

*Proceedings of*  
***National Conference on Innovative  
Research in Science Engineering and  
Technology (NCIRSET-2024)***

***16<sup>th</sup> April 2024***

***ISBN: 978-81-964523-5-3***

***Organized by***

***DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION  
ENGINEERING***



"Empowerment through quality technical education"

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# Smart Restaurant System

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**ABSTRACT:** As the world is emerging towards new trends and technologies, there is a need to invent something that is more attractive and useful for the citizens. This project highlights the application of robotics in the food industry. In this new technological age, all jobs depend on a technology called automation. New research works are developed in the market instead of human workers being the fashion and new passion today. In this context, we develop the concept of the food serving robots (FSR) in this work. It required Arduino board and the Arduino IDE to build. This project is divided in to two parts, first one that consists of a digital menu made via MIT app inventor and Firebase database. Second segment is moveable robot that delivers the food to the customers table.

**KEYWORDS:** Android Application, IR Sensor, HC-05 Bluetooth Module, DC Motors, Arduino UNO Micro-controller.

## I. INTRODUCTION

Restaurant is a place where people come, sit and eat meals that are cooked and served by the chef and the waiters respectively. In traditional restaurant system orders are taken by a waiter and they bring the food when it is ready. After eating the food customers will pay the bill. This system relies on large numbers of manpower to handle customer reservation, inquiry about them, ordering food, placing order on table, reminding dishes of customer. Therefore, to improve the service quality for customers effectively by using advanced technologies has received much attention in recent years. Intelligent Restaurant it's all about getting all of your different touch-points working together connected, sharing information, personalizing experiences and speeding processes.

In today's restaurant Digital multi-touch menu cards and other forms of digital facility are replacing old fashioned services like-waiters can take order from customer and serve them. Intelligent Robot system delivers almost infinite flexibility in promoting meal and snack options. Intelligent Robot system uses technologies innovatively in a modern restaurant such as LCD, RF module, database & line following Robot to enhance quality of services and to enrich customer's dining experience. In our project we have also created two mobile applications one for the customers and second one for the chef. When customers enter our shop they open the app and give out their order and this order is received at the chef side via internet using firebase database that stores orders. At the chef side there is a separate application to which is connected with the robot by using that application we can give order to the robot to go to specific table after placing the order in the robotic system.

## II. PROBLEM STATEMENT

Creating a smart restaurant system involves integrating cutting-edge technologies such as an E-menu and an autonomous path-following waiter robot to revolutionize the dining experience. The E-menu, accessible via mobile devices, provides customers with a seamless interface to browse the menu, view dish details, and place orders effortlessly. Meanwhile, a robust backend order management system ensures real-time synchronization between the E-menu app and kitchen staff, enabling efficient order processing and tracking. The autonomous waiter robot, equipped with advanced sensors and communication capabilities, navigates the restaurant environment independently, delivering orders from the kitchen to designated tables. Integration of these components requires meticulous planning to establish seamless communication protocols and ensure efficient data flow. By prioritizing user experience and feedback, as well as providing comprehensive maintenance and support, the smart restaurant system aims to optimize operations, enhance customer satisfaction, and set new standards for dining establishments in the modern era.

## III. RELATED WORK

"Automated System for Restaurant Services" Riga Technical University, Riga, Latvia published a paper in 2021 in which The authors proposed a smart restaurant system that can automate the ordering, payment, and kitchen processes



using touchscreen devices, wireless networks, and data transmission technologies. The authors develop an application prototype that can reduce the service time by 52.76% compared to the manual service system. The authors suggest some possible ways to enhance the system, such as using robots, sensors, RFID, and IoT technologies to improve customer experience, inventory management, and food delivery.

Smart restaurant using waiter robot dept. of ECE, ksit (2023) published a paper. This research paper describes a smart restaurant system that uses an electronic menu and a waiter robot to improve the efficiency, convenience, and customer satisfaction of the restaurant. The system allows customers to browse and place orders using an LCD display with a 4X4 keypad, while the robot delivers food and drinks to tables. The system aims to reduce human contact and errors, but it also faces some limitations such as the cost of installation and maintenance, and the need for human staff to interact with customers.

Robots, Artificial Intelligence, and Service Automation in Restaurants(2019). The findings underscore the substantial advantages of robots, artificial intelligence, and service automation (RAISA) in restaurants. These technologies enhance efficiency, reduce labor costs, personalize customer experiences, and provide valuable data for decision-making. However, addressing cost constraints, technological limitations, and customer adoption challenges is essential for their successful implementation.

Robotic in Modern-Day Restaurants and its Impact on the Dining Experience. IMS Unison University, Dehradun India 248009 (2022) published a paper in which the authors studied the robotic restaurant experience in India, using online reviews as data. They found six factors influencing customer satisfaction: uniqueness, robotic experience, service quality, food quality, pricing, and ambiance.

They proposed a model for improving the dining experience and discussed the implications and limitations of their study.

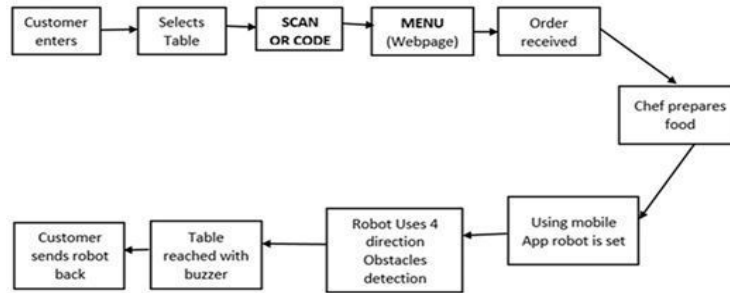
Restaurant Automation Technology for the Future.(2022) The findings underscore the substantial advantages of robots, artificial intelligence, and service automation (RAISA) in restaurants. These technologies enhance efficiency, reduce labor costs, personalize customer experiences, and provide valuable data for decision-making. However, addressing cost constraints, technological limitations, and customer adoption challenges is essential for their successful implementation.

Waiter Robot with Smart Ordering System(2022) The paper presents an autonomous waiter robot with Arduino, QR code tech, and sensors, navigating via infrared and ultrasonic sensors. A Wix-based website facilitates contactless ordering and reservations. The lightweight aluminum chassis supports the system. Successful integration showcases potential for restaurant automation. Future work includes refining functionality and aesthetics, emphasizing continuous improvement.

#### **IV. PROPOSED SYSTEM (METHODOLOGY)**

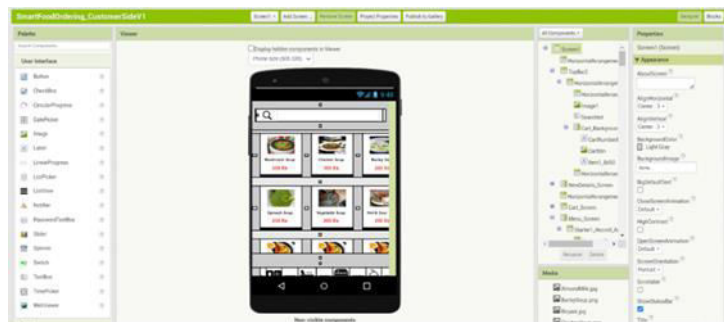
We propose a smart restaurant system designed to revolutionize the dining experience through the integration of mobile technology and robotics. Our system consists of an Android application for streamlined food ordering and an Arduino-based robot tasked with delivering orders from the kitchen to designated tables. The Android application serves as the primary interface for customers, providing them with a user-friendly platform to browse the menu, place orders, and make payments seamlessly. Meanwhile, the Arduino-based robot autonomously navigates predefined paths within the restaurant, equipped with sensors for obstacle detection and navigation to ensure safe and efficient order delivery. Through this integration, our proposed system aims to optimize restaurant operations, minimize wait times, and enhance customer satisfaction.

Our research paper will delve into the technical details of each component, the implementation process, and the potential impact of our system on the hospitality industry.



## V. SOFTWARE AND HARDWARE INTERFACE

**Android Application :** In our smart restaurant system, the Android application serves as the primary interface for customers to explore the menu, place orders, and track their delivery. Developed using MIT App Inventor, the application provides a user-friendly experience, allowing customers to browse through various dishes, view descriptions, and customize their orders effortlessly. While payment processing is not facilitated directly within the app, customers can conveniently settle their bills through traditional payment methods upon dining completion. The Android application seamlessly integrates with the backend system, ensuring smooth communication between customers and the restaurant staff for efficient order processing and delivery.



**Firestore Backend :** Firestore serves as the robust backend infrastructure responsible for facilitating real-time communication and data management. Leveraging Firestore's real-time database capabilities, orders placed by customers through the Android application are instantly transmitted to the kitchen staff for prompt processing. Additionally, Firestore Authentication ensures secure user authentication, safeguarding sensitive information and enhancing data privacy. Moreover, Firestore Cloud Messaging enables instant notifications, keeping customers informed about order status updates throughout the dining experience. With Firestore as the backbone of our backend system, we ensure scalability, reliability, and responsiveness, crucial for optimizing restaurant operations and enhancing customer satisfaction.

**Communication :** Communication between the customer-side application and Firestore, and subsequently the chef-side application, is integral for order processing. Customers utilize the application to place orders, which are then seamlessly transmitted to Firestore's real-time database. This database acts as a conduit, ensuring that orders are promptly relayed to the chef-side application for preparation. Through this streamlined communication, chefs receive real-time notifications of incoming orders, enabling efficient preparation and timely delivery of meals to customers.

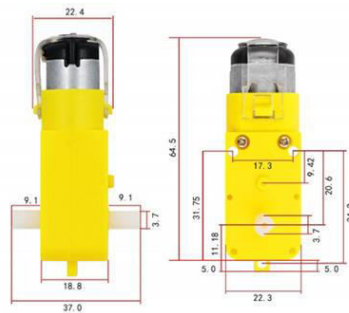
Similarly, in the hardware-software interface, communication between the Android application and the Arduino-based robot is facilitated by a HC-05 Bluetooth module. Commands initiated by the application, such as specifying the destination table for order delivery, are wirelessly transmitted to the Arduino controller via the Bluetooth module. Upon receiving these commands, the Arduino controller orchestrates the robot's navigation, guiding it along predefined paths within the restaurant to the designated table. This seamless communication ensures effective coordination, enabling the robot to efficiently fulfill its role in delivering orders and enhancing the overall dining experience for customers.

**Arduino mega :** In our smart restaurant system project, we employ the Arduino Mega as the central control unit for our autonomous food delivery robot. With its enhanced processing power and expanded I/O capabilities, the Arduino Mega efficiently manages various tasks, including receiving commands from the mobile application via the HC-05 Bluetooth



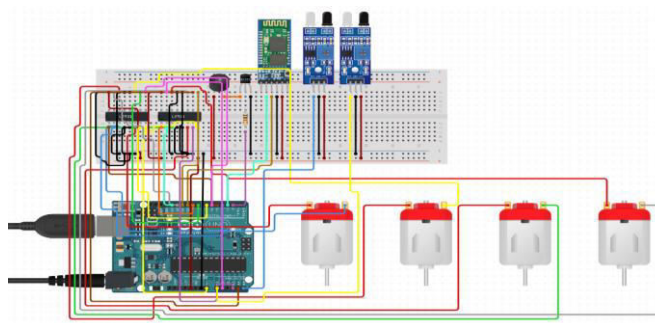
sensors, improving the accuracy of obstacle detection by the Arduino Mega controller. This amplified signal enables the system to effectively identify obstacles in the path of the food delivery robot, ensuring safe navigation within the restaurant environment. With its reliability and versatility, the LM358 enhances the overall performance and efficiency of our autonomous food delivery system, contributing to a seamless dining experience for restaurant patrons.

**BO Motors :** The BO (Brushed DC) motors are pivotal in our smart restaurant system, serving as the primary propulsion mechanism for the food delivery robot. These motors provide the necessary torque and rotational motion required for the robot's movement across the restaurant floor. Coupled with wheels, the BO motors enable smooth and precise navigation to designated tables for order delivery. Their compact size, affordability, and compatibility with motor driver modules make them an ideal choice for our project, ensuring reliable and efficient operation of the food delivery robot within the restaurant environment.



## **VLSYSTEM ARCHITECTURE AND WORKING PROCEDURE**

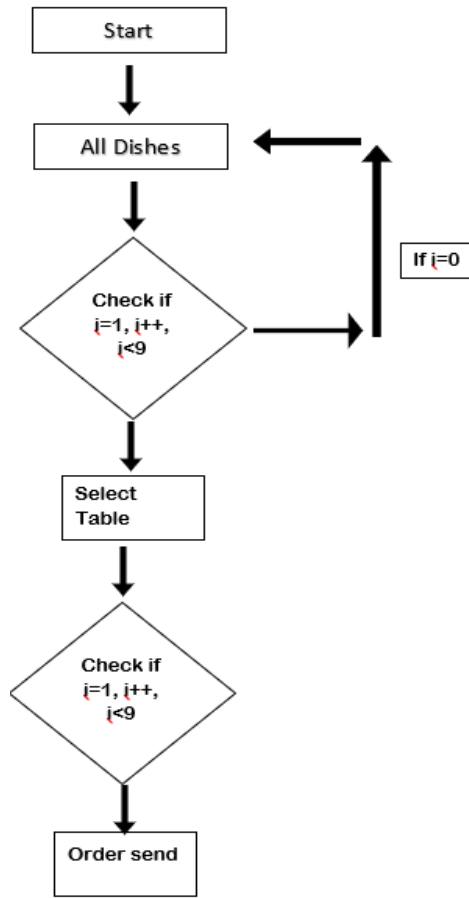
**System Design :** In our smart restaurant system project, the system design intricately blends hardware and software components to create an autonomous food delivery solution. The customer-facing Android application, crafted with MIT App Inventor and backed by Firebase, empowers patrons to effortlessly navigate the digital menu, place orders, and make payments. Meanwhile, Firebase ensures seamless communication between the application and the backend, expediting order processing and transmission to the chef-side application. On the hardware front, the Arduino Mega governs the food delivery robot's operation, integrating the HC-05 Bluetooth module for wireless communication, IR sensors for obstacle detection, and BO motors for precise movement control. This holistic design approach prioritizes reliability, efficiency, and user satisfaction, aiming to streamline restaurant operations and elevate the dining experience for patrons.



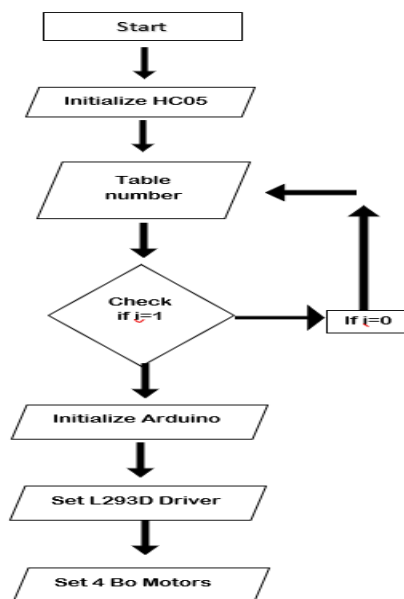




Digital Menu Flow Chart :



Arduino Software flow chart :

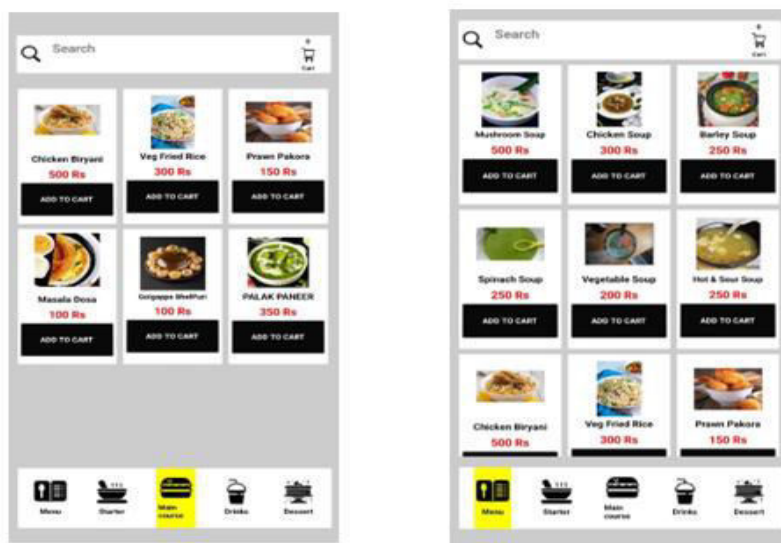


## VII. HARDWARE WORKING DETAILS

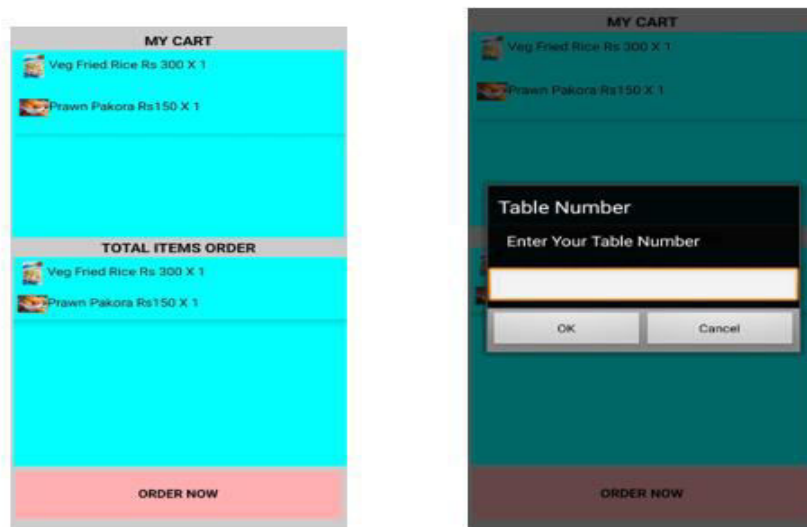
Hardware details: - In this project we have used Arduino Uno for controlling purposes and 4 Bo Motors along with wheels for movement and also HC 05 for communication between mobile application and hardware. In this project we have also used IR sensor modules for detection of any obstacles.

Working: -

Digital Menu: - By using MIT app inventor & Firebase database we have created this digital menu which currently has 8 dishes, this number can be increased or decreased according to the restaurants. In our project we have developed 2 applications. 1 for chef and another for the customer. When customer selects the dish it then transferred via internet and stored on cloud Firebase data base and then transferred to the chef and then chef can start preparing the dish and after completing it, he can load all that to the robot and transfer it to the customer we have ordered.



**Fig . Customer Side Application**



**Fig. Chef side application**

Robot :- Now starts the important elements of our project i.e automatic food distribution in hotels. In this part when the chef prepares a dish and gives a command for that specific table i.e. (Table 1, Table 2, Table 3). The robot

automatically starts moving and reaches its Destination table gives an alert using a buzzer which is available and when customers take their orders from the robot they have a switch which will give a command to the robot to return to the chef's stop. And this process continues for all tables. In this project we have only implemented 3 tables we can have n number of tables and destinations.

In this process of delivering the food at the customer's table if there are any obstacles available then the robot will stop, give an alert via buzzer, and wait for clearance. The front and back IR modules are responsible for all kinds of obstacle detection.



**Fig. Food Delivery robot**

## **VIII. CONCLUSION AND FUTURE WORK**

Our smart restaurant system project represents a successful integration of innovative technologies to enhance the dining experience for customers and optimize restaurant operations. Through the development of a customer-facing Android application and an autonomous food delivery robot, we have created a seamless platform for browsing menus, placing orders, and delivering meals. The robust communication between the application and the backend, coupled with efficient obstacle detection and navigation capabilities of the robot, ensures smooth and reliable operation within the restaurant environment. This project demonstrates the potential of technology to revolutionize the hospitality industry, offering a glimpse into the future of automated service and customer interaction.

### **Future Work:**

Moving forward, there are several avenues for further development and enhancement of our smart restaurant system. One potential area of focus is the refinement of the user interface and functionality of the Android application, incorporating features such as personalized recommendations, order tracking, and loyalty programs to enhance customer engagement and satisfaction. Additionally, improvements to the obstacle detection system of the food delivery robot could be explored, utilizing advanced sensor technologies or machine learning algorithms to enhance accuracy and responsiveness. Furthermore, scalability and adaptability to different restaurant environments could be addressed, allowing for seamless integration of the system into a variety of dining establishments. Overall, future work on our smart restaurant system project aims to continue pushing the boundaries of innovation in hospitality technology, ultimately delivering a superior dining experience for customers and streamlining restaurant operations.

