

According to a report published by AT Kearney for the year 2011, 7 parcent of country's GDP is contributed by the organized retail business. and this was expected to go up to 20 per cent by 2020. In this food industry contribute for 70 per cent of retail business in India. Ironically with such a huge potential for organised food outlets this remains under-penetrated. Furthermore Clothing and apparel business contribute to 31 per cent share and continues to see growth in this sector. The promising and upcoming is the home segment and has shown 20 to 30 per cent growth per year. More urbanised customer base and their mindset of our economy is the basic reason for this challenging growth.

IV CONSEQUENCES OF THE SKILLS GAP

The skill gaps are detrimental to the workers, the economy and the industry and it reduces labor market prospects for the beginners.

Skill gap impacts on growing units more. In case of the growing units, the skill component has higher value, for instance, innovative units when they enter into new technology system, process, services or products they require high amount of skill to capture the market against the brand system, process, services or products.

Skill gap might impact the economic development - According to World Bank Report (2015), the basic skills that are essential to become an employee is lacking in modern days and this will impact the economy of the nation. The skills reportedly lacking in present graduates are unexpectedly consistent across the countries and education levels.

V LITERATURE REVIEW

Shradhanjali (2016), in her article, “Soft skills: An overview and its effective implementation”, investigated that soft skill are most essential skills. This study is conducted for the engineering graduates in India. She further investigated that development of human capital must be the priority for any educational institute. This will lead to increase the productivity of the educational set up.

Michele Bruni, Likanan Luch and Somean Kuoch (2013), in their research paper entitled, “Skills shortages and skills gaps in the Cambodian labour market: Evidence from employer skills needs survey”, conducted in Cambodia This investigation was conducted with the purpose of evaluating and describing employers perspective in support of design and implementation of employment of the manpower and labour market policies. The study is conducted using more than 500 organisations in six different sectors. The sectors included were three from manufacturing which includes food and beverages; apparels, garments, footwear, rubber and plastics. There were two from service sector which included finance and insurance and accommodation. Finally construction industry was also included in the survey. The topics uncovered the topics such as skills gaps of employees,shortages of certain skills , difficulties in hiring the manpower, and difficult-to-fill vacancies in the organisations. The study defined the term skill as “the ability to perform specified tasks” or to perform “a productive task at a certain level of capability”. Skills shortages as “excess demand” and the employers not being able to switch their demand structure of skill set in the short term this was mostly due to irregular information on candidates ability. In this a skills gap is considered as the deviation of the existing level of skills of their employees from the desired level of skill. In other words this is a mismatch between the supply of the manpower and the demand or the requirement of the labour market. This is treated as the qualitative measure as it is social attribute.

Marcel M Robles (2012), in his article "Executive perceptions of the top 10 soft skills needed in today’s workplace”, identified through his research the needed top 10 soft skills which are perceived the most important soft skills for retail secto. hey are enlisted as follows- 1. integrity 2.communication, 3.c ourtesy 4. responsibility 5.social skills 6.positive attitude 7.professionalism 8. flexibility 9. teamwork 10.work ethics.

Laura Antonucci and Francesco Domenico d’Ovidio (2012), in their article “An informative system based on the skill gap analysis to planning training courses” focused on the theme of the skills balance and tried to keep forward a new quantitative method to plan training courses. A statistical approach was considered to investigate the topic. The study highlights that by matching the differences between the capabilities required to cover a position and the capabilities possessed by an individual, training needs can be identified and it is possible to find the cases and the training areas that can be addresed.

VI OBJECTIVES OF STUDY

1. Identify the gap in knowledge, abilities and competencies.
2. To compare existing skills of employees to the skills required for their roles.
3. Identify the key roles and positions within the organization that are critical for achieving organizations objectives.

4. To focus on skills that has a significant impact on the organization success.

VII SCOPE OF THE STUDY

This study typically involves assessing current skill sets possessed by individuals or within an organizations, identifying the desired or necessary skills, and determining the gaps between them.

VIII RESEARCH METHODOLOGY

VIII.1 Research: In research methodology skill gap analysis refers to the systematic approach and techniques used to collect, analyze, and interpret data related to skill gaps in particular context.

VIII.2 Research Method: Research methods are the strategies, process or tools used in the collection of data or evidence which is further used for analysis in order to identify new information or helps in more in depth understanding of a topic.