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# Weather Logger for Research and Education

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**ABSTRACT:** This paper presents a Weather Monitoring System (WMS) that employs IoT and cloud technologies. The WMS captures, records, and displays various weather conditions, such as temperature and humidity, using sensors. Sensor data is transmitted to the cloud for remote access, enabling users to receive real-time updates via a web interface. The system's key components include an Arduino UNO board, sensors, and a WIFI Module for data transmission. WMSs are crucial for monitoring and analyzing weather patterns, offering insights into environmental changes. The system stores data at regular intervals with timestamps for future analysis and provides real-time alerts for monitoring environmental parameters, including temperature, humidity, atmospheric pressure, wind speed, wind direction, air quality, light intensity, rainfall, and geographical coordinates.

## I. INTRODUCTION

A weather logger is a device designed to record and store weather data for research and educational purposes, aiding in the study of weather patterns, climate change, and environmental phenomena. These loggers vary in complexity, with basic models recording temperature, humidity, and rainfall, while more advanced versions can capture additional data such as wind speed and direction, barometric pressure, and UV radiation. Weather loggers find utility in various research fields, including meteorology, climatology, and hydrology, enabling the study of weather patterns at different scales and monitoring the impacts of climate change on ecosystems. Additionally, weather loggers serve as valuable educational tools, fostering learning about weather and climate in science classrooms and supporting citizen science projects by collecting data from diverse locations.

## II. AIM

To implement a comprehensive weather logging system to enhance meteorological and climatology education and research.

## III. PROPOSED SYSTEM

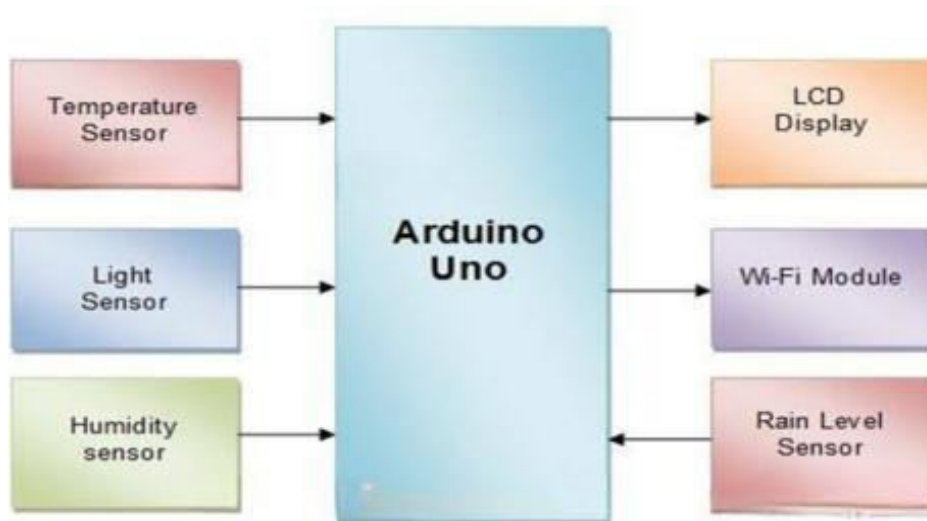


fig.1 block diagram of weather logger with education and research



The primary controller, managed by the Arduino UNO, independently governs each component of the system. An LCD display directly showcases the sensor data, providing real-time updates. The DHT11 sensor, functioning based on Arduino code, measures local temperature (T) and humidity (H). The Wind Speed meter generates power, directed to pin A1 of the Arduino board to calculate Wind Speed using predefined formulas in the Arduino code. The LDR module measures light on the photoresistor, displaying readings based on the Day/Night cycle. The connection scheme of the system illustrates how components are linked. Each component requires a 5V and GND connection from the Arduino board. Initially, the DHT sensor measures temperature (T) in degrees Celsius and humidity (H) in percentage, sending data directly to the display and indirectly to the microcontroller's I/O monitor. Additionally, the Wind Speed meter concurrently measures wind speed.

#### **IV. WORKING PRINCIPLE**

A Weather Logger with Education and Research aims to collect weather data for educational purposes and scientific research. The working principle typically involves several components:

1. **Sensors:** Various sensors are employed to measure different weather parameters such as temperature, humidity, air pressure, wind speed, wind direction, precipitation, UV index, etc. These sensors are strategically placed in an outdoor environment to capture accurate data.
2. **Data Collection:** The sensors continuously collect weather data at regular intervals. This data is then transmitted to a central processing unit or data logger.
3. **Data Logging:** The central processing unit or data logger collects the data from the sensors and stores it in a database. The data logging system may also include a real-time clock to timestamp each data point accurately.
4. **Data Analysis and Display:** The collected data can be analysed using software tools to generate various weather metrics, trends, and patterns. Additionally, the data can be displayed in real-time on a digital interface such as a computer monitor, smartphone app, or a dedicated display panel.
5. **Education and Research:** The collected weather data serves as a valuable resource for educational purposes in schools, universities, and research institutions. It can be used to teach students about meteorology, climate science, data analysis, and scientific research methods. Researchers can also utilize the data to study local weather patterns, climate change, and its impacts.
6. **Maintenance and Calibration:** Regular maintenance and calibration of the sensors and data logging system are essential to ensure the accuracy and reliability of the collected data over time. This may involve periodic sensor calibration, battery replacement, software updates, and physical inspection of the equipment.

#### **V. METHODOLOGY**

The Weather Logger for education and research utilizes various hardware components, including the Arduino UNO. Arduino is a platform intended for constructing computers capable of sensing and controlling physical elements beyond typical desktop computers' capabilities. It is an open-source platform centered around a simple microcontroller board, complemented by a development environment for programming. Arduino systems can function independently or interact with computer software like Flash, Processing, or Max MSP. The boards can be manually assembled or bought pre-assembled, and the open-source IDE is available for free download. The Arduino Uno, based on the ATmega328 microcontroller, features 14 digital input/output pins (with 6 usable as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains all necessary components to support the microcontroller, requiring only a USB cable for computer connection or an AC-to-DC adapter or battery for power.

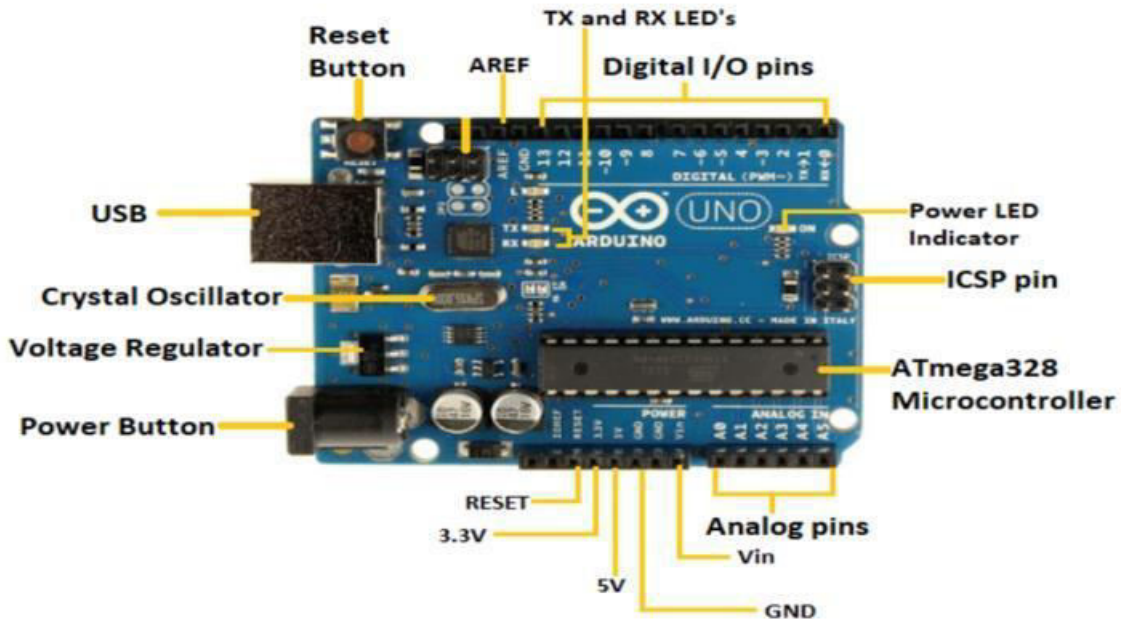


Fig .2 Arduino

Operating Voltage: 5v  
 Processor:16MHz ATmega328P  
 Input Voltage: 7-12v  
 Memory: 32k byte  
 Dimensions: 68.6mm x 53.4mm  
 USB: 2.0

- The Node MCU is an open-source IoT platform that utilizes firmware running on the ESP8266 Wi-Fi SoC from Expressif Systems, along with hardware based on the ESP12 module. It serves as a development environment for both software and hardware, centered around the cost-effective ESP8266 System-on-a-Chip (SoC).

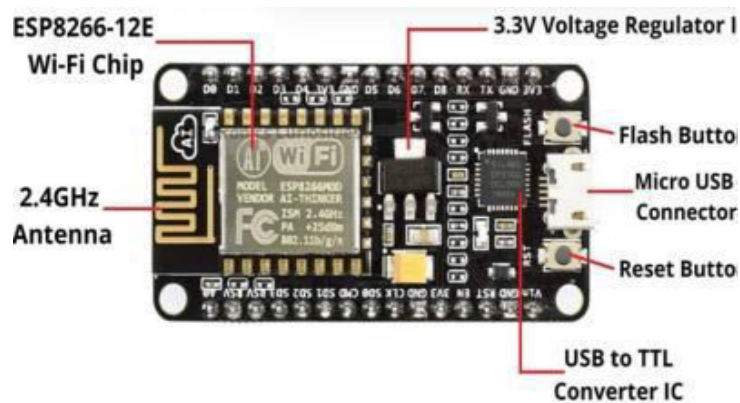


Fig.3 Node

MCU  
 Input voltage: 4.5v-10  
 Antenna: 2.4GHz  
 ADC range: 3.3v  
 Memory: 4MB / 64KB  
 Temperature Range: -40C- 125C  
 Dimensions: 49mm x 26mm

- The DHT11 Temperature and Humidity sensor is an affordable digital sensor created for detecting temperature and

humidity levels. It can be easily connected to various microcontrollers like Arduino and Raspberry Pi, allowing for real-time measurement of humidity and temperature. This sensor is offered in both standalone and module forms.

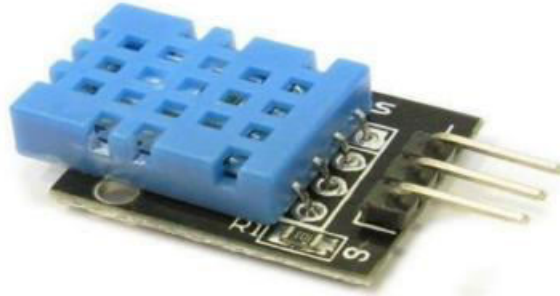


Fig.4 Temperature and Humidity sensor

- LCD Display:

The Liquid Crystal Display (LCD) is widely used for user interfaces and debugging in various devices. Character-based LCDs, which rely on controllers like Hitachi's HD44780 or compatible ones like HD44580, are particularly popular. These LCDs come in 1-line, 2-line, or 4-line variants with a single controller, supporting up to 80 characters. LCDs that exceed 80 characters typically employ two HD44780 controllers.

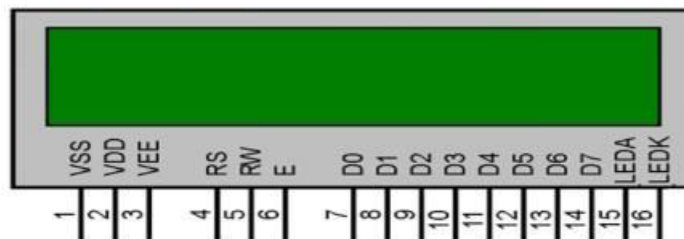


Fig.5LCD

Minimum logic voltage: 4.5 V

Maximum logic voltage: 5.5 V

Typical LED backlight voltage drop: 4.2 V.

Typical LED backlight current:120 mA

Supply current: 2 mA

- Wi-Fi Module:

For this setup, a small wireless transmitter or hub is necessary. It retrieves data from the internet via your home broadband connection and transforms it into radio waves, which it then broadcasts to establish a local area around itself. Commonly referred to as a Wireless Access Point (WAP), this transmitter allows devices with the compatible wireless adapter to receive these radio signals, creating a Wireless Local Area Network (WLAN). However, the range of the Wi-Fi signal is limited because of its relatively weak radio signals, typically covering an average home and extending to the street directly outside, but not much farther.





Fig.6 Wi-Fi Module

Power supply: 3.3 Volts  
Consumption: 100 m Amps  
Input/Output voltage: 3.6 Volts  
Range: 50 meters  
Dimensions: 30 x 20 x 3

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# River Cleaning Bot Using IOT

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**ABSTRACT:** The design and development of River Cleaning and Monitoring Systems (RCMS) are reviewed in detail in this study in order to meet the growing environmental problems related to river pollution. The Study includes developments in autonomous vehicles, remote sensing applications, and sensor technologies that allow for dynamic river health evaluation and real-time data collection. The application of robotics, such as underwater drones and Unmanned Aerial Vehicles (UAVs), is being investigated to automate the removal of pollutants. With the use of renewable energy sources and environmentally friendly products, RCMS places a strong emphasis on environmental sustainability. A promising path for revolutionizing river restoration efforts is provided by the synthesis of cutting-edge technologies and sustainable practices in RCMS design. This approach also provides insightful information for researchers, policymakers, and environmental practitioners involved in reducing the negative effects of human activity on essential water ecosystems

**KEYWORDS:** RCMS, Sensors, Pollution, River Restoration & Ecosystem.

## I. INTRODUCTION

River cleaning systems are an essential technological answer to the growing problems that human pollution in aquatic ecosystems is posing. These systems use a variety of strategies and cutting-edge technologies—like sensor networks, artificial intelligence, and autonomous cars—to actively monitor, evaluate, and lessen the negative effects of pollution on rivers. The principal aim is to maintain and improve the well-being of these marine environments by effectively eliminating physical detritus, impurities, and pollutants. River cleaning systems ensure a more sustainable and methodical approach to maintaining water quality by utilizing a variety of mechanical, robotic, and autonomous devices for targeted interventions. A dedication to environmental sustainability is further emphasized by the incorporation of renewable energy sources and eco-friendly materials. River cleaning systems are essential for protecting the biodiversity and biological balance of rivers in the face of escalating environmental concerns. They also help to solve the pressing demand for comprehensive and creative solutions to water pollution.

### 1. Classifications of river cleaning system

River cleaning systems (RCS) are categorized according to a range of factors, including the many technologies and techniques used to maintain and repair river environments. One of the main criteria for classification is the technology that these systems use. One type of system is mechanical, which uses physical tools like skimmers, dredgers, and conveyor belts to clear the riverbed and surface of debris and pollutants.

### 2. Different operational modes for river cleaning system

Unmanned Aerial Vehicles (UAVs), Unmanned Surface Vehicles (USVs), and underwater drones are examples of autonomous vehicles in another category. These self-governing systems are intended to perform automatic duties related to cleaning and monitoring. Furthermore, a few river cleaning systems concentrate on sensor technology, using a range of sensors—including water quality sensors—for ongoing evaluation without the need for direct physical intervention.

The way these system function is another important factor for classification. Cleaning systems are made expressly to remove impurities, pollutants, and physical debris from river environments. In contrast, monitoring systems prioritize the acquisition and examination of data in real-time to evaluate the general health of rivers, their pollution levels, and the quality of the water, all without requiring direct cleaning intervention.

Another consideration for classification is the scope of the business. Large-scale river cleaning, encompassing vast areas and solving pervasive pollution issues are the goals of macro-level systems. Conversely, micro-level systems are designed for targeted cleaning and monitoring in smaller river segments or specific pollution locations.



Fig.1 River cleaning system

The classification of power sources makes a distinction between renewable energy sources and conventional power. Whilesome river cleaning systems prioritize sustainability by integrating eco-friendly power sources like solar, wind, or hydro energy, others rely on conventional power sources like electricity or fossil fuels.

One important classifying factor is operational autonomy. In order to maintain control and make decisions during cleaning and monitoring operations, manual systems need human operators. Autonomous systems, on the other hand, use automation and artificial intelligence to make decisions on their own and carry out tasks independently.

Some river cleaning systems put an emphasis on eco-friendliness by using biodegradable materials, bio inspired designs, and sustainable procedures in order to minimize their negative effects on the environment. On the other hand, conventional systems might make use of conventional tools and materials without giving ecological sustainability any thought.

## **II. EMBEDDED INTEGRATED RIVER CLEANING SYSTEMS**

Technology integration affects classification. Some systems use artificial intelligence (AI) for data analysis and decision-making and the Internet of Things (IoT) for connectivity. Others use robotics to accomplish duties like cleaning and monitoring. These classifications provide a thorough framework for comprehending the wide range of river cleaning systems available, assisting practitioners, policymakers, and researchers in choosing or creating systems that are suited to particular operational needs and environmental challenges.

## **III. RCMS METHODOLOGY**

Cleaning rivers using a chain conveyor with a DC motor for dirt collection, along with a monitoring system using a pH sensor, involves several steps and considerations. Here's a general methodology to guide you through the process:

1. Initial Assessment:
2. Design of Chain Conveyor System:
3. Selection of DC Motor:
4. Integration of Dirt Collection Mechanism:
5. Installation and Testing:
6. pH Monitoring System:
7. Integration of Monitoring System:
8. Operation and Maintenance:
9. Environmental Considerations:
10. Continuous Improvement:

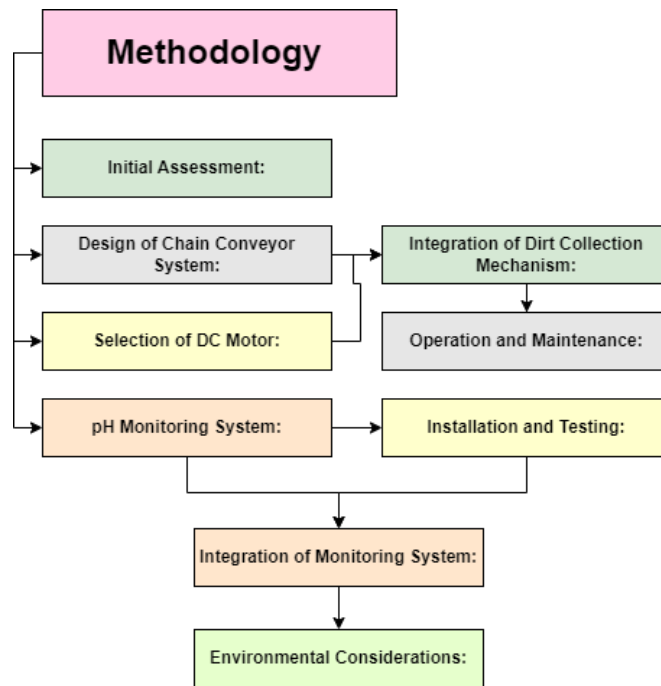


Fig.2 Rcms Methodologies

#### IV. WORKING

The river cleaning process begins with the deployment of a chain conveyor system equipped with a DC motor along targeted areas of the river. As the conveyor moves along the riverbed, it efficiently collects dirt and debris, pulling them onto the conveyor belt for transportation. Simultaneously, a monitoring system integrated with pH sensors strategically placed along the river continuously monitors the water's pH levels in real-time. This data is relayed to a central control station for analysis, enabling prompt identification of any potential pollution sources or environmental concerns. Operators oversee the cleaning operation, ensuring the conveyor system operates smoothly while also monitoring the pH levels to maintain water quality standards. This integrated approach not only effectively removes pollutants from the river but also enables proactive monitoring and management of water quality, contributing to the preservation and restoration of the ecosystem.

The system will have two types of implementations.

- Modal Development
- Code Development
- Modal development- the modal must float on the water with its frame and other waste + metal collecting mechanisms.
- The modal will run wirelessly using wi-fi or Bluetooth module.
- The system will have motor pulley mechanism with magnet to pull the metal content from underground river surfaces.
- The system will have Ph sensor to measure the Ph Value of the water connected to Arduino. Also metal sensor for metal identification inside the underground surface of river.
- Code development – to make the modal wirelessly we require embedded modules. They are motors and drivers to create motion in waters, sensor reading, and IOT data storing systems etc.

#### V. RCMS SURVEY

Ahmed Shabbir Khan [1] The majority of Mumbai's industries are found close to lakes, rivers, and oceans. Thousands of industries also surround the Mithi River. residential and business districts. This results in an increase in the Mithi River's water pollution level as well as a number of serious environmental issues and contamination in the river's natural ecosystem. The discharge of untreated water into a river has a detrimental effect on the quality of the water, resulting in



a much lower level of water compared to the international standard. Over 20 times the water standard amount of contamination in rivers has been quickly raised by unlawful and untreated industrial and commercial effluents. Almost all rivers are often found to be contaminated by different human activities. One of the most contaminated waterways is the Mithi River, which gets a lot of pollutants and effluents from both legal and illicit industrial activity. 4. The river has several areas that are prone to flooding. The river may flood for a number of causes. The primary cause of the river's floods is tidal variation. Some of the main causes of the river's flooding problems are excessive siltation, unauthorized construction that reduces the river's capacity to hold water, increased runoff water gradients brought on by development and high-covering areas, obstructions to the drainage system caused by solid waste matter—mostly plastic—garbage dumping, shoddy structural design, etc. Flooding is a result of the Mithi River's high siltation process. More than twelve thousand cubic meters of silt and debris from the Mithi River should be excavated, according to a recommendation made by the Mumbai Metropolitan Region Development Authority (MMRDA).[1]

By Osiany [2] The objective of this study is to design and construct the AGATOR (Automatic Garbage Collector), an automated garbage collector that uses a rotor robot concept to effectively and efficiently counteract rubbish buildup in rivers with no flow. Design and construction is the implementation strategy. This approach entails demand analysis, the engineering, development, and testing of hardware and software, as well as the individual component requirements. The IC ATmega16 with a 5 volt voltage and a 1,1 mA current, the IC Driver with a 12 volt voltage and a 1,2 mA current, and the limit switch acting as the controller are the components used in the test results that are obtained using the AGATOR specification. Robot control system, actuator robot, sensor system, and mechanical robot are examples of support equipment for robots. The trash can can only hold a maximum weight of 5 kilograms. When taking out the trash, the robot moves at an average speed of 0.26 m/s.[2]

Mragank Sharma [3] The essential requirement for life on Earth is water. Even though there is 70% water on Earth, most of it is unfit for human consumption. Since clean water is needed for so many things, including drinking, bathing, cleaning, and cooking, there is a large demand for it. Water contaminants have the potential to seriously harm human health and even endanger lives. The primary purpose of the with the aid of claws, the automatic drainage system is designed to gather, move, and dispose of solid waste in the trash bucket. Papers, polythene bags, and empty bottles are among the solid waste materials found in drainage water. Blockages in the drainage system can result from contaminants in the drainage water. To prevent situations like this, it is necessary to periodically remove these pollutants to ensure that drainage water flows continuously. With the aid of the model, which uses a driving system to extract solid waste and dispose of it in a trash bucket, the drain may be continuously cleaned. The goal of this project is to start the system functioning efficiently. Every time an impurity is detected, this project automatically purges the drainage system's water supply. Additionally, to prevent blockages, chain-sprocket-driven claws collect and dispose of solid trash. In addition to lowering the risk to human life, it even lowers the cost of manual labor. [3]

Mr. Abhijeet. M. Ballade [4] Aquatic animals' lives are being hampered and put in risk due to the rise in water pollution caused by waste debris. Similar to this, aquatic creatures occasionally have a tendency to consume surface waste detritus, viewing it as food, which ultimately results in animal deaths. Because of the contaminated Water is where many of humanity's skin diseases are found. In an effort to lessen water pollution, we are developing river cleaning equipment. A "river cleanup machine" is a device that cleans up waste material from the surface of water and disposes of it securely. The river cleanup device in Nashik uses hydropower to remove rubbish, plastics, and other material from the Godavari River. This machine's primary purpose in this project is to remove waste particles from the water's surface and place them in the tray. The conveyor is arranged on a shaft and bearing support; the M.S. angle frame, which is welded to resemble a slope-facing machine part, has a bearing mounted on it and the shaft attached to a pedestal bearing. Waterwheels rotate due to hydropower; belt drives are used to transfer this power to the conveyer system. The conveyer gathers plastics, rubbish, and water debris from water bodies as it moves. [4]

Prof. N.G.Jogi ,Akash [5] The world's holiest river and India's national river, the Ganga River The Ganga River, often known as the Indian soul, is located in India. The current state of our national river, the Ganga, is shocking when we consider that around 29 core liters of sewage, full of toxins and pollutants, are dumped into it.[9] Tones of municipal solid garbage are also dumped by us. The Indian government is in charge of keeping rivers like Varanasi and Ahmadabad clean. We are all aware of the Ganga Abhiyan. Comparably, due to the large quantity of trash present in the lake water, the villages in every state in India that is connected to both small and large lakes and the majority of villages do not use the lake's water for daily use or for farming. Our first goal is to purify the lake's water, thus we're building an effective pedal-operated boat trash collection. Here, we are collecting trash from the lake using a pedal-operated boat that has a conveyor attached to it.[5]

Ganesh U L, Vinod [6] The idea put out in this research study is to use a mechanical drain cleaner in place of physical



labor to clean drains. Even though mechanical drainage is essential to all industrial applications these days, properly disposing of sewage from businesses and industries remains a difficult undertaking. Regretfully, drainage pipes are used for disposal. Human life may occasionally be lost while clearing obstructions in the drainage system. We developed our project to make effective use of this "mechanical semi-automatic drainage water cleaner" in order to control waste disposal and provide regular waste filtration in order to solve this issue and save human life. By encouraging waste management and clearing debris from the drainage system, the drainage system cleaner is a device that helps safeguard the environment against various environmental threats. If these wastes are not removed, they settle in residential areas where they are burned, contributing to climate change; alternatively, they clog drainage systems, resulting in flooding.[6]

Sheikh Md Shahid Md Rafique [7] The design and construction of the river trash cleaning machine are the main focus of this project. The study examined the current state of our country's waterways, which are overflowing with pollutants, hazardous items, garbage, and billions gallons of sewage. The Indian government has taken on the responsibility of cleaning rivers and has invested a significant amount of money in numerous major and medium-sized projects in different towns, including Ahmadabad, Varanasi, and the "Namami Gange" and "Narmada Bachao" rivers. This was taken into account when designing this equipment, which cleans the surface of river water. In the modern manufacturing world, nearly every step of the process is being streamlined to produce goods more quickly. Mass production relies heavily on automation. We built the remote-operated river cleaning device for this project. The primary goal of the initiative is to clean the river with less manpower and in less time. Using a motor and chain drive setup, we were able to automate the process of cleaning rivers for this project. Below is a list of some automation requirements. In this instance, the cleaning machine is controlled by an RF transmitter and receiver. Automation can be accomplished by several means such as computers, hydraulics, pneumatics, robots, etc. Among these, pneumatics provide an appealing avenue for automation at a low cost. [7]

Viki Sahebrao Bagul [8] The proposed paper represents the devices is place across drain so that only water flow through lower grids, waste like bottle, Etc. Floating in drain are lifted by teeth which is connected to chain. This chain is attached by gear driven by motor .When motor runs the chain starts to circulate making teeth to lift up. The waste materials are lifted by teeth and are stored in waste storage tank. The deplete squander water cleaner machine is planned and made by utilizing gear changing and shaft coupling rule. It comprise fundamentally DC equipped engine, shafts, squander expulsion plates, clean receptacle, course, sprocket and chains. Construction materials are effortlessly available, creates work (development and maintenance), simple to build.[8]

Rajendra Patil [9] Mechanical control techniques, such as harvesting, shredding, mowing, rototilling, rotovating, and chaining, entail the total or partial removal of plants. Hand harvesting, raking, and cut stump control are among the manual harvesting tasks that can be accelerated with mechanical control techniques. utilization of devices powered by motors (Haller 2009; Lembi 2009).

[10] Instead of eradicating the target species locally, these plant management strategies usually lower its abundance to non-nuisance levels. Today, a variety of equipment is used to manage and control aquatic vegetation. This equipment is made for different plant types, such as floating, submerged, and emergent vegetation, and is intended to operate in different aquatic settings, such as wetlands, open water, canals, and shorelines. One sort of barge used for a variety of jobs in rivers, lakes, bays, and harbors is the mechanized aquatic harvester, sometimes known as a "harvester." Harvesters are made to gather and discharge waste and vegetation up to six feet below the water's surface utilizing a conveyor system on a boom that can be adjusted to the proper cutting height. When the barge reaches capacity, chopped material is conveyed to a dumping site and offloaded using the conveyor. Cutter bars gather material and bring it aboard the vessel using the conveyor.[9]

## **VI. GAP IDENTIFICATION**

River cleaning utilizing a chain conveyor with a DC motor for dirt collection, coupled with a monitoring system incorporating pH sensors, represents an innovative approach to tackling water pollution and ecosystem preservation. Through this analysis concludes by highlighting the urgent need for creative and long-lasting solutions in the field of river cleaning systems. The research has examined a wide range of technologies and approaches, including sensor networks, autonomous cars, and mechanical systems. The synopsis of current research emphasizes the benefits and drawbacks of existing methods, highlighting the significance of comprehensive plans that give environmental sustainability a high priority in addition to pollutant removal



## VII. CONCLUSION

The conclusions drawn from this assessment highlight the necessity of continuing research and development in the field of river cleaning systems, since pollution caused by humans continues to pose a threat to the health of our rivers. Future systems could revolutionize river restoration efforts and make a significant contribution to the preservation of these important ecosystems by incorporating state-of-the-art technologies, improving operational autonomy, and emphasizing environmentally beneficial techniques. Because river cleaning systems are interdisciplinary, it is necessary for researchers, policymakers, and practitioners to work together to develop practical, scalable, and environmentally responsible solutions that will benefit current and future generations.

## VIII. ADVANTAGES OF THE RIVER CLEANING SYSTEMS

Automatic River cleaning and monitoring systems offer a transformative leap forward in river management, surpassing the limitations of manual cleaning methods. Their key advantages lie in operational efficiency, precision, and safety. Automated systems ensure continuous, round-the-clock monitoring, enabling swift response to pollution incidents and early detection of environmental threats. The precision of advanced sensor technologies and artificial intelligence-driven cleaning mechanisms enhances accuracy in pollutant identification and removal, reducing the risk of oversight. Additionally, by eliminating the need for manual labor in potentially hazardous conditions, these systems enhance safety for personnel. The scalability, adaptability, and potential for cost-effectiveness further underscore the advantages of Automatic River cleaning and monitoring systems, making them a sustainable and technologically advanced solution for preserving the health and integrity of our vital waterways.

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# **IOT Enabled RC Boat Water Pollution Monitoring Using GSM & GPS**

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**ABSTRACT:** In recent years, there has been a growing concern about ensuring access to clean and safe drinking water, particularly in rural regions where governmental effectiveness and population growth pose challenges. This innovative design addresses the need for cost-effective real-time monitoring of water quality, offering a solution beyond traditional methods like sampling and laboratory analysis. The system utilizes a wireless multi-sensor network to continuously measure and report the physicochemical properties of water, including electrical conductivity (EC), Total Dissolved Solids (TDS), and temperature. Unlike static monitoring stations, this design employs a remote-controlled boat suitable for diverse water bodies such as lakes, reservoirs, and canals, adapting to the varying parameters of water quality across different locations. The boat's streamlined housing minimizes water resistance while maintaining stability, allowing it to navigate efficiently using a 2.4 GHz protocol. Equipped with GPS technology, the boat's position is tracked and relayed in real-time via GSM communication, ensuring accurate data collection and reporting. All collected data, along with graphical representations, are made accessible through open-source IoT platforms like Blynk, providing vital information on water contamination levels and alerting to potentially hazardous conditions. This integrated approach offers a scalable and adaptable solution to monitor water quality in remote and challenging environments efficiently.

**KEYWORDS:** Total Dissolved Solvents, Electrical Conductivity, Temperature, Gsm Communication, Gps Technology, Blynk, Environment

## **I. INTRODUCTION**

In the contemporary world, environmental conservation and the sustainable management of natural resources have become imperative tasks. Water pollution poses a significant threat to ecosystems and public health, underscoring the need for innovative solutions that enable efficient monitoring and remediation. The project "IoT Enabled RC Boat Water Pollution Monitoring Using GSM & GPS" represents a pioneering endeavor aimed at leveraging cutting-edge technologies to address this critical environmental challenge. The concept of using remote-controlled (RC) boats equipped with IoT (Internet of Things) capabilities, GSM (Global System for Mobile Communications), and GPS (Global Positioning System) technologies for water pollution monitoring signifies a paradigm shift in environmental monitoring methodologies. This project integrates the principles of robotics, IoT, and telecommunications to create a versatile and effective tool for monitoring water quality in lakes, reservoirs, canals, and other water bodies.

The primary objective of this project is to develop an autonomous RC boat that can navigate water bodies while continuously assessing and transmitting real-time data on water quality parameters. By integrating IoT sensors into the boat's design, crucial metrics such as water temperature, electrical conductivity (EC), turbidity, and pH levels can be monitored remotely and with high precision. These sensors provide essential insights into the presence of pollutants, suspended solids, and changes in water chemistry, enabling prompt intervention and mitigation measures. Furthermore, the inclusion of GSM and GPS technologies in the RC boat's system architecture enhances its functionality and accessibility. The GSM module enables seamless communication between the boat and an online IoT platform, facilitating data transmission and remote monitoring from any location with cellular network coverage. This real-time data transmission capability is essential for timely decision-making and intervention in response to detected water quality anomalies. The GPS module integrated into the RC boat enables precise positioning and tracking of the vessel during monitoring missions. This feature not only ensures accurate data geotagging but also enhances operational control by providing real-time location updates to stakeholders. Additionally, the GPS functionality supports navigation and autonomous mission planning, allowing the RC boat to execute predefined routes for comprehensive coverage of target water bodies. The impact and relevance of the "IoT Enabled RC Boat Water Pollution Monitoring Using GSM & GPS" project extend beyond scientific innovation. By deploying autonomous monitoring systems capable of





continuously assessing water quality, stakeholders such as environmental agencies, researchers, and policymakers gain access to invaluable data for evidence-based decision-making and policy formulation. Moreover, this project CONTRIBUTES to broader efforts aimed at promoting environmental awareness and fostering community engagement in water resource management. The deployment of IoT-enabled technologies in environmental monitoring underscores the transformative potential of technology in addressing complex environmental challenges and advancing sustainable development goals.

## II. EVALUATION MODEL

The evaluation model comprises four fundamental elements: TP (True Positive), TN (True Negative), FP (False Positive), and FN (False Negative). TP denotes correctly identified actual samples, while TN represents accurately predicted negative samples. FP signifies the misprediction of positive samples, and FN denotes the misprediction of negative (or non-predicted positive) samples. Equations (1)–(4) encompass metrics such as Accuracy, F1-score, and Receiver Operating Characteristic (ROC) used to assess model performance. Accuracy gauges the alignment between predicted and actual outputs by computing the ratio of correctly predicted values to total predictions. The F1-score, a harmonic mean, combines precision and recall to gauge model accuracy. Recall measures the model's sensitivity to positive results, while specificity signifies the percentage of negative (undrinkable water) identifications. A higher area under the ROC curve (closer to 1) indicates better model performance. The Random Forest (RF) model, an essential tool in classification, integrates bootstrap aggregation and randomization. It comprises multiple decision trees without interdependencies, with each tree labeling new data points independently. RF excels in handling high-dimensional datasets with scattered or continuous data, processing them directly without normalization. RF employs weak learners like Classification and Regression Trees (CART) to select features and combines them to form a robust learner.

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN}$$

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

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

$$\text{F1 - score} = \frac{2 * \text{Precision} * \text{Recall}}{\text{Precision} + \text{Recall}}$$

Figure 1. Evaluation Formula.

## III. SYSTEM METHODOLOGY

### TDS (Total Dissolved Solvents) –

Total Dissolved Solids (TDS) is a crucial water quality parameter that refers to the total amount of dissolved inorganic and organic substances present in water. These substances can include minerals, salts, metals, cations (positively charged ions), anions (negatively charged ions), and other organic compounds. The composition of TDS in water can vary widely depending on the water source and surrounding geological and environmental factors. Common components of TDS include calcium, magnesium, sodium, potassium, chloride, sulfate, carbonate, and nitrate ions. Organic substances such as pesticides, herbicides, and industrial pollutants can also contribute to TDS. TDS levels are significant indicators of water quality and can impact various aspects of water use and consumption. High TDS concentrations can affect the taste, odor, and appearance of water, making it unpalatable for drinking and other domestic uses. Additionally, elevated TDS levels can lead to scale formation in pipes and water appliances, reducing their efficiency and lifespan. In terms of health implications, while TDS itself is not necessarily harmful, elevated

levels of specific ions within TDS can pose health risks. For example, high concentrations of sodium or chloride can be detrimental to individuals with certain health conditions, such as hypertension or kidney disease. Furthermore, the presence of certain contaminants within TDS, such as heavy metals or organic pollutants, can have adverse health effects upon ingestion. Monitoring TDS levels is essential for ensuring water quality and safety. Water treatment processes like reverse osmosis, distillation, and ion exchange are commonly employed to reduce TDS concentrations in drinking water to acceptable levels. Regulatory standards and guidelines exist to define safe TDS levels for different water uses, including drinking water standards established by health and environmental agencies.

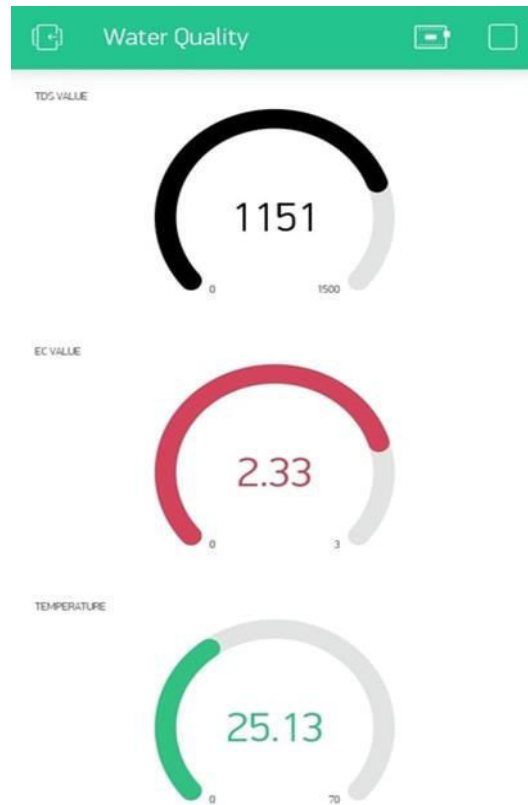


Figure 2. TDS Blynk Readings.

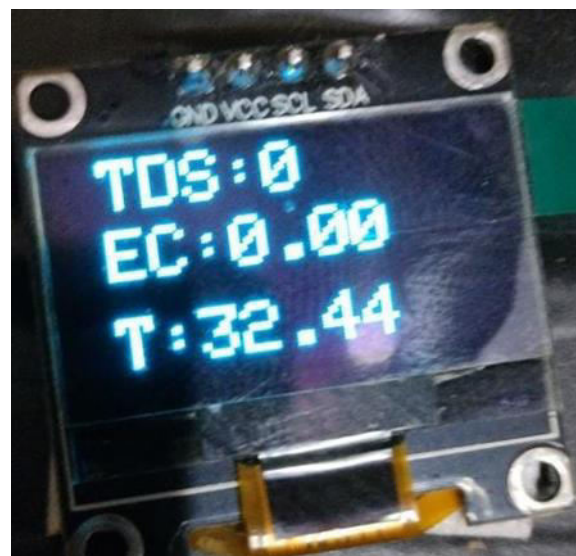


Figure 3. OLED Data Readings.