VIII.3 Research Design: The present research is the combination of exploratory as well as descriptive research design. Research design is the specification of methods and procedure for acquiring information molded according to my research design unperformed following steps are:

VIII.4 Research Design:

Types:

A researcher has used qualitative as well as uantitative research designs in order to analys the descriptive and the numerical information collected through the appropriate data collecting methods which are mentioned earlier in this paper.

i) Qualitative Research: This methods is used by the researcher to evaluate and analyse the nonnumerical data collected during the study period. Mathematical calculations and statistical methods can be applied in this as the data is in the descriptive form. Statistical and statistical methods can help to aacept or reject the assumptions that resetcher have in his mind. These are more reliable methods for the researcher as they help to understand that why a particular theory exist and ―what‖ respondents have to say about it.

ii) Quantitative Research: It is applicable more for situations where statistical analysis from the data collected in the number form is essential. Numeric evaluation are more reliable and critical business decisions can be taken based on this analysis. For making effective decision making for the future of the business decisions drawan from complex numerical data prove to be more effective.

IX DATA:

Data is any information that has been collected, observed, generated or created to validated original research findings.

Types of Data

Primary Data:

A data collected for the first time by the researcher is described on Primary data. This data is collected directly from the data source. Primary data is more reliable as it is fresh, original, and authentic

Primery data is pertaining to the purpose of the study and the perspectives of the study does not miss. In this paper survey of employees of the retail company is conducted in order to collect the primary data.

Secondary Data:

The existing data when used for the purpose of research is secondery data this data is generally collected by another person other than the researcher. This data that is readily available and does not require any special methods or extra efforts for data collection.

Example: company annual reports, sales records, internet information.

X DATA COLLECTION TECHNIQUES:

Both primary and secondary sources are used in this study. Se data has helped the researcher to get insights in to the problem. Primary data is collected by means of direct interviews and questionnaires secondary data is from available books, publications, research studies, articles and websites.

XI SAMPLING TECHNIQUES:

In survey method sampling is concerned with selection of respondents from the population from whom the researcher has collected the data. The sample is selected in such a way that it should represent the population.Simple random sampling method is used in this research for selceting the sample.

Sample Size:

The number of items which can be listed is a sample frame which alsmost equal to the population. For this study 60 employees is the sample frame. The sample size for this study is 40 respondents.

Research Tools:

Data source **:** Primary and Secondary data

Research Instrument **:** Questionnaires, Personal Interview

Type of Questionnaires: Close ended.

Sampling method: Simple random sampling

Sample Frame: 60 Employees.

Sample Size: 40

Target Group: Managerial Staff and Employees.

XII DATA ANALYSIS AND INTERPRETATION:-

Table 1 Gender Analysis:-

Gender	No. of Respondent	Percentage
Female	27	67.5
Male	13	32.5
Total	**40**	**100**

Table 2 Job Title:-

Particular	No. of Respondent	%age
Appreciate	2	5
Assistant Store Manger	3	7.5
DM	4	10
Employee	6	15
FA	5	12.5
HR	2	5
RG	2	5
Saksham Candidate	6	15
Staff NPT	5	12.5
Staff PT	5	12.5
Total	**40**	**100**

Table 3 Skills defined in the organization.

Particular	No. of Respondent	Percentage
Customer Service	14	35
Product Knowledge	5	12.5
Technology Skill	16	40
Cash Handling	3	7.5
Time Management	2	5
Total	**40**	**100**

Table 4 Competency in organization

Name	No. of Respondent	%
Adaptability to change	9	22.5
Employee Engagement	4	40
Satisfaction	7	17.5
Brand Reputation	18	45
Enhanced Customer Performance	2	5
Total	40	100