### **DS18B20 (Temperature Sensor) –**

The DS18B20 is a digital temperature sensor known for its accuracy, simplicity, and ease of use in various applications. Developed by Maxim Integrated, this sensor operates on the 1-Wire protocol, enabling multiple sensors to be connected to a single microcontroller pin, simplifying wiring and integration into electronic systems. One of the key features of the DS18B20 is its high precision. It can measure temperatures ranging from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  with an accuracy of  $\pm 0.5^{\circ}\text{C}$  within this temperature range. This level of accuracy makes it suitable for applications where precise temperature monitoring is critical, such as in medical devices, industrial automation, environmental monitoring, and HVAC systems. The DS18B20 sensor communicates temperature data digitally through the 1-Wire interface, which reduces the complexity of the wiring required. This interface allows several DS18B20 sensors to share the same data line, enabling efficient temperature monitoring in multi-sensor setups. Each DS18B20 sensor has a unique 64-bit serial code assigned during manufacturing, which helps in identifying and addressing specific sensors on the 1-Wire bus.

Another advantage of the DS18B20 is its low power consumption, which is beneficial for battery-operated devices or applications where power efficiency is crucial. The sensor can operate in a wide voltage range (3.0V to 5.5V) and consumes only a minimal amount of power during temperature conversion, typically around 1.5mA. Integration of the DS18B20 sensor into microcontroller-based projects is straightforward due to the availability of libraries and example codes for popular platforms like Arduino, Raspberry Pi, and ESP8266/ESP32. These resources simplify the process of reading temperature data from the sensor and incorporating it into various projects and prototypes.

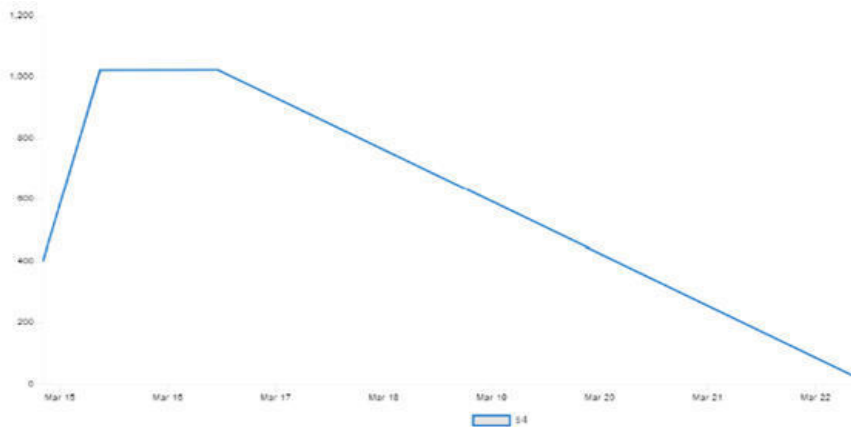


Figure 4. DS18B20 Graphical Readings.

## **IV. RESULTS**

Our project on "IoT Enabled RC Boat Water Pollution Monitoring using GSM & GPS" presents an innovative approach to addressing the challenges of water quality assessment in lakes, reservoirs, and canals. This discussion will analyze the results and implications of implementing such a system. Firstly, the integration of IoT technologies, specifically GSM and GPS modules, into an RC boat for water pollution monitoring has demonstrated promising results. By equipping the boat with sensors such as electrical conductivity (EC), turbidity, and water temperature sensors, we were able to collect real-time data on key water quality parameters. This data was transmitted wirelessly to an open-source IoT platform, providing accessible and timely information for analysis and decision-making.

One significant finding from our project was the effectiveness of remote monitoring enabled by the GSM module. The ability to receive real-time updates on water quality parameters directly on mobile devices via SMS notifications was instrumental in enhancing the efficiency of pollution monitoring. This feature allows stakeholders to promptly respond to any detected anomalies or pollution events, thereby contributing to proactive water resource management. Moreover, the GPS module integrated into the RC boat proved invaluable for tracking its movement and precisely pinpointing sampling locations. This capability ensures comprehensive coverage of water bodies during monitoring activities, enhancing the accuracy and reliability of collected data.

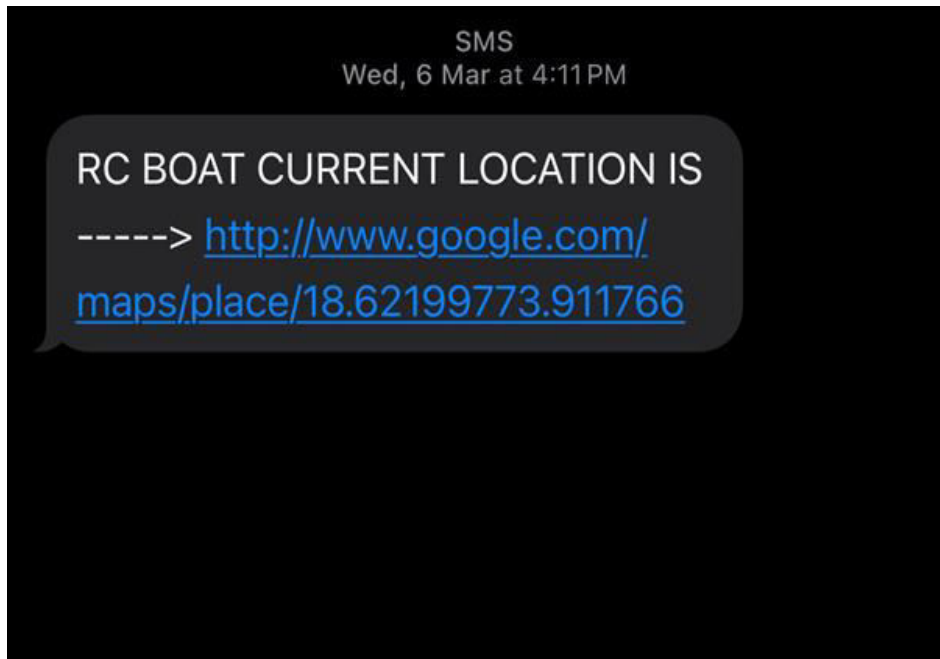


Figure 5. SMS Coordinate's.



Figure 6. Actual Prototype Model.

The combination of GPS tracking and remote data transmission via GSM provides a holistic solution for efficient and effective water pollution monitoring. In terms of sensor performance, our project utilized EC sensors, turbidity sensors, and water temperature sensors to assess water quality. These sensors demonstrated satisfactory accuracy in detecting pollutant levels and variations in water properties. Future iterations of this project could explore additional sensor types or enhancements to further expand the scope and depth of water quality assessment.



Furthermore, the open-source IoT platform used in our project facilitated data aggregation, visualization, and analysis. This centralized platform serves as a valuable tool for researchers, policymakers, and environmental agencies to access comprehensive water quality data and derive actionable insights for pollution management strategies.

## V. CONCLUSION

In conclusion, the development of an IoT-enabled RC boat for water pollution monitoring using GSM and GPS technology represents a significant advancement in environmental monitoring and management. This project has successfully demonstrated the feasibility and effectiveness of employing remote-controlled boats equipped with sophisticated sensors and communication modules to assess water quality in lakes, reservoirs, and canals. One of the key achievements of this project is the integration of various sensors such as EC, turbidity, and water temperature sensors, enabling real-time detection and measurement of pollutant levels and water quality parameters. The use of IoT technology allows for continuous monitoring and data collection, providing valuable insights into the health of water bodies over time. By transmitting this data to an open-source IoT platform online, stakeholders and environmental agencies can access up-to-date information for informed decision-making and timely intervention. The incorporation of GPS and GSM modules has further enhanced the functionality of the RC boat by enabling precise tracking and remote control capabilities. The GPS module (Neo 6M) facilitates accurate location tracking of the boat during monitoring operations, ensuring comprehensive coverage of the target water bodies.

Meanwhile, the GSM module (SIM800) enables real-time communication by sending SMS notifications to designated recipients, providing instant updates on the boat's location and monitoring status. From a practical standpoint, this project offers a scalable and cost-effective solution for water pollution monitoring, particularly in areas where manual monitoring is challenging or resource-intensive. The RC boat's autonomous operation reduces the need for human intervention, thereby optimizing efficiency and minimizing operational costs. Moreover, the open-source nature of the IoT platform promotes collaboration and knowledge sharing among stakeholders, fostering a community-driven approach to environmental stewardship. Looking ahead, the successful implementation of this IoT-enabled RC boat for water pollution monitoring sets a precedent for future innovations in environmental sensing and data-driven decision-making. As technology continues to evolve, there is immense potential to further enhance the capabilities of such systems and leverage data analytics for predictive modeling and early warning systems. Ultimately, this project underscores the transformative power of IoT and remote sensing technologies in safeguarding our precious water resources and advancing sustainability efforts globally.

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# Resume Parsing Web-App Using AI

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**ABSTRACT:** Agencies and various high-level firms must deal with a large number of new jobs seeking people with various resumes. However, managing large amounts of text data and selecting the best-fit candidate is more difficult and time-consuming. This paper provides an overview of an ongoing Information Extraction System project that helps recruiters in identifying the best candidate by extracting relevant information from the resume. This project presents a system that uses Natural Language Processing (NLP) techniques to extract minute data from a resume, such as education, experience, skills, and experience. The recruiting process is made easier and more efficient by parsing the resume. The proposed system is made up of three modules: an administration management system, File upload and parser system, and an information extraction system. The administrator will upload the applicant's resume into the system, and the relevant information will be extracted in a structured format. Using the parsed information from the Resume, HR can select the best candidate for the job based on the company's needs.

**KEYWORDS:** AI-Powered Resume Parsing, Information Retrieval, Entity Recognition, Keyword Extraction, Text-Analysis.

## I. INTRODUCTION

Daily, corporate firms and recruiting agencies have to process a large number of resumes. Working with a large volume of text data is usually time consuming and stressful. Data gathered from different resumes can be in a various form, including .pdf, .docx, single column resumes, double-column resumes, free formats, and so on. And these formats might not be suitable for the particular application. So, questions may arise in our mind that, what is resume parsing? The process of converting the unstructured form (.pdf/ .docx / .jpeg etc.) of resume data into a structured format is known as resume parsing.

Subsequently, converting a resume into prepared text or structured information makes studying, analyzing, and comprehending easier. As a result, many organizations and institutions depend on Information Extraction, where unstructured data and vital information are extracted and converted to make information more readable and organized data forms. The completion of this task takes a long time for humans. So, it is necessary to develop an automated intelligent system that can extract all relevant information to determine whether an applicant is suitable for a particular job profile (Kurama, 2021).

The foundation of this project is a resume automation system. Concerning the project, there will be an admin panel at first, into which the administrator must initially log in. Following that, there will be a section for uploading gathered CVs, which the admin will manage. After that, Regex, NLTK, and Spacy's phrase matcher will extract necessary information such as Name, Address, Email, phone number, Nationality, Skills [Hard Skills, Soft Skills], Education, Experience, Experience Year, Languages etc. in json format. Finally, the extracted information or dump JSON file is saved in the database by admin if necessary.

## II. SYSTEM MODEL AND ASSUMPTIONS

The system model for the "Resume Parser App Using AI" encompasses several key components and processes to efficiently extract and manage information from resumes. At its core, the system receives resumes in various formats such as PDF, DOC, or TXT as input. These resumes are then processed by a parser module equipped with artificial intelligence and machine learning algorithms. The parser module employs natural language processing (NLP) techniques to analyze the content of resumes, extract relevant information such as personal details, education history, work experience, and skills, and organize it into a structured format. This structured data is then stored in a database for easy access and retrieval. The system also includes an output interface that allows users to access the parsed resume data in a convenient format, such as JSON or CSV, for further analysis or integration with other applications.



Assumptions underlying the system model include the expectation of consistent formatting within resumes, ensuring that the parser module can effectively extract information regardless of minor variations in layout or structure. Additionally, it assumes that the text quality of resumes is sufficiently high, with legible content and minimal noise or formatting issues that could hinder the parsing process. The system operates under the assumption that resumes are primarily in the English language, though provisions may be made to support other languages in future iterations. It also assumes the availability of a suitable amount of training data for the AI and ML models powering the parser module, enabling accurate extraction of information across a diverse range of resumes. Finally, the system is designed with scalability in mind, capable of handling a large volume of resumes efficiently to meet the demands of users processing resumes in various contexts, such as recruitment agencies or human resources departments.

### **III.EFFICIENT COMMUNICATION**

Incorporating the theme of "Efficient Communication" into the development of your "Resume Parser App Using AI" entails optimizing the interface and functionality to streamline communication between users and the application. One approach could involve implementing real-time feedback mechanisms within the app to guide users through the resume parsing process, offering suggestions for improving readability, formatting, and alignment with job descriptions. Customization options for output formats can further enhance efficiency, allowing users to tailor the presentation of parsed resume data to their specific needs, whether for internal use or external sharing.

Integration with communication tools is another avenue to explore, enabling seamless sharing of parsed resume data directly from the app to email clients or messaging platforms. This feature facilitates swift collaboration among team members, recruiters, and hiring managers, enhancing the efficiency of communication workflows throughout the recruitment process. Moreover, the app can leverage AI-driven automation to generate personalized responses to candidates based on the parsed resume data, facilitating prompt and relevant communication without manual intervention.

Overall, by integrating these features and functionalities into your resume parser app using AI, you can enhance communication efficiency throughout the recruitment process, enabling smoother collaboration, faster response times, and more informed decision-making.

### **IV.SECURITY**

In developing your "Resume Parser App Using AI," security considerations are paramount to safeguard sensitive data and ensure the integrity of your application. To achieve this, robust encryption mechanisms should be implemented to secure data both at rest and in transit, ensuring that data stored in databases is encrypted and that communication between the app and external services is encrypted using protocols like SSL/TLS. Access control measures, such as role-based access control (RBAC), should be enforced to restrict access to sensitive functionalities and data based on user roles, with authentication mechanisms like multi-factor authentication employed to verify user identities.

Secure file handling practices should also be a priority, including upload restrictions, file format validation, and malware scanning to prevent unauthorized access to uploaded resumes and parsed data. Additionally, implementing data masking and anonymization techniques can protect personally identifiable information (PII) in parsed resumes, mitigating the risk of data breaches while still allowing for meaningful analysis. Adherence to secure coding practices is essential to mitigate common vulnerabilities like injection attacks, with regular code reviews and security audits conducted to identify and address potential risks.