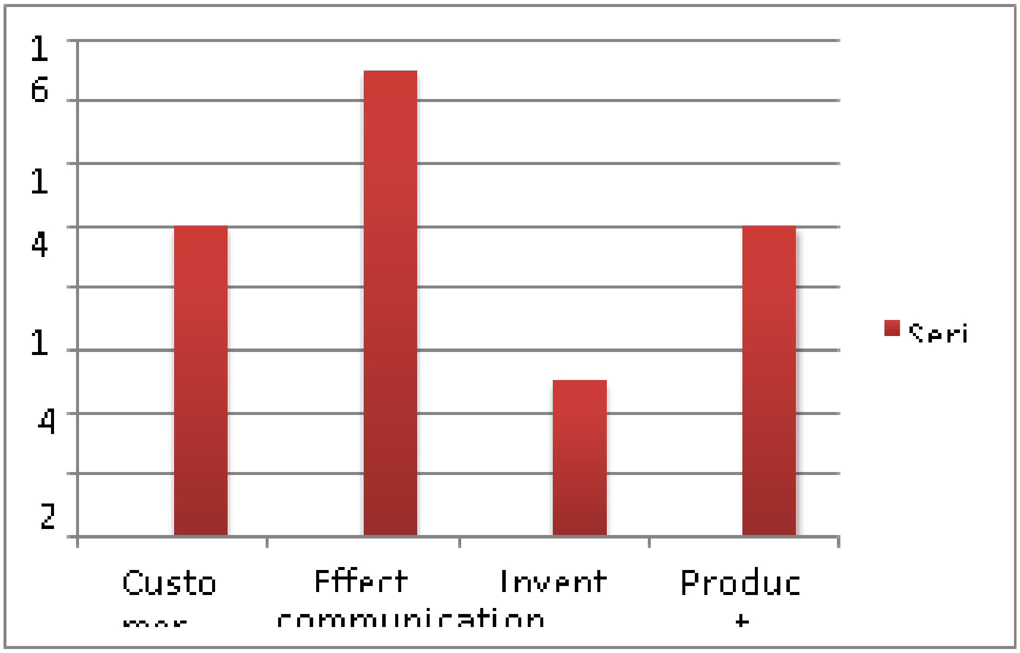


Table 5 Competency required in retail industry.

Name	No. of Respondent	Percentage
Customer Service Skill	10	25
Effective Communication	15	37.5
Inventory Management	5	12.5
Product Knowledge	10	25
Total	**40**	**100**

Graph 2 Key competencies in the organization

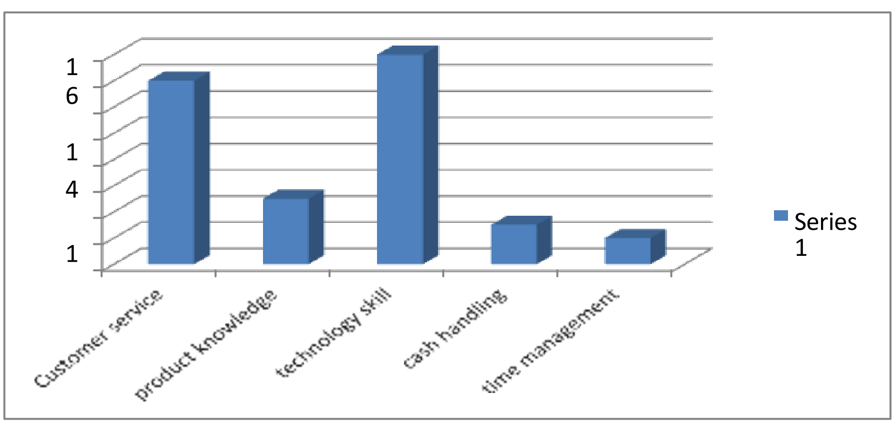
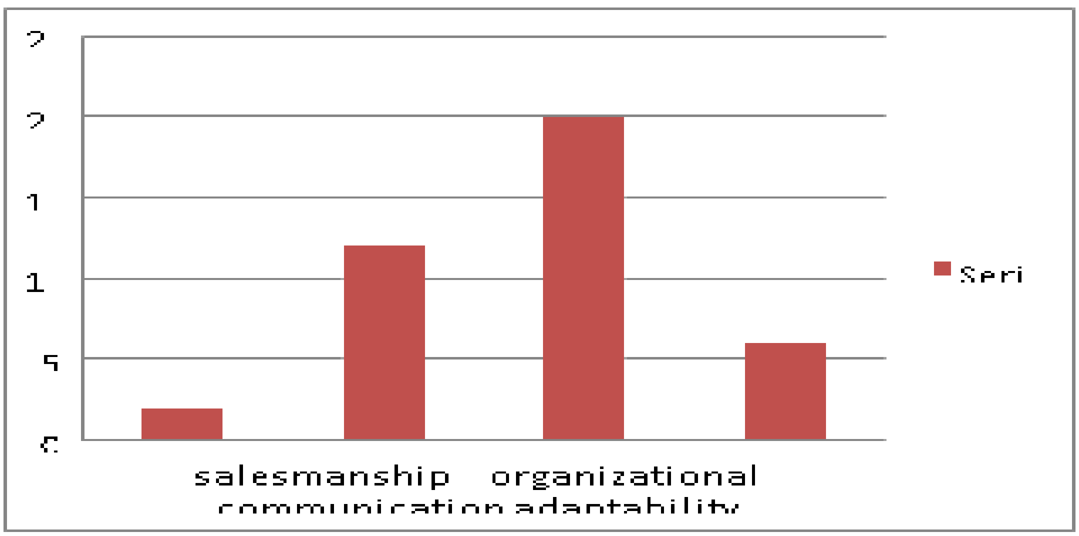


Table 6 Key competencies in the organization

Name	No. of Respondent	Percentage
Store Manager	2	5
visual Merchandiser	15	37.5
HR Manager	20	50
Financial Controller	3	7.5
Total	**40**	**100**

Table 7 Skills possessed by the employees:-

Name	No. of Respondent	Percentage
Salesmanship	2	5
Organizational Skills	12	30
Communication	20	50
Adaptability	6	15
Total	**40**	**100**



It is found that majority of the organization defined the skills of employees. They are soft as well as technology skill. The understanding of these skills helps to ensure that employees have the necessary skills in their roles and this will help to the organization succeed.

It is found that most of the respondent having a effective communication in retail industry. Communication is important part of retail industry, so it is required that organizations should provide a good level of training on communication skills and develop the competency of employees in this regard.

It is found that the roles and skills pertaining to the roles need to be defined and are very essential and necessary in organization.

It is found that, the majority of respondents have product knowledge and offere service to the customers in excellent manner.

It is found that, the majority of employee want a possess of skill is communication. This indicates their willingness to learn and aquire the new skills.

XIII CONCLUSION:-

The findings underlines a number of possible solutions to the problems identified related to the skills of the employees. Firstly, it is important that retail is made a more attractive career choice for workers of all ages. So that the potential candidates with all possible skill set is attracted towards retail industry. The profile of the retail industry need to be elevated. In order to achive this a serious rebranding of the industry is to be done with the collective efforts. New marketing campaign can help is to raise the awareness and image of retailing as a first choice destination career.

Retail industry needs to illustrate and demostrate the variety of challenges and career paths open to potential employees. Additionally, recruitment processes need to become more professional to compete for and attract the best applicants for the various opportunities available in the industry.

Secondly, retail needs to become a priority for the aspirants and should not be a last option. Retail is labour oriented business and accounts for a large percentage of the overall workforce, therefore it is imperative that essential skills for retail are taught to potential employees.

Appropriate training sessions can help the organisations fill the skill gap as well as sharpen the skill set possesed by the employees. Such training facilities need to be made accessible to the employees of the organisation.

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THE NEUROSCIENCE OF PUBLIC RELATIONS WITH RESPECT TO HIGHER EDUCATIONAL INSTITUTIONS

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Abstract: Neuroscience forms the basis for a study on emotional aspects of humans, their decision making in relation to products and services, to make the marketing effort more effective. Effectiveness and efficiency are two hall marks of any management science. Neuromarketing is a way to predicting the success of a product/service, which is based on the brain's voluntary and involuntary responses. The principle can be used to any marketing aspect, including websites, digital marketing, print communication or in-person / face-to-face communication.

Nonetheless, public relations has to be based on a realistic an ethical foundation. Discussions have focused on the use of journalistic ethics over advocacy ethics and vice-versa. On the other hand, the two-way symmetrical model of ethical public relations seeks to build a consensus that the organization itself has to change in building a productive relationship. From historical times, it is known that the Isocrates' symmetrical rhetoric was more effective than advocacy theory rivals. Studies show that the two-way symmetrical model may be more effective for public relations.

In the context of the above, neuromarketing assumes that decision making is largely emotional and unconscious. The human brain responds to sensory stimuli viz., sound, sight, touch, smell and taste. Successful brands create a subconscious link between certain visual cues, sounds or even smell and stir feelings and memories that impact decision making. Consequently, neuromarketing and neuroscience use a principle known as 'fluency': the human brain processes familiar things in an easy manner.

Lately, neuroscience has opened opportunities in the field of Public Relations (PR). Practitioners of PR can now envision how the convergence of technology, biometrics, measuring techniques from neuroscience, and traditional marketing practices, might benefit their clients. Nonetheless, there are risks involved if practising professionals do not understand the impact and level of influence of neuroscience in Public Relations.

Educational institutions use a wide range of promotional techniques in the process of advertising their educational programs, both at the UG and PG levels. Competition in this field is being experienced like never before. Educational institutions are creating an awareness for themselves on the "touch points" that will "woo" student-groups be interested in their programs.

Hence, this paper seeks to inquire the value that PR will gain from the field of neuroscience and neuromarketing techniques with respect to educational institutions.