## V. RESULT AND DISCUSSION

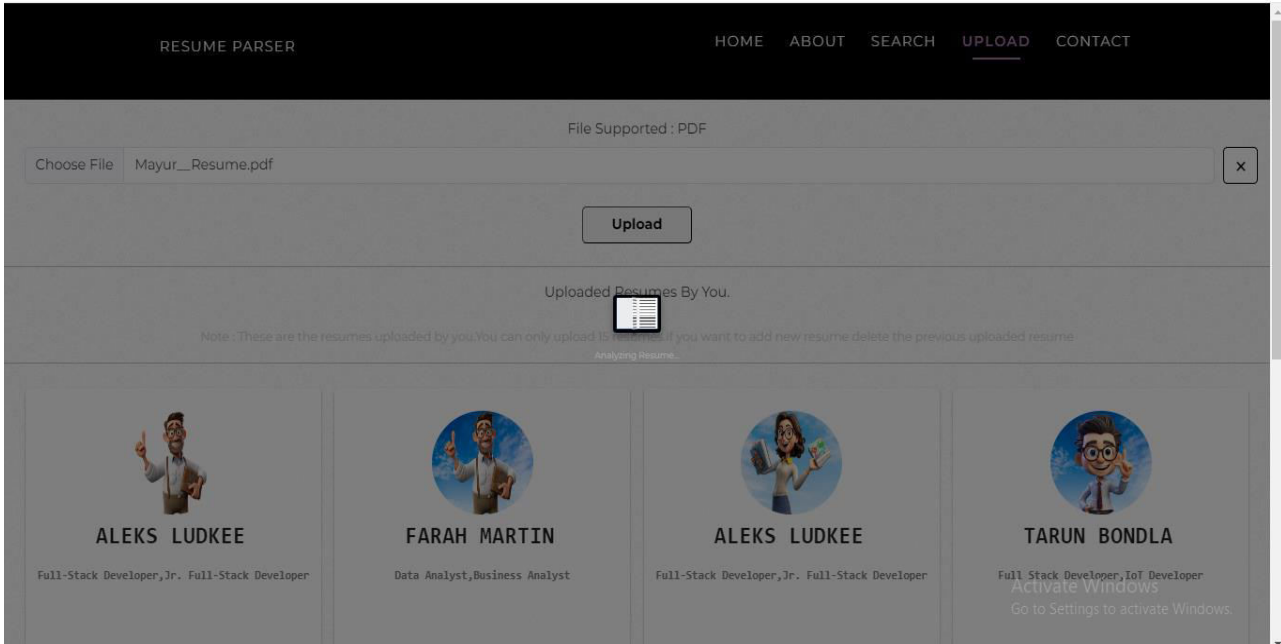


Fig: Upload Page

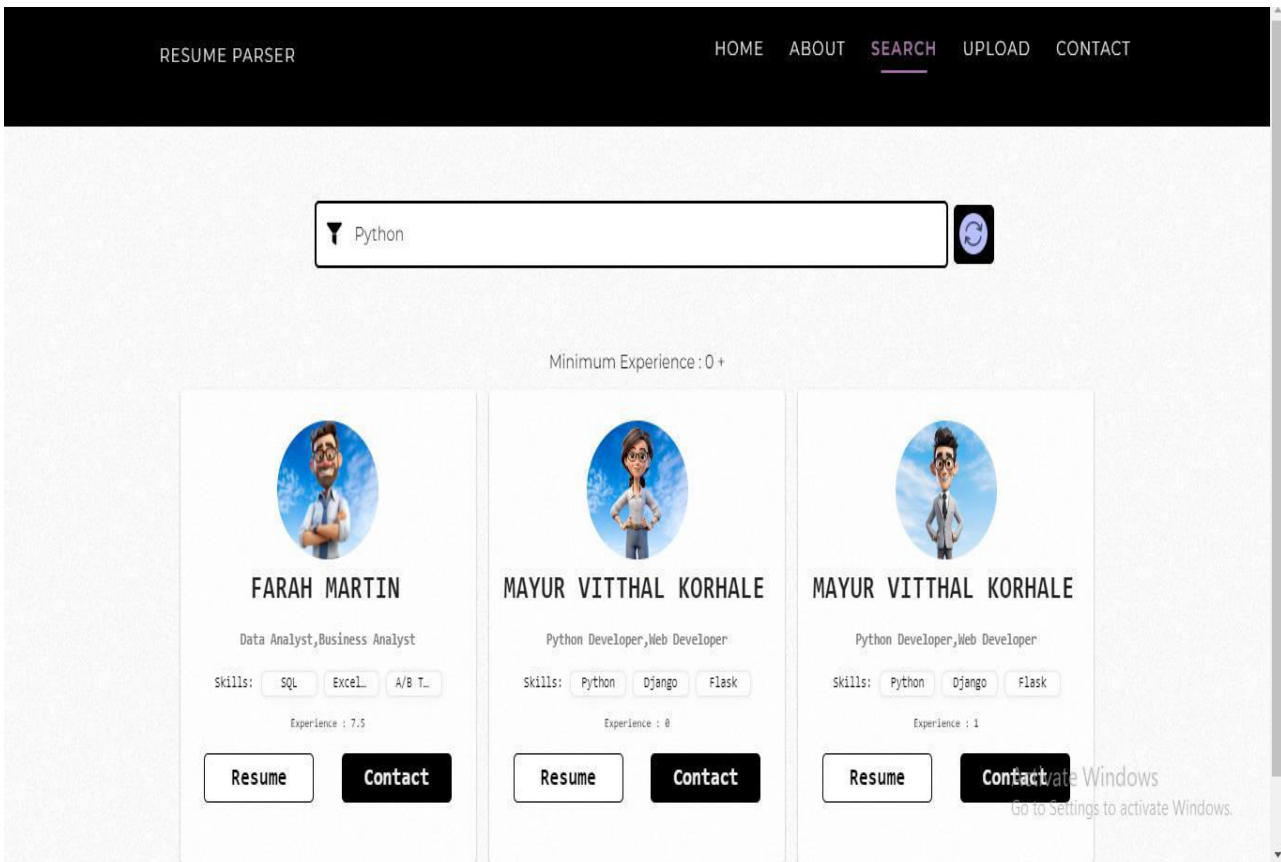


Fig: Filter Page and Final Output



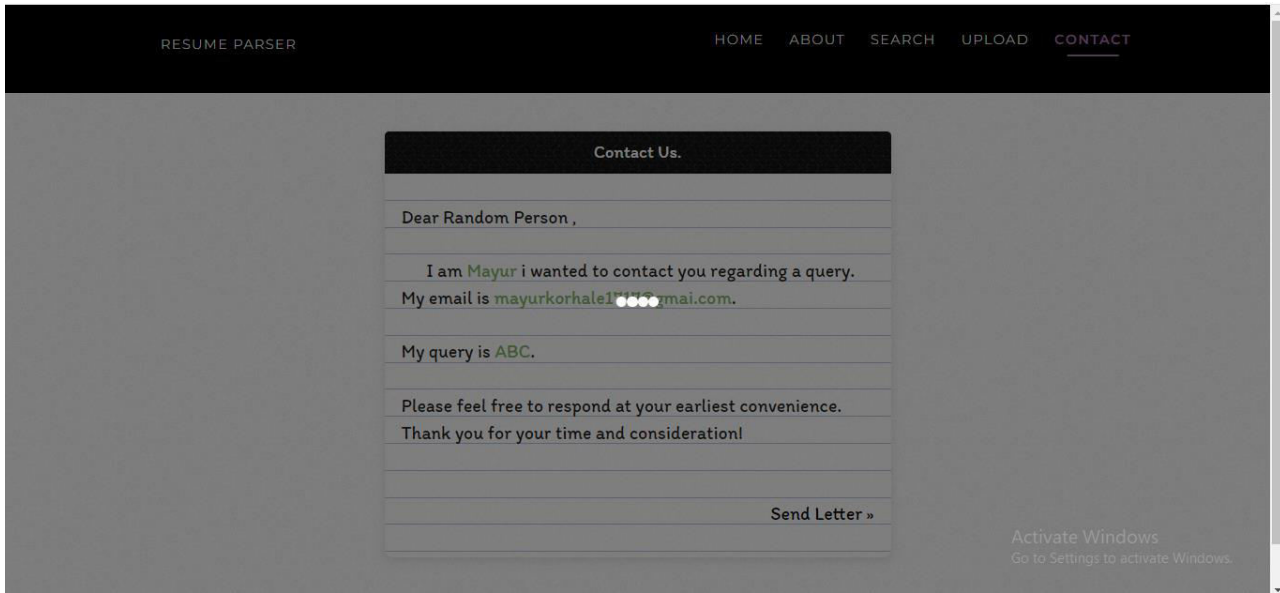


Fig: Contact Us Page

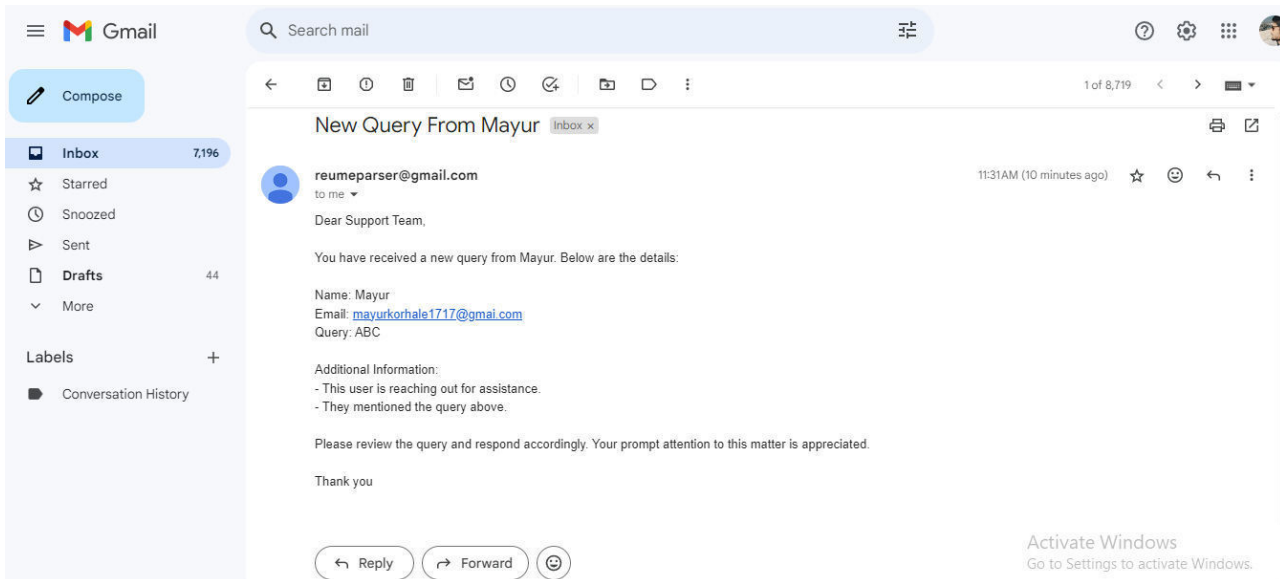


Fig: Query Mail

## VI.CONCLUSION

In conclusion the Resume Parser App using AI stands as a transformative solution that streamlines the hiring process, saving time and resources for employers while providing job seekers with a fairer chance. By automating resume analysis, extracting key information, and matching skills to job requirements, it accelerates and enhances recruitment, ultimately leading to more informed and efficient hiring decisions in today's competitive job market.

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# Anti-Sleep Alarm for Drivers

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**ABSTRACT:** Video retrieval is an important technology used in the design of video search and extraction of a preliminary set of related videos from the database. The necessity of, efficiently querying for generally available video data has been improved with the increase in the availability of huge quantities of such data. Hence, content-based video data retrieval proves to be a challenging and crucial problem.

In this project, an effective video segmentation and retrieval system based on dominant features such as motion, color and edge is proposed. The video retrieval system can be split into three parts. First, video segmentation in which video is converted into frames. I and P frames are separated from all frames and later dividing the video into shots or scenes. Finally select the one or more key frames for each such shot. Second, features are extracted from the shots. In the Feature Extraction, motion features are extracted using Squared Euclidean distance from P shots, Color Feature is extracted based on color quantization and Edge Density feature is extracted for the objects present in the database video clips from shots. The third stage of the system retrieves given number of video clips from the database based on the query clip. The retrieval is performed based on the Latent Semantic Indexing(LSI), which measures the similarity between the database video clips and the query clip

**KEYWORDS:** Detection, Eye-Detection, CNN, Video camera, Driver.

## I. INTRODUCTION

Driver exhaustion can be a significant variable in an expensive number of vehicle accidents. road accidents in india cause financial losses around rs.9.34 billion every year. it can be seen there are around 2,700 road accidents consistently which is one death per every four hours. It has been figured around 25% of car crashes with driver fatalities are due to driver's drowsiness. It was uncovered that driving execution quickly drop with expanded tiredness which result in making more than 20% of all vehicle accidents. Less attention and focus while driving, heads the driver to being distracted and the likelihood of street accident goes high. Drowsiness related accidents have all the earmarks of being more serious as the driver isn't capable of taking any preventive measures at that moment. Because of the danger that the drowsiness presents on the road, strategies need to be created for checking in its influences.

The most common type accident in today's world is the accident occurring due to the sleepiness of the driver irrespective of day and night. The death rate of accidents due to this has spiked to 21% over the world. This shows how serious this problem is. The Drowsiness Detection is a safe technology that can prevent accidents that are caused by drivers who fall asleep while driving. The objective of this python project is to build a Drowsiness Detection Model which will detect that a driver's eyes are closed for a few seconds.

Relevance:

OpenCV is an open-source computer vision library that provides a wide range of functions for image and video processing. It can be used to capture video frames from a camera or a video file, and then analyze the frames to detect signs of drowsiness in the driver. Some common signs of drowsiness that can be detected using computer vision techniques include eye closure, head movement, and yawning.

Python is a popular programming language for developing computer vision applications, and it has many libraries and frameworks that can be used for drowsiness detection. For example, the dlib library provides facial landmark detection, which can be used to detect eye closure and head movement, while the face\_recognition library can be used to recognize facial features and detect yawning.

Overall, Python and OpenCV provide a powerful platform for developing drowsiness detection systems. By combining image and video processing techniques with machine learning algorithms, it is possible to build a robust and accurate system that can detect signs of drowsiness in real-time and alert the driver to take action to avoid accidents



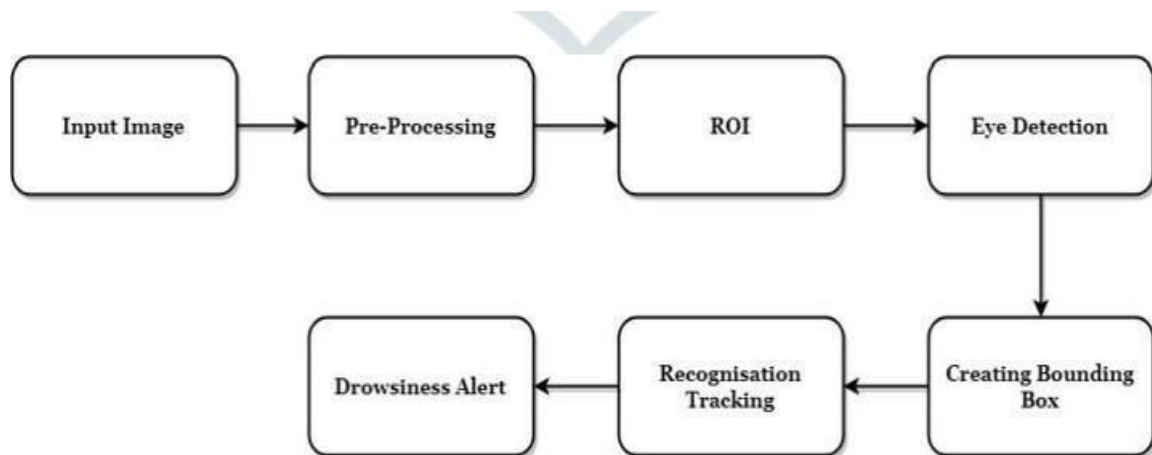
## II. KEY HIGHLIGHTS

1. **Eye Detection:** Once the face is detected, the next step is to detect the eyes. This can be done using the Haar cascades for eye detection provided by OpenCV.
2. **Eye Tracking:** After the eyes are detected, the next step is to track them using the optical flow algorithm. This helps to track the movement of the eyes and detect if they are closing.
3. **Raspberry Pi4:** Raspberry Pi boards are small and compact, making them easy to install and maintain. They are also very energy-efficient, which means that they consume very little power and generate very little heat, reducing the risk of hardware failures and prolonging the lifespan of the device.

## III. HARDWARE And SOFTWARE COMPONENTS

- Digital Camera
- Raspberry Pi
- Buzzer
- Monitor Display
- HDMI wires
- Python programming language used
- Python IDL
- Pre-Determined setup in dlib
- Email alerts

## IV. PROPOSED SYSTEM



Block Diagram

**Input Image:** This block contains the sample images of the driver who is interacting with our system. The images will act as input for our system and they will be helpful to detect the facial expression and also the eye pattern of the driver in question. The images taken are pretty important as they play a major part in output generation. These images are then subjected to image processing, Eigen algorithm etc. for detecting that the driver is drowsy or not.

**Pre-processing:** In this block the main focus is on image. In some cases, the image may be distorted or captured incorrectly or it may happen that the image needs to be enhanced as per the need. The process of correcting the missing components in the image or making the required enhancements takes place in this block. It includes operations such as (e.g., rotation, scaling, and translation).

**ROI (Region of Interest):** Once the face is found its ROI is detected and processed. In the second block, the detection of driver drowsiness via eyelid closure takes place. The eye of the driver is continuously monitored and if found closed for a certain period of time the alarm sound.

**Eye Detection:** The total count of frames in which eyes are closed are identified. When this number of frames is above a certain threshold, the diver will get a visual warning on the navigation display that points out he is drowsy. Then the alarm



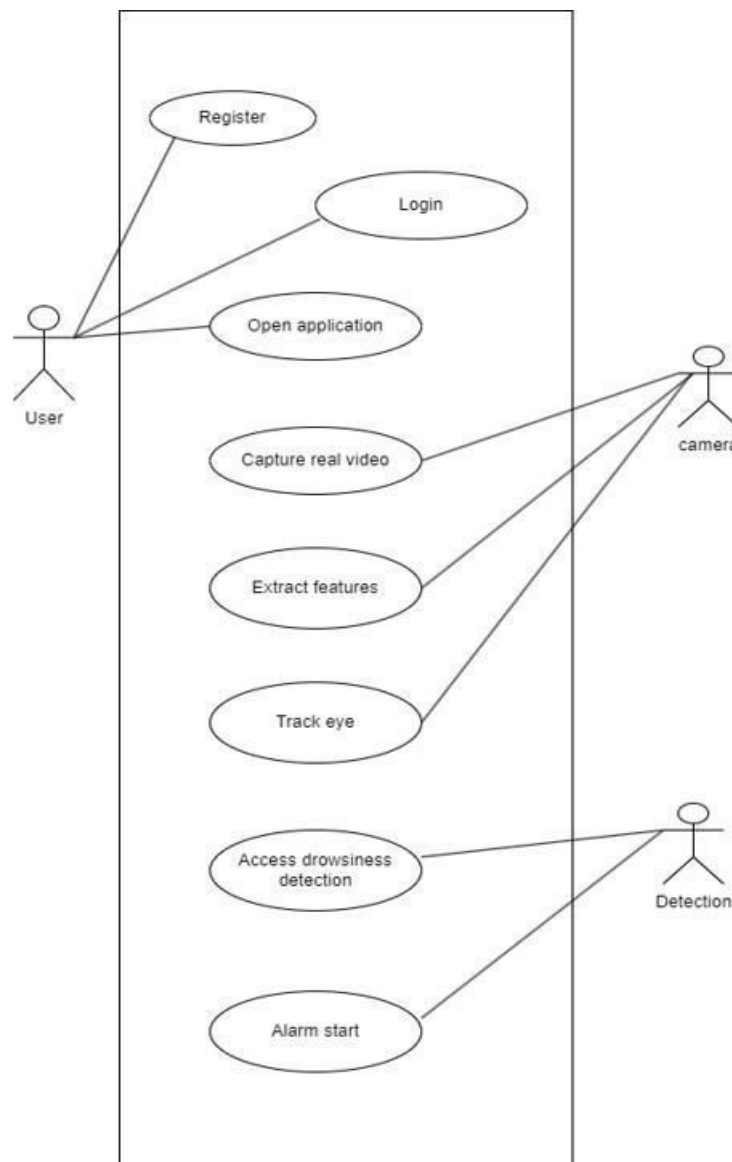
will be generated.

**Creating Bounding Box:** As we all know a bounding box is an imaginary rectangle that serves as a point of reference for object detection and creates a collision box for that object. Data annotators place these rectangles over images, outlining the object of interest within each image by defining its X and Y coordinates as implemented in our system the imaginary box is created for eye detection and also the collision box is formed with its reference.

**Recognition Tracking:** The main face detection, recognition, and tracking features and functions consist of: Detecting faces Decoding of an image file and detecting faces on it can be done here. Recognizing faces By using example faces you can recognize faces in an image. Tracking faces Tracking of faces using the camera preview images, starting from a specific location in the image can be carried out here.

**Drowsiness Alert:** This block comes into play or has a role to play specifically when the particular driver is detected as drowsy. If the driver is drowsy the process of generating an alert alarm is carried out here.

### V. FLOWCHART



## VI. METHODOLOGY

There are different methodologies that can be used for drowsiness detection system using Python and OpenCV. Here are some general steps that can be followed:

**CNN:** A convolutional neural network (CNN or ConvNet) is a network architecture for deep learning that learns directly from data. CNNs are particularly useful for finding patterns in images to recognize objects, classes, and categories.

**Eye Detection:** Once the face is detected, the next step is to detect the eyes. This can be done using the Haar cascades for eye detection provided by CNN.

**Eye Tracking:** After the eyes are detected, the next step is to track them using the optical flow algorithm. This helps to track the movement of the eyes and detect if they are closing.

**Eye Aspect Ratio (EAR):** The eye aspect ratio is a measure of the openness of the eyes. It can be calculated by measuring the ratio of the length of the eye's vertical axis to the length of the eye's horizontal axis. The EAR value decreases when the eyes are closing. By monitoring the EAR value over time, it is possible to detect when the eyes are closing or when the person is becoming drowsy.

**Alert System:** Finally, an alert system can be implemented to warn the driver if they become drowsy. This can be done by playing an alarm or by flashing a warning message on the screen.

## Results



## VII. CONCLUSION

In this way we have implemented the drowsiness detection system using python successfully. The alarm will automatically goes on when the driver's eyes are closed more than the given time interval. He system must be mounted on the vehicle in the real world for the proper execution of driver drowsiness system. This system will help in lowering the accidents which are mostly done due to driver falling asleep while driving. The system will detect drowsiness by observing eye blinking patterns that is achieved by using Euclidean distance ratio i.e. eye blinking ratio. It is most efficient technique and the whole program is much faster than by using CNN.



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# **Lora-WSN Based IOT Frame Work For Precision Agriculture**

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**ABSTRACT:** The emergence of the Internet of Things (IoT) has brought about a trans- formative impact on Precision Agriculture, revolutionizing the monitoring and control of agricultural processes in real-time. Among the various communication protocols, Low-Power Wide-Area Network (LoRa-WAN) technology has gained prominence due to its extensive reach and minimal power consumption. This study introduces a comprehensive IoT framework specifically tailored for Precision Agriculture, utilizing LoRa Wireless Sensor Networks (LoRa-WSN) to effectively address the distinctive challenges and requirements of the agricultural sector. The proposed framework seamlessly integrates diverse sensor nodes, including soil moisture sensors, temperature and humidity sensors, and crop health monitoring devices, all interconnected through LoRa-WAN technology. The LoRa-WSN architecture ensures efficient data collection and transmission across expansive agricultural landscapes, even in remote or low- connectivity areas. Additionally, the framework incorporates data analytics and cloud-based platforms to process the gathered data, furnishing farmers with actionable insights for informed decision-making. These insights encompass assessments of soil quality, predictive analyses of crop yields, and real-time monitoring of environmental conditions, facilitating precise resource management, optimization of irrigation, and effective pest control. Recognizing the paramount importance of security and privacy in agricultural systems, our framework integrates robust encryption and authentication mechanisms to safeguard sensitive data. Moreover, the design emphasizes scalability, cost-effectiveness, and energy efficiency, ensuring long-term sustainability and affordability for farmers.

**KEYWORD:** Long Range Communication [Lora], Internet of Things [IoT], Wireless sensor network [WSN]

## **I. INTRODUCTION**

The proposed Internet of Things (IoT) framework, based on LoRa (Long Range) technology for Wireless Sensor Networks (WSN), capitalizes on Low-Power Wide- Area Network (LPWAN) capabilities. Specifically, the use of LoRa enables the establishment of a wireless sensor network, facilitating the deployment of numerous battery operated sensors across agricultural areas. These sensors are designed to monitor various parameters, including soil moisture, temperature, humidity, and crop health. The collected data is transmitted over extended distances using LoRa modulation, directing it to a centralized gateway. As the global population continues to grow and climate conditions evolve, the agricultural industry is undergoing a shift towards more efficient and sustainable practices. Precision agriculture, characterized by precise resource management and data- driven decision-making, emerges as a crucial solution to address these challenges. The core of precision agriculture lies in the acquisition of accurate and real-time field data, a role fulfilled by the LoRa-based Wireless Sensor Network (WSN) IoT frame- work. The expanding global population underscores the importance of judiciously managing finite freshwater resources. Agriculture, a major consumer of global fresh- water, poses challenges as approximately half of the world's population faces water scarcity. Balancing the need for adequate soil moisture, crucial for processes like plant growth and nutrient cycling, is vital. Conversely, excessive irrigation can lead to land desalinization and pollution of freshwater sources. Achieving optimal irrigation levels becomes the objective, known as scientific irrigation scheduling, a component of precision agriculture where soil moisture monitoring plays a pivotal role. In the context of vast agricultural fields, employing a wireless solution for soil moisture monitoring proves preferable, avoiding the complexities and costs associated with laying and maintaining extensive cable networks. In this wireless setup, multiple sensors establish a network conveying soil moisture data from different field locations to a central server.

## **II. WORKING PRINCIPLE**

Wireless Sensor Networks (WSNs) find application in agriculture for tasks such as temperature measurement, environmental monitoring, irrigation system management, and water supply measurement. These networks play a



pivotal role in assisting farm- ers in cultivating high-yield crops. However, the sensor nodes within WSNs necessitate a power supply, typically from batteries. The utilization of WSNs contributes to enhanced crop quality and increased production, directly impacting the economic aspect of agriculture. Ongoing research indicates that the challenges in implementing precision agriculture can be progressively addressed through the adoption and advancement of WSNs. The incorporation of wireless sensor networks into agriculture stands out as a highly advantageous approach, promoting precision agriculture, elevating food crop yields, and alleviating the burdens on farmers. WSNs play a crucial role in ensuring the robust growth of crops in precision agriculture by minimizing pesticide usage, effectively managing weeds and pests, and facilitating efficient and eco-friendly agricultural practices. These networks have the capability to sense and collect real- time data on various aspects of agricultural production, providing prompt feedback to users. The results of data analysis and processing are then communicated to users, enabling the efficient management of precision agriculture.

### III. METHODOLOGY

Precision Farming has the potential to bring about a significant transformation in boosting crop production. Through remote access, farmers gain the flexibility to man- age their time and explore part-time businesses or work. In our project or module, farmers can efficiently oversee farm fields from a distance of up to 10 kilometers, utilizing smartphones or laptops. Moisture sensors and humidity-temperature sensors take measurements, transmitting data via LoRa gateway to The Things Network. This network aggregates all the data, sending the combined datasets to Blynk. Blynk, a software based on Math Works, visualizes the data graphically. Based on the analyzed data, proactive measures are implemented to enhance crop yield. The processed data is converted into actionable information and delivered to end-users, supporting both quantitative and qualitative growth of crops in the farm field. On the sensor node, we employ the Arduino Nano board and the SX1278 LoRa-02 Transceiver module. Multiple sensors, including the capacitive soil moisture sensor v1.2 for quantifying soil water content, and the DS18B20 waterproof temperature sensor for measuring soil temperature, are interfaced. To address cold season challenges, where plants may succumb to fog and low temperatures, the DHT22 Temperature & Humidity sensor is utilized to measure ambient temperature and humidity. An automatic irrigation system is facilitated through the use of a 5V Single- channel relay module and a water pump. This integrated system ensures efficient monitoring and management of agricultural parameters for optimal crop growth.

### IV. SYSTEM DESIGN AND IMPLEMENTATION

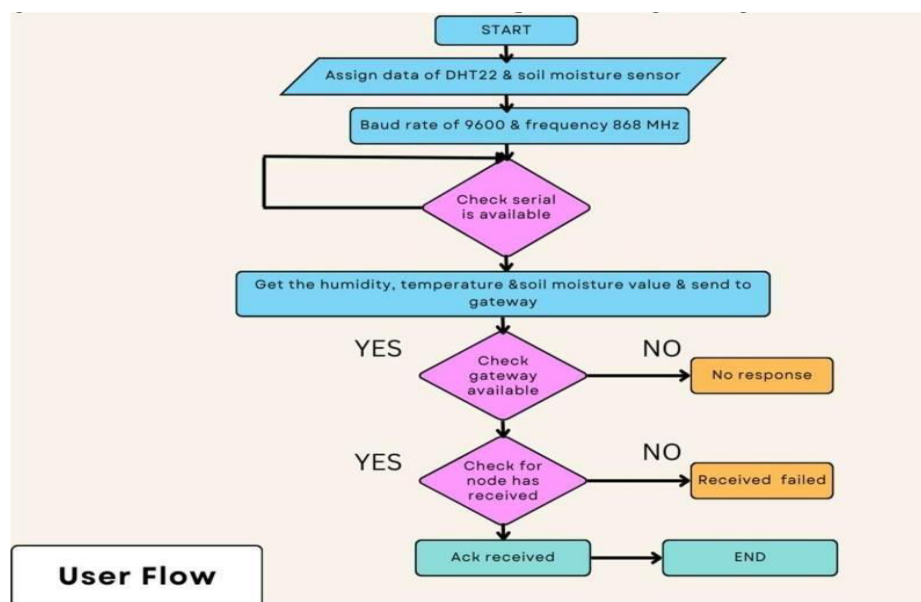


Fig. 1 : User Flowchart

**Client Module:** The client module comprises a LoRa node paired with an At- mega128 controller, which is linked to sensors responsible for gathering soil conditions, including moisture levels and the humidity- temperature of the surrounding environment. For measuring soil moisture, the FC-28 sensor is employed, while the DHT22 sensor is utilized to gather humidity and temperature data from the field. The collected information is analyzed to derive insights into the water requirements of the field.

**Gateway Module:** Serving as a crucial intermediary between the LoRa nodes and the cloud, the gateway module is responsible for collecting data from LoRa nodes and transmitting it to the cloud for analysis. With an impressive communication range, the LoRa gateway can effectively interact with LoRa nodes situated up to 10 kilometers away in open fields, surpassing the range capabilities of current technologies.

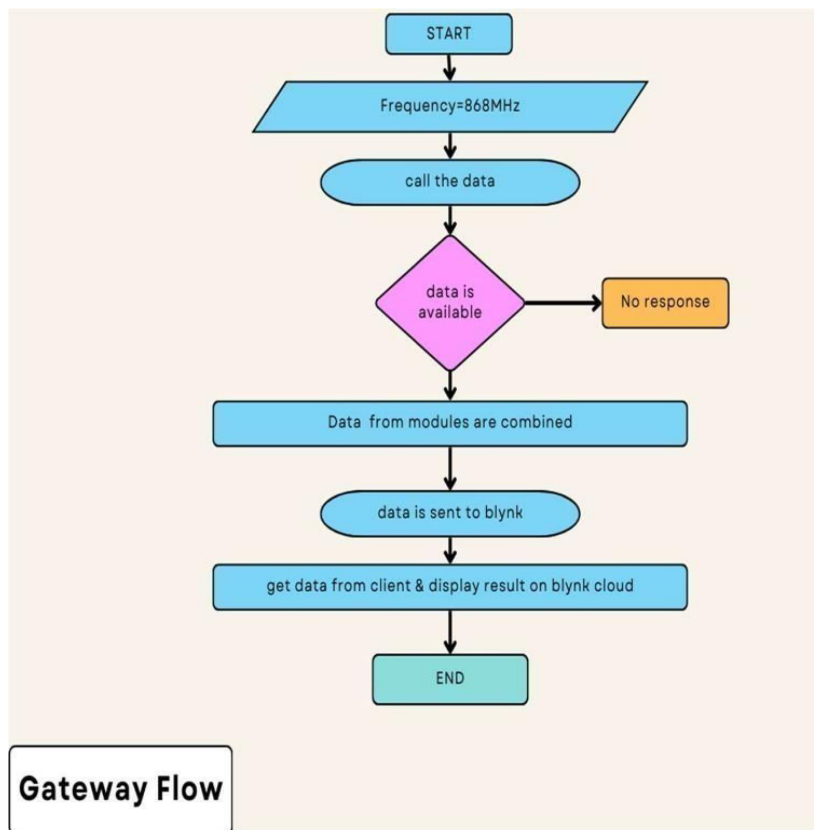


Fig. 2 : Gateway Flowchart

Primarily, the gateway employs two communication technologies: LoRa technology for gathering information from LoRa nodes positioned in the fields, and WiFi for uploading the collected data to the cloud. The communication between the gateway and the cloud is facilitated using the HTTP protocol. The strategic placement of the gateway is crucial to efficiently receive data through LoRa communication from nodes and subsequently upload the data to the cloud via HTTP protocol. To store and analyze the data, users need to create accounts for The Things Network and Blynk, the latter serving for data visualization. Following account creation, integration between the gateway and The Things Network is established, involving the use of application session-keys, network session-keys, and device addresses. The Things Network aggregates all the data and transmits it to the Blynk Cloud for further processing.

### V. BLOCK DIAGRAM

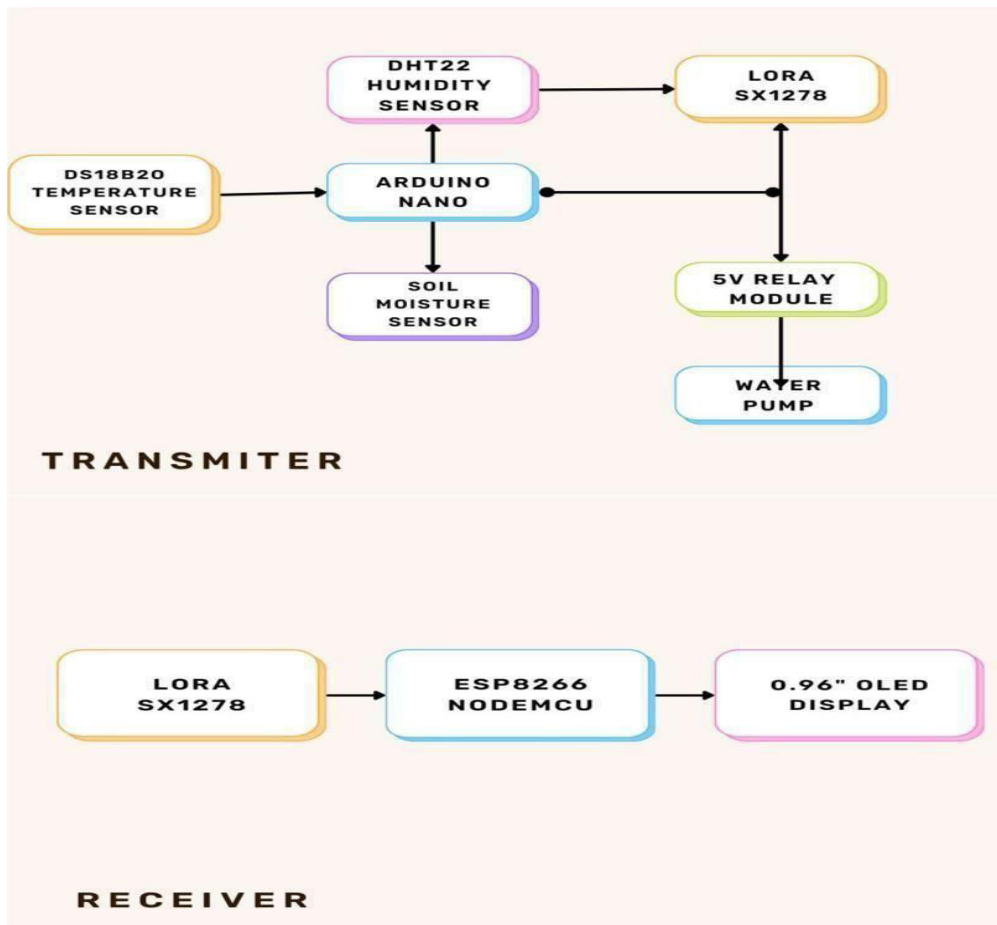


Fig. 3 : Block Diagram of Transmitter and Receiver

### VI. RESULT

The Arduino Nano collects data from the soil moisture sensor, DHT22 sensor, and DS18B20 sensor. It formats the collected data into packets suitable for transmission. Using the LoRa SX1278 module, the Arduino transmits these datapackets wirelessly. The LoRa SX1278 module sends the packets to a receiver module located within its range.

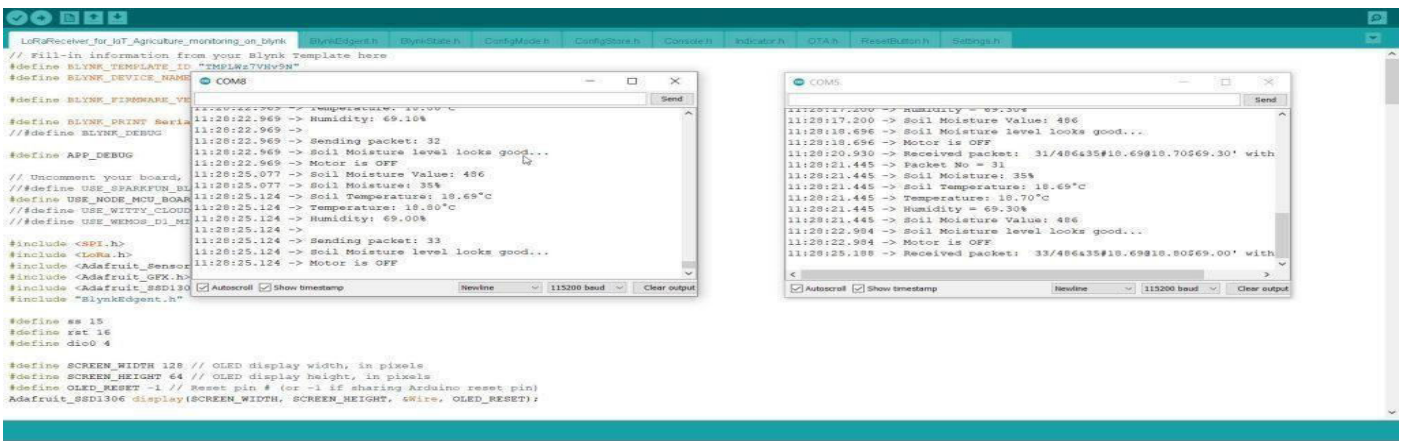


Fig. 4 : Real time data can transmit and receive in serial monitor



The LoRa SX1278 module receives data packets transmitted by the sender. The NodeMCU ESP8266 receives these data packets from the LoRa SX1278 module. The NodeMCU ESP8266 processes the received data packets, extracting relevant information. The extracted data is then displayed on the 0.96" OLED display in a text format.

## VII. CONCLUSION

LoRa stands out as a resilient, systematic, cost-effective, and exceedingly adaptable solution. LoRaWAN dictates the communication protocol for the network, while the physical layer of LoRa facilitates extensive and long-range communication connections. In this context, various variables related to crop growth in agriculture, including temperature, humidity, pH, soil moisture, etc., are taken into account. The procedure has been thoroughly tested and proven to be both cost-effective (more affordable) and accurate compared to existing methodologies.

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# Milk Vending Machine

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**ABSTRACT:** The aim of this paper is to assess the current situation in the sale of milk through vending machines in the context of the previous period of the decline in milk consumption, the transition of the Czech Republic towards the market economy, the transformation of agriculture, the entry into the EU and the concentration in the milk market and to define the basic motivational factors and barriers of the development of this distribution path. Technical problems with sales, intent to diversify milk selling and aiming the high profitability of the sale are the reasons for operating vending machines that are correlated with the share of this selling channel on producers' total sales of milk. Vending machines are inhibited by misinformation from state authorities; other problems are weak support by media and low consumer awareness. The expectations of the operators concerning the development of the situation of the milk vending machines are rather optimistic: 36% of them expect an increase in sales, 48% expect the stagnation and only 16% expect the decrease. Machines have played a very important role in making human life easier. Automatic vending machines are very helpful in providing various needed full items for general people. Here we discuss the development of automatic milk vending machine. There equipment is available in a plethora of various on the market. Our goal in this project is to offer simple, affordable designs that are more effective and have convenient payment options. A card system is utilized for milk payment and dispensing in order to remove the need for human intervention. This card system has RFID, which is made up of user-friendly RFID tags and an RFID reader.

**KEYWORDS:** Microcontroller, RFID, Sensor, GSM

## I. INTRODUCTION

In order to cut down on wait times and carry money, individuals frequently utilize cards to pay for goods shops and shopping centers these days. But in milk centers, there's always a huge line to get milk, and you have to pay with cash. To solve this, milk flow may be measured and money can be collected using an RFID reader and microcontroller. This technology distributes milk without requiring human contact by using RFID tags. In order to prevent problems with image processing and beam interruption approaches, RFID traffic management is also utilized. An RFID tag installed in every car transmits signals to the police control center. It was suggested to use an autonomous decentralized system (ADS) to judge when to send card to adjacent gas bunks in order to react to changing circumstances. A milk vending machine is a device that dispenses milk products to customers after payment. Milk vending machines are becoming increasingly popular as they offer a convenient and cost-effective way for customers to purchase fresh milk products. The Milk Station Company is a YouTube channel that features videos on milk vending machines, including an introduction to their machines and how to clean them<sup>1</sup>. Milk vending machines are also being introduced in the UK as a way for dairy farms to sell their products directly to customers. For example, Curlew Fields Farm in Hessay, York, has introduced a milk vending machine that allows customers to buy a reusable bottle and fill it with pasteurized milk produced on the farm. The machine also offers milkshakes with various flavors. Milk vending machines offer a convenient and cost-effective way for customers to purchase fresh milk products. They are becoming increasingly popular as they offer a sustainable and eco-friendly alternative to traditional milk packaging. QR code technology can further enhance the customer experience by allowing for contactless payment and easy transaction tracking.

Milk vending machines offer a convenient and cost-effective way for customers to purchase fresh milk products. They are becoming increasingly popular as they offer a sustainable and eco-friendly alternative to traditional milk packaging. QR code technology can further enhance the customer experience by allowing for contactless payment and easy transaction tracking.

## II. AIM

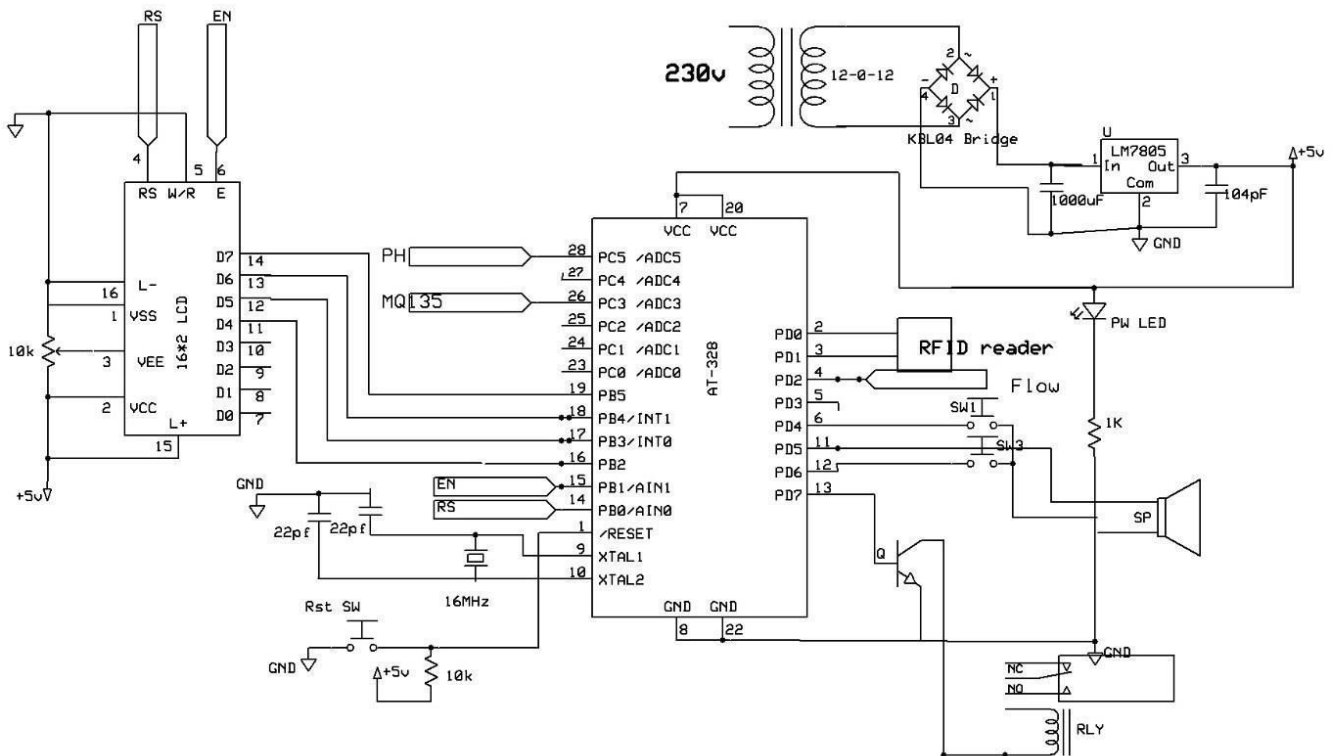
The aim of milk vending machines is to provide consumers with convenient access to fresh, locally sourced milk while promoting sustainability, supporting local farmers, reducing environmental impact, and meeting the evolving needs of modern consumers. It also benefits dairy owners by reducing operational costs, providing sales reports, and maintaining

milk quality through temperature control. The vending machine is designed to be easily movable, enabling owners to adapt to market demands and reduce product prices by eliminating middlemen. Overall, the milk vending machine aims to promote fresh milk consumption, support local dairy farmers, and contribute to a circular economy.