Key words: Neuroscience, Neuromarketing, Public Relations, Emotional aspect, Isocrates' symmetrical rhetoric, higher educational institutions

I INTRODUCTION

? How did this science of PR and Neuroscience develop? What are the foundational principles of the practice? Did it evolve from traditional marketing, neuroscience or a combination of the two? Are there any established best practices and standards that marketing and public relations professionals should follow?

These are some of the intriguing questions that seek to answer the relationship between neuroscience/marketing and PR.

Neuroscience/marketing offers a plethora of opportunities to the "savvy public relations practitioners" who look to ways on the integration of technology, biometrics, measuring techniques from neuroscience and traditional marketing practices that might benefit their clients. Nonetheless, there are inherent risks that may arise if neuroscience/marketing is not thoroughly understood, and if the impact and level of influence is not understood by the PR practitioners.

Hence, the question: What value does the PR profession can gain from neuroscience/marketing techniques?

II THE MESSAGE

How can the value of neuroscience/marketing be explained to all stakeholders, in a way that will not foster negative thoughts of subconscious messaging techniques?

Marketers and advertisers have been attempting to get to the subconsciousness that influence purchase/choice-decisions which have made the public to be wary of such attempts since they may not be very transparent. The present-day organizations are increasingly becoming conscious to be more ethical and transparent regarding their communication in a manner that their products/services will be acceptable to their audience, across geographies. Any compromise in this regard will sway the audience/public to alternative options.

III THE INFLUENCE OF THE CONSUMER

Specific techniques to reach the target audience/public may be drawn from the field of neuroscience/marketing to know the reasons as to why such people are influenced by specific messaging. They, the advertisers could use appropriate communication and messaging techniques that will possibly influence the target audience/consumers and for their better understanding too. There is a need to be alert to the subtlety in such kind of endeavors. The Public Relations Society of America (PRSA) emphasizes on the importance of defining PR: "recognize the need to understand the attitudes and values of [their public] — and to develop effective relationships with — many different stakeholders, such as employees, members, customers, local communities, shareholders and other institutions, and with society at large."

Hence, there is an imperative to determine the most effective ways of communicating and messaging: the ones that are strongest and elicit positive feedback from the audience consumers. The drivers that influence people in/with their decision making has thus to be ascertained. The field of PR is offering exciting opportunities with emerging practices and technologies (social media) that will supplement the value-creating process in organizations. Nonetheless, the underlying imperative is to be ethical and transparent.

One such emerging area is the “neuromarketing”, drawn from neuroscience, an area that has drawn inspiration for all the PR practitioners. This area seeks to elicit the right type of response form the audience/consumers. Organizations that use neuromarketing techniques have audience/consumers who remember the communication/messages, which will be evident in their ability to “recall a product/service with ease”.

Therefore, the personnel who use neuroscience/marketing techniques must use appropriate action words that will elicit the desired response or a call to take action form the audience/consumers, which will drive the decision-making behavior.

The “advertisement copy” must seek to engage the audience/consumer in an imaginative manner that will lead to the desired action.

An anthropologist will most definitely vouch for such interventions, and will also advocate the impact of story-telling to be extremely influential. Therefore, the advertiser has to create a story and sell the product/service around that, as the story will be infused with mystique. Over a period of time, such story-telling must adopt various variants to be more impactful.

IV THE PROPOSITION

PR strategies are potentially influenced by neuroscience/marketing techniques since the advertiser seeks to have a better understanding of the audience/consumer. This becomes his/her ultimate objective, of understanding them better than before. So, such PR strategies must be fine-tuned to get the message across, effectively and well.

V NANO TOOL

With the advent of social and digital media, the real-world-face-to-face communication with eye-contact, body language, etc have become extinct, due to which the communication/message is/are failing to create the desired impact. Neuroscience research has uncovered specific ways that one can fine-tune the message — whether it’s giving performance feedback, persuading the team to embrace a change initiative, or selling a product or service — to make sure others listen, attend to the message, and act on it.

VI THE RECOMMENDATION AND PRINCIPLES

A time-tested and effective way for connecting with the audience/consumers is to establish eye-contact and mirroring the audience/consumer being alive and miming the audience/consumer. This will potentially result in a synchronization of the brain waves that will lead to a positive engagement, good rapport which will lead to a positive feedback/decision-making.