### III. METHODOLOGY

The proposed project uses refrigerated containers for milk storage, separating it into three different qualities based on PH value, water content, and viscosity. Quality will be used for bifurcation and classification. Consumers input required quality and standard quantity values in a numeric keypad, and the machine asks for payment using rechargeable cards with RFID. Milk is dispensed from the outlet after payment is made. An LCD display will display milk quality and purchase details. A GSM module and level sensor will notify manufacturers or milk distributors for milk refills when used up. Hot water must be run through the machine for cleaning. If commercialized, a maintenance team can monitor usage and cleanliness, increasing employability. The methodology for implementing a milk vending machine involves several steps. First, the machine should be strategically placed in a well-lit and ventilated area with stable water and electric power supplies, preferably in busy shopping areas or supermarket

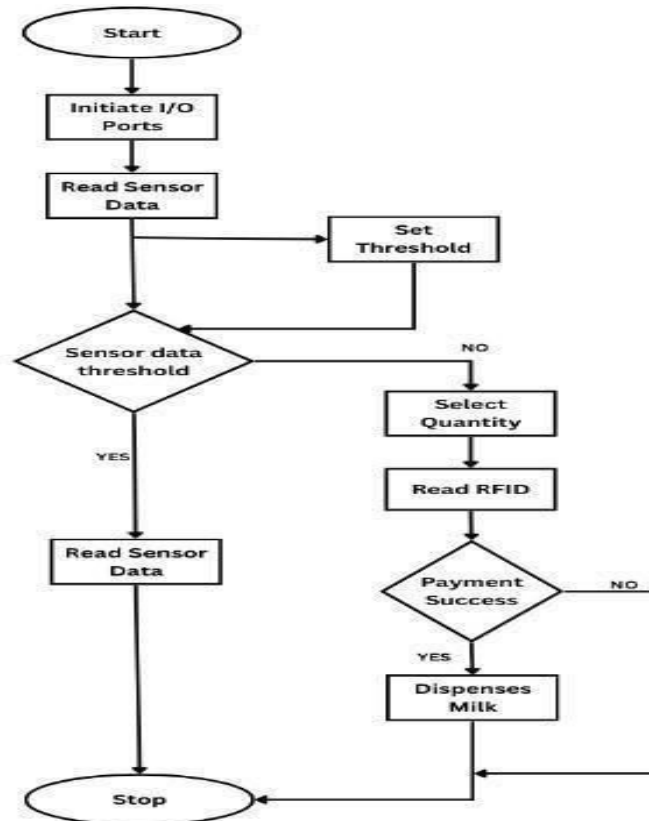
### IV. CIRCUIT DIAGRAM



1. Power Supply:- A 9V DC power supply is utilized to power the submersible pump for milk dispensing, which can be connected to the VIN and GND pins of the Arduino Uno board.
2. Arduino Uno Board:- The Arduino Uno board is the primary controller, connecting to the power supply and other components like the GSM module, I2C interface, flow sensor, submersible pump, and 5V relay.
3. GSM Module:- The GSM module is utilized for sending and receiving SMS messages from a user's smartphone, connected to the Arduino Uno board via serial communication pins (TX and RX).
4. I2C Interface:- The Arduino Uno board can be connected to an OLED display via an I2C interface, displaying transaction details and other relevant information.
5. Flow Sensor:- A flow sensor is utilized to measure the quantity of milk dispensed, connected to the Arduino Uno board via digital input pins.

6. Submersible Pump:- The submersible pump, connected to the Arduino Uno board via a 5V relay, is used to dispense the necessary amount of milk.
7. Resistors and capacitors:- Resistors and capacitors are crucial in circuits to regulate voltage and current levels, while also safeguarding components from damage.
8. The components are connected to the Arduino Uno board, and the code is uploaded using the Arduino IDE.

## V. WORKING PRINCIPLE



The steps of a milk vending machine can vary depending on its specific features, but common steps include:  
 Selecting the desired product: Customers can choose their desired product from the vending machine using methods like entering a code, scanning a QR code, or sending an SMS message.

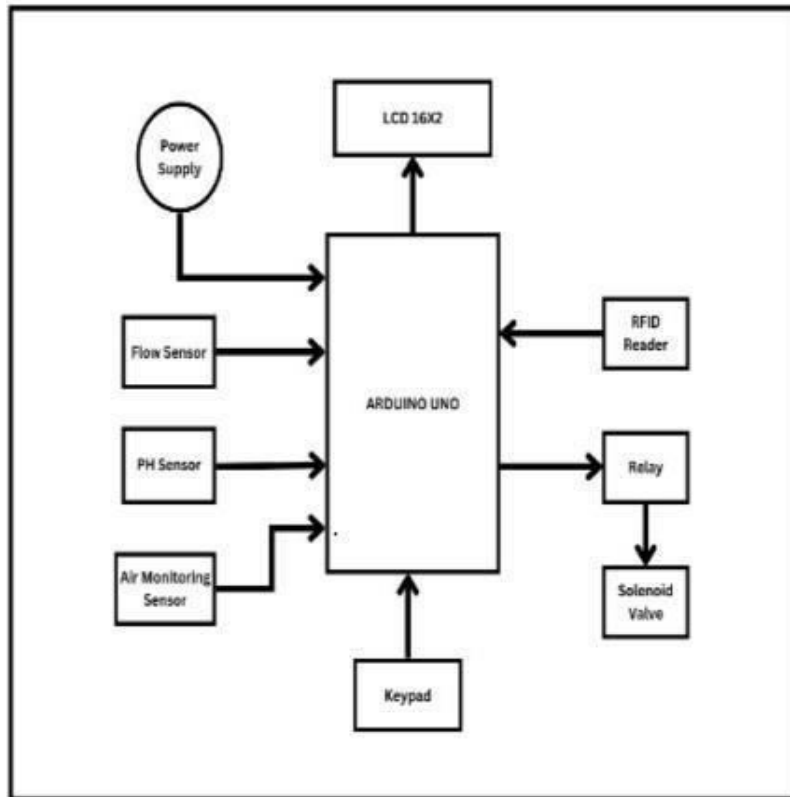
Payment: Customers can pay for their selected product using various methods like coins, mobile wallets, order bit/credit cards.

Dispensing the product: The vending machine dispenses a product after payment, with milk quantity measured using a flow sensor and controlled by a submersible pump.

Updating the inventory: The vending machine maintains stock levels by updating its inventory system after dispensed milk, ensuring that the machine's stock levels remain current.

Transaction completion: The milk vending machine process involves selecting the desired product, making payment, dispensing the product, updating inventory, and completing the transaction, making it hygienic and safe, especially during the current pandemic situation, and allowing customers to leave with their milk

## VI. PROPOSED SYSTEM



The architecture of a milk vending machine typically involves several key components, including a user interface, a payment system, a milk storage and dispensing system, and a control system. The user interface typically includes a touchscreen or other input device that allows users to select the milk product they want to purchase and make payment. It may also include a display that shows the price, quantity, and other information about the milk product. The payment system can include various payment methods, such as cash, credit/debit cards, or mobile payments. It typically involves a payment terminal or other device that communicates with the control system to process payments and dispense the milk product.

The milk storage and dispensing system includes a milk storage tank, a pump, and a dispensing mechanism. The milk storage tank holds the milk product, while the pump draws the milk from the tank and dispenses it into a container provided by the user. The dispensing mechanism may include sensors to ensure that the correct quantity of milk is dispensed and to prevent overflows. The control system is the brain of the milk vending machine and typically includes a microcontroller or other programmable device that controls the various components of the machine. It may include sensors to monitor the temperature, pressure, and other conditions of the milk product, as well as a communication system to send alerts or alarms if there are any issues with the machine. The architecture of a milk vending machine may also include security features, such as locks, alarms, or cameras, to prevent theft or vandalism. It may also include a power system, such as a battery or generator, to ensure that the machine can operate even if there is a power outage.



## VII. RESULT AND DISCUSSION

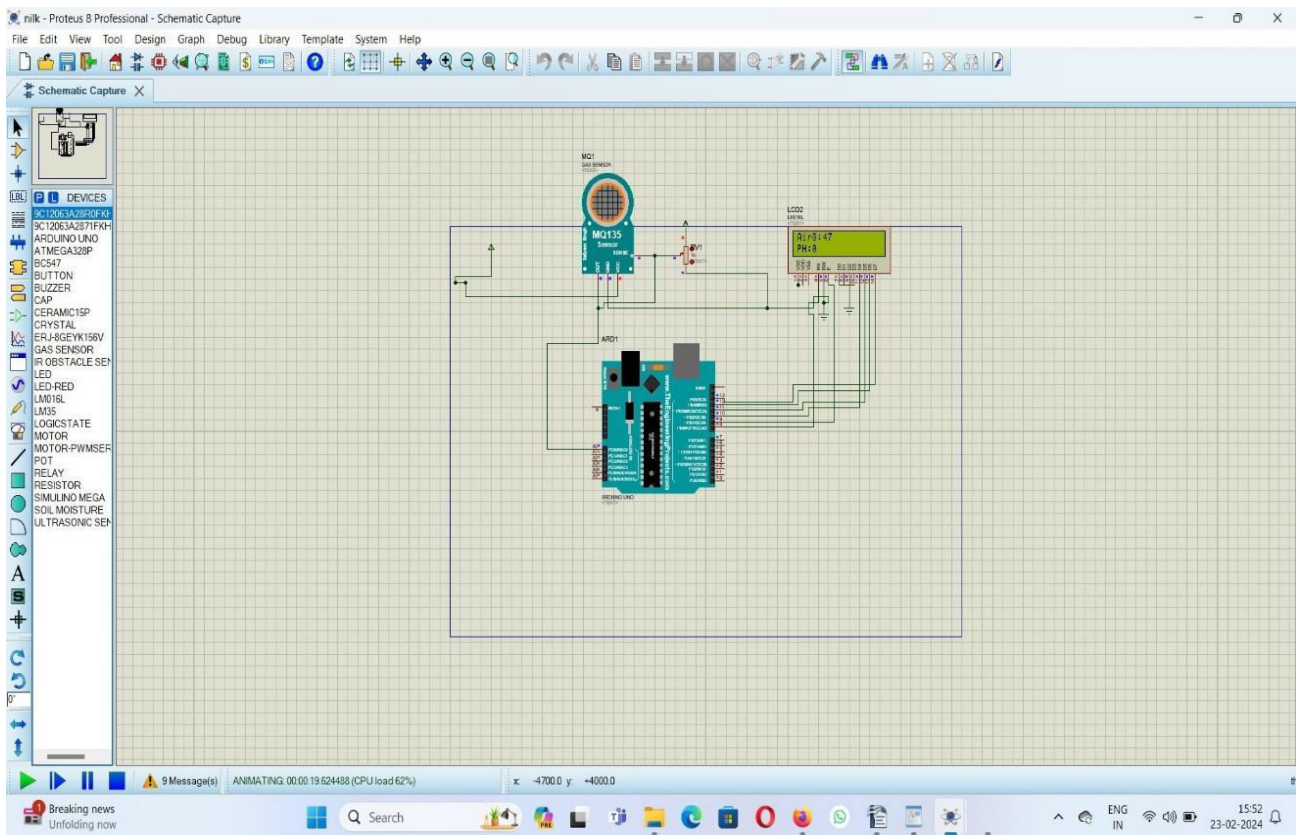


Fig1. Software simulation

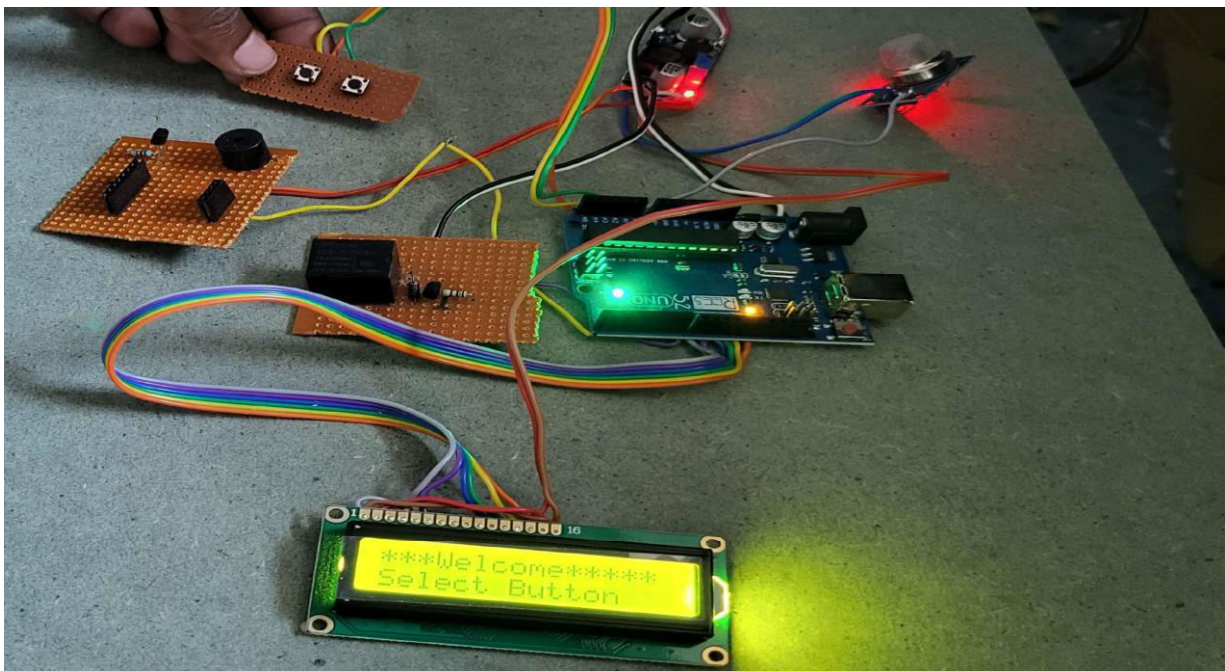


Fig2. Hardware implementation

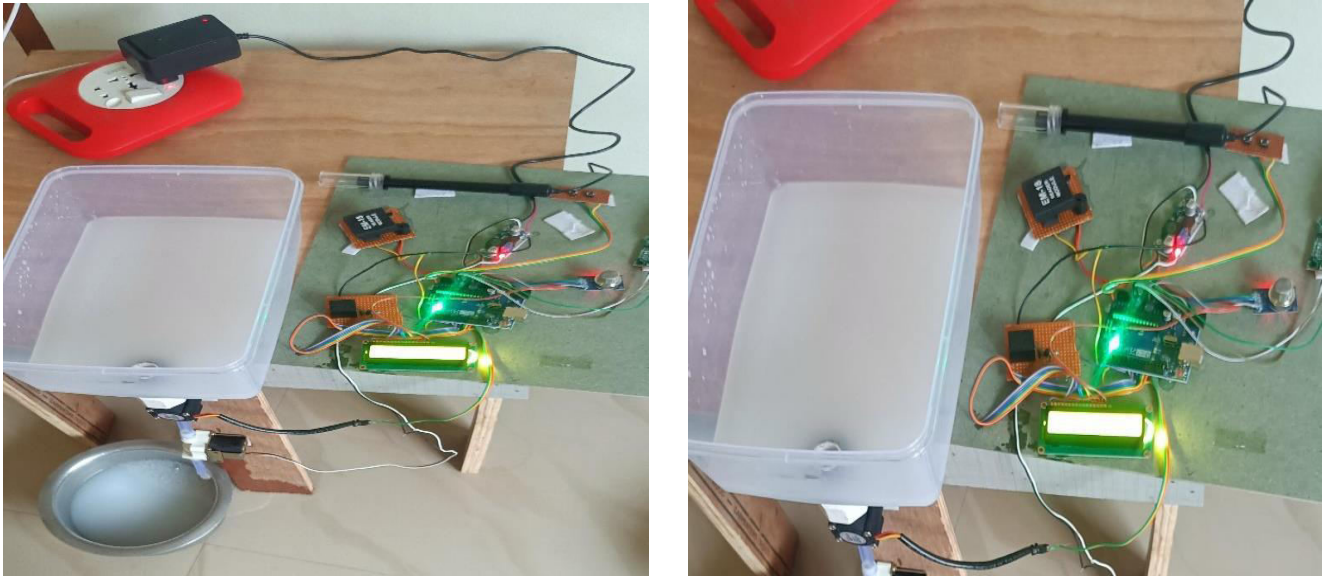


Fig3. Scanning card using RFID



Fig4. Measure the water testing

### VIII. CONCLUSION

In conclusion, milk vending machines offer a convenient, safe, and efficient way for users to access fresh, locally sourced milk. These machines can be calibrated to dispense a specific quantity of milk per SMS message and can also send an SMS message to the user with the transaction details. The use of basic components such as Arduino Uno, GSM 900, I2C, flow sensor, submersible pump, and 5V relay in the milk vending machine project demonstrates the feasibility of building a simple and effective vending machine. Milk vending machines are also a more sustainable way to purchase milk as they reduce plastic waste and support local agriculture by sourcing milk from local farms. Overall, milk vending machines provide numerous benefits to consumers, farmers, and the environment, making them a



promising solution for the future of milk distribution. This paper discusses the history of technical issues and challenges in vending machines, particularly milk vending machines. It highlights the potential for equal distribution of milk supply, avoiding wastage, and simplifying payment. The technology of vending machines can be used to facilitate various food consumer products, and in the future, online systems could be implemented for more reliable product distribution management. This would make the process more efficient and efficient for companies.

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# Smart City Base Waste Management System Using IOT

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**ABSTRACT:** The Internet of Things (IoT) embodies a framework characterized by an interconnected network of embedded sensors and services. These sensors are amalgamated to collect a variety of data, monitor physical conditions such as levels in waste bins, and communicate with multiple centralized platforms. The demand for such sensors is escalating, yet the proliferation of technologies presents manifold challenges. For example, how can IoT and its associated data be utilized to enhance waste management? In smart cities, an efficient waste management system is essential. IoT-driven approaches have the capacity to equip cities with the means to handle waste collection adeptly. This study advocates for an intelligent method for recommending routes in an IoT-based waste management system, while considering spatial constraints. It conducts an exhaustive examination employing AI-driven methodologies and contrasts their respective outcomes. Our proposed solution adopts a multifaceted decision-making process, taking into account bin status and coordinates to address the routing predicament. Deep learning and IoT provide a pliable solution for categorization and real-time data surveillance, respectively. This research delineates a resilient framework for a waste management system founded on deep learning and IoT. By harnessing machine learning and graph theory, the system can optimize waste collection by pinpointing the most efficient path.

**KEYWORDS:** Detection and sorting of waste, streamlined communication, automated functionality

## I. INTRODUCTION

The amount of waste produced daily from both industries and households is rapidly increasing, largely driven by the exponential consumption of packaged items, textiles, paper, food, plastics, metals, and glass. As a result, the efficient handling of this growing waste has become a crucial aspect of our everyday lives. While developed countries have adopted numerous effective waste management methods, the situation is markedly different in many developing nations. Here, there is a casual approach towards maintaining clean environments, compounded by a lack of strict regulations governing the use of biodegradable materials and sustainable development practices. The absence of comprehensive environmental policies only worsens these challenges, leading to the severe consequences of inadequate waste management, particularly in the context of IoT-based solutions.