Behavior Modification Research co-authored by Emily Falk, a Professor of Communication, Psychology, and Marketing at the University of Pennsylvania’s Annenberg School for Communication, shows that difficult messages are met with a natural self-defensive impulse that can block understanding. To combat that, Falk and fellow researchers asked people to think about things that mattered most to them (like family, friends, or spirituality) or to repeatedly wish for the well-being of other people (both close contacts and strangers).

VII KEEP IT SIMPLE

Brain synchrony is hindered by complexity. Hence, the need to keep the communication/message simple. Research on movie trailers by Moran Cerf at Northwestern's Kellogg School of Management found that the most effective ones, in terms of creating brain synchrony and driving ticket sales, had the fewest spoken words and the fewest faces and other stimuli on the screen. Simple communication/messages are easy to understand, and more likely it is to be remembered. In the book *Made to Stick*, researchers Chip and Dan Heath, offer six principles for making ideas understood and remembered, and the first is simplicity. But, they argue, it's not just "short and sweet." The Heaths say it's about communicating an essential core, something that's both simple and profound.

VIII THE PITCH

Wharton's Jonah Berger and Alex Van Zant of Rutgers Business School found that speaking slightly louder than normal and varying your overall volume increases the perception of your confidence, which in turn makes you more persuasive. "There's work that shows people seem more human when we hear their voice. We give them more sense of mind, we think of them more as real people when they use their voice. Our research also suggests it can make people more persuasive," writes Berger.

IX PROVIDE FEEDBACK

A study led by Tessa West and Katherine Thorson of New York University used heart-rate monitors on subjects while they were engaged in giving or receiving unprompted feedback. Although the participants were uncomfortable asking for feedback, doing so helped equip them to hear and process it. Their innate "threat response" was lower. Before you deliver some potentially hard-to-hear feedback, schedule a meeting and ask the employee to evaluate you and how well you are supporting him or her in their development and current role. It's vital that you listen uncritically, take your time responding, and even use mirroring by repeating the feedback in your own words ("Let me make sure I understand what you said").

X THE PRACTICALITY IN COMPANIES

Audience is always a core value of the company/institution. So, avoiding difficult conversation is imperative to success. Focus may also be on how the audience contributes to the greater good of the organization, including participating in a number of organizational initiatives.

It is known that the world's simplest organizations have the most loyal customers, and consequently a higher revenue. Organizations may encourage honest opinion(s) from the customers and hence will also have higher engagement-levels with them.

XI THE FINAL THOUGHT

The PR professionals need to do is see the bigger picture of what is happening in the marketing profession, and recognize the niche for the discipline, and look to see how the brain reacts to specific crisis communication messages, and how communicators can adapt their messages to make sure that they are the most effective. The Higher Educational Institutions can adopt the same principle in marketing their educational programs, depending upon the location, age, gender, and the specialisms offered, and keep changing the approach from time-to-time. Neuroscience/marketing in PR is, thus, an emerging area that seeks to identify all the elements of the brain scientifically and correctly to benefit the stakeholders.

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NCSTEM 2023

This book is organized into four distinct sections, each dedicated to a specific field: Computer Science and Engineering, Electrical Engineering Electronics and Telecommunication, Master of Business Administration. These sections comprehensively cover a wide array of topics within Science, Technology, and Management. The overarching goal of this book is to inspire and ignite a passion for research culture among students and faculty members across these diverse streams. It aims to encourage and empower individuals, fostering an environment that cultivates curiosity, innovation, and scholarly pursuits.

SVERI, a charitable Trust, embarked on its ambitious missions on a rural development project, has established its first ideal Engineering College in Pandharpur. The college is approved by All India Council for Technical Education (AICTE), New Delhi and the Government of Maharashtra. The Engineering College has achieved remarkable recognition, being accredited by the esteemed National Assessment and Accreditation Council (NAAC) with A+ Grade having 3.46 CGPA. Along with the ISO 9001:2015 certification. Furthermore, the college has gained recognition from the Institution of Engineers (India), Kolkata, further validating its academic excellence and commitment to engineering education. The college offers a diverse range of courses, including B.Tech programs in Mechanical Engineering, Computer Science & Engineering, Electronics & Tele-communication Engineering, Electrical Engineering, and Civil Engineering. The institution also offers M.Tech programs in Mechanical (Design Engineering), Electronics & Tele-communication Engineering, Computer Science & Engineering, and Structural Engineering.

Additionally, the college provides Master of Business Administration (MBA) and Master in Computer Applications (MCA) programs, offering a comprehensive academic experience across various disciplines. The Institute is recognized by Punyashlok Ahilyadevi Holkar Solapur University Solapur, allowing candidates to pursue doctoral programs.