## II. AIM

Smart cities that use IoT sensors and AI algorithms to manage waste, reduce energy consumption, and improve the overall quality of life for residents To ensure the protection of the environment through effective waste management. To protect the health and wellbeing of people by providing an affordable waste collection service. Preventing pollution and ecological degradation It uses greenenergy. Automatically received message when dustbin full. Automatically open lid of dustbin also separate waste so energy loss.

## III. BLOCK DIAGRAM

Power Supply: Provides power to all components.

Microcontroller (ATmega328): Controls and coordinates the operation of all components.

LCD Display: Displays information such as fill level, collection schedules, and system status.

GSM Module: Sends notifications/alerts to waste management authorities or residents when bins are full or when maintenance is required.

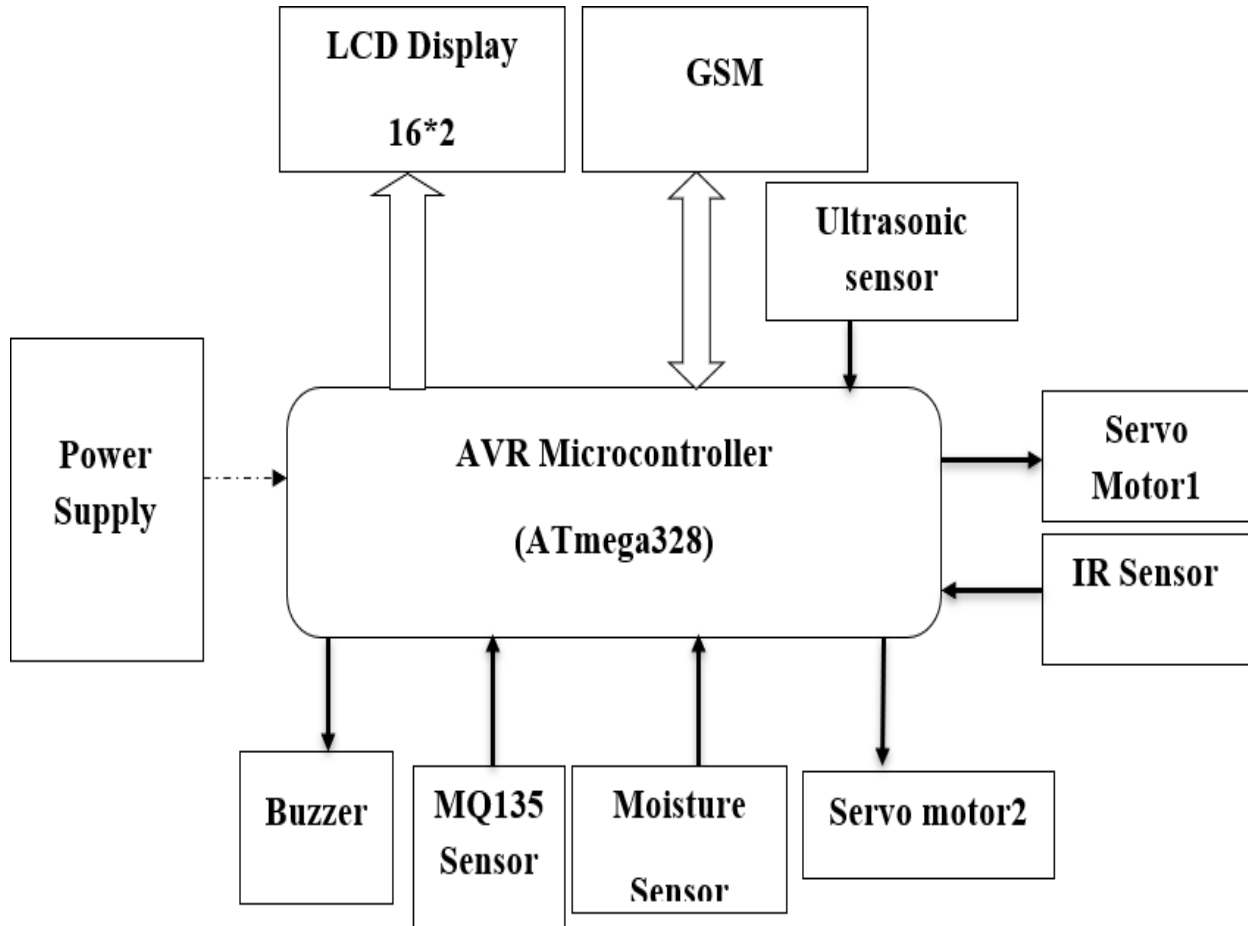
Ultrasonic Sensor: Measures the fill level of the waste bin.

Buzzer: Provides audible alerts for nearby residents or workers when bins are full or when maintenance is needed.

MQ135 Sensor: Monitors air quality to detect pollution levels.

Moisture Sensor: Detects moisture levels to determine if waste is dry or wet. Servo Motor 1: Controls the opening and closing of the waste bin lid. Servo Motor 2: Separates waste into different compartments (e.g., recyclables, organic, non-recyclables).

IR Sensor: Detects objects or obstructions in front of the waste bin for safety purposes.



**Fig. Block Diagram Of The System**

#### IV. WORKING

The intelligent waste management system employs sensors to monitor the fill levels of garbage bins and relay this information via a GSM module. Utilizing an ultrasonic sensor positioned atop the bins, it gauges the garbage level by comparing it with the bin's capacity. Additionally, an IR sensor serves a dual purpose: obstacle avoidance within the bin and object detection. The system also integrates a moisture sensor to distinguish between dry and wet waste, enabling the Arduino module to control a servo motor accordingly. Input from these sensors is processed by the Arduino, which triggers actions such as servo motor movement and LED display updates. Upon detecting a full bin, the GSM module dispatches an SMS alert to authorized personnel, while the LED display highlights the affected bin.

The smart waste dustbin operates through a combination of various sensors and communication modules to efficiently manage waste. Here's how it works:

1. Ultrasonic Sensor: This sensor is mounted on the top of the dustbin to measure the fill level of the waste. It emits ultrasonic waves and measures the time taken for the waves to bounce back. By calculating the distance, it determines the fill level of the dustbin. When the level reaches a certain threshold, it sends a signal to the microcontroller indicating that the bin needs to be emptied.
2. IR Sensor: The IR sensor is employed for both obstacle avoidance within the bin and object detection. It ensures that the waste is properly disposed of without any obstructions. If an obstacle is detected, the system can trigger an alert or take corrective action.

3. Gas Sensor: The gas sensor is used to detect harmful gases emitted from the waste. It ensures the safety of both the environment and the personnel handling the waste. When dangerous levels of gases are detected, the system can trigger alarms and alerts for immediate action.
  4. GSM Module: This module enables communication with authorized personnel or a central monitoring system. When the fill level of the dustbin reaches a critical point or when harmful gases are detected, the GSM module sends out alerts via SMS or calls to designated individuals or authorities. This allows for timely action to be taken, such as emptying the bin or addressing any safety concerns.
  5. Microcontroller: The brain of the system, the microcontroller processes the data from the sensors and executes predefined actions based on programmed logic. It coordinates the functioning of the sensors, communicates with the GSM module, and controls any other components, such as actuators or displays.
- Overall, the smart waste dustbin system offers an efficient and automated approach to waste management, ensuring timely disposal, safety, and environmental protection through the integration of various sensors and communication technologies.

### V. SIMULATION

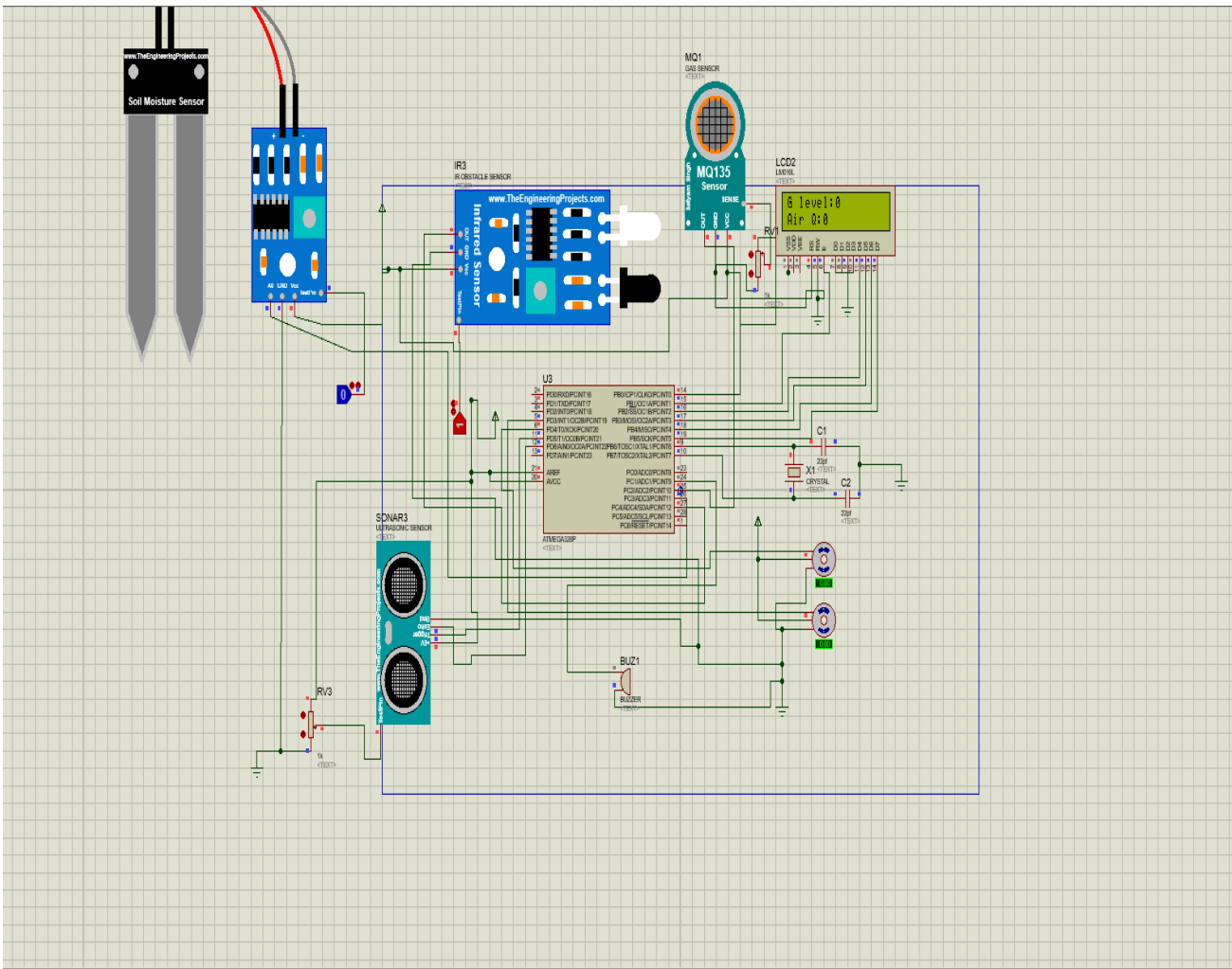


Fig. 2 Simulation Of waste dustbin

## VI. RESULT

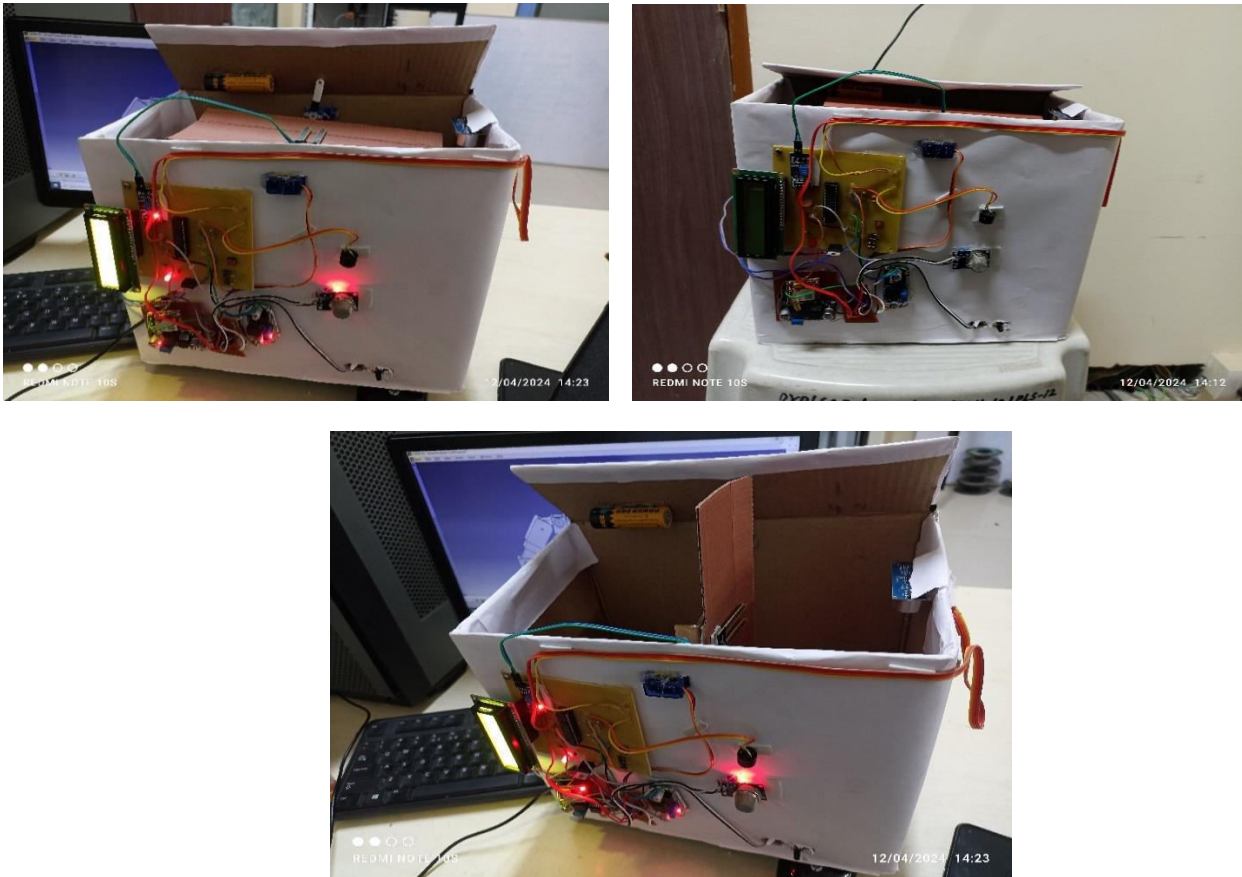


Figure :4

## VII. CONCLUSION

improved atmosphere conducive to breathing. When the capacity of the dustbin beyond a certain threshold, this mechanism guarantees that the recycling bin is cleaned. A Node MCU and an ultrasonic sensor are used in each proposal for the architecture of a smart trash can system. Vehicles that collect garbage are always working in cities and towns, with an emphasis on regional development; nevertheless, not all of these dustbins may be full at all times. The trash in the city's dustbins will be tracked by this gadget using the suggested manner. Individuals may view the accuracy of these trash cans at any times by using their technological devices. rubbish collection is more effective when there is a smart dustbin or rubbish bin .

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# IOT IV Bag Monitoring and Health Observation Alert System

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**ABSTRACT:** The IoT IV Bag Monitoring and Health Observation Alert System project is a comprehensive solution designed to monitor IV bags and track vital health parameters, ensuring timely intervention in critical situations. Leveraging Raspberry Pi as the core computing platform, the system integrates various sensors to monitor factors such as IV bag weight, temperature, and patient vital signs. Real-time alerts are generated and transmitted via MQTT protocol, enabling health care providers to respond promptly to any deviations from normal conditions.

This research presents a portable physiological checking framework that can continuously monitor the patient's vital signs. suggested a continuous monitoring and control system to record patient data and assess patient status. An IoT-based remote health monitoring system.

Nowadays, every nation places a high priority on health care. The Internet of Things, or IoT, is the next technological revolution and a rapidly expanding field of study, particularly in the medical field. The use of smart phones and wearable sensors has increased, has accelerated the evolution of remote health care monitoring. Even if the doctor is far away, using IOT IV Bag Monitoring and Health Observation Alert System obtains an accurate diagnostic of the patient's condition.

**KEYWORDS:** ESP32 Microcontroller, DTH11 Temperature sensor, Pulse sensor, HX711 Load sensor, Blynk IOT Platform.

## I. INTRODUCTION

The administration of drugs and fluids to patients via an IV line is monitored and controlled using intravenous (IV) drip monitoring. IV drip monitoring devices are designed to guarantee patients receive fluids and drugs in a secure and efficient manner. Systems for monitoring IV drips can assist medical professionals in Observe the infusion rate. By measuring the rate at which fluids and medications are given to a patient, IV drip monitoring systems can assist make sure that the appropriate amount of fluids or medication is given at the appropriate time.

IOT IV Bag Monitoring and Health Observation Alert System using ESP32, is revolutionizing healthcare monitoring. This system collects data from IV bags and patient health evaluations in real time using an ESP32 microcontroller. The healthcare industry benefits from the integration of Internet of Things (IOT) as it increases overall efficiency and improves patient care.

Data on the patients will be supplied through the internet or IoT cloud to the hospital that is working together. The attending physician at the hospital will keep a close eye on the patient's overall health. It is particularly beneficial since it reduces the time it takes to obtain a patient's medical record and allows the doctor to view all of the patient's data before the patient even arrives at the hospital. Encouraging patients to send their health information to hospitals facilitates the preparation of necessary supplies for therapy.

## II. RELATED WORK

Ananda Mohan Ghosh et al. [1] has suggested using an E-health sensor shield kit interface kit to manage the hospital's health monitoring system, enabling family members and consulting physicians to remotely monitor the patient's condition online. However, it doesn't notify the relevant doctors and family members by email or SMS alert.

P Kumar et al. [2] has suggested a Raspberry Pi-based patient monitoring healthcare system that tracks the patient's





bodily movement, heart rate, temperature, and respiration level. Data is gathered from sensors and shown on the screen using Putty software. Nevertheless, our suggested approach includes an alarm warning system to force doctors or family members to hand over the patient the needed medications.

By Lu et al. [3] Design and implementation of a smart intravenous infusion monitoring system. It can monitor the infusion process & detect any problems, such as occlusion, air bubbles, or disconnection of the IV line. This system uses an IoT platform and sends alerts to healthcare providers in real-time.

By Kim et al. [4] ZigBee technology is used in a wireless intravenous monitoring system (2015): This paper describes the planning and execution of a ZigBee-powered wireless intravenous monitoring device. When wanted, the system can send three notifications to healthcare providers to notify them of any irregularities in the infusion flow rate.

Jasmeet Chhabra. [5]proposes the plan and implementation for emergency medical services based on IoT health monitoring system. In this project, the patient health-related problems and healthcare cost are reduced.

By Ravi Kishore Kodali.[6] proposed the healthcare monitoring which is implemented to check the temperature of the patient. The Zig Bee mesh protocol is used where the patient 24-hour care records are being monitored. In-hospital records are maintained in the cloud.

N. GANESH. [7]proposed and published a Health Monitoring System using a Raspberry Pi and IOT in the Oriental Journal of Computer Science and Technology. The proposed method offers patients more effective and efficient medical care, and the information.

Wang et al. [8] IoT platform and has the ability to instantly notify healthcare practitioners of threats. "Internet of Things-Based Wireless Intravenous Drip Monitoring System" (2018): The design and execution of an Internet of Things-based wireless intravenous drip monitoring system are presented in this article. The infusion process may be tracked by the system, which can also identify issues and notify medical professionals.

Geo et al. [9] "Creation of an internet-of-things-based intravenous infusion safety and monitoring system" (2020): The creation of an IoT-based intravenous infusion safety and monitoring system is presented in the present article. The infusion process may be tracked by the system, which can also identify anomalies and notify medical professionals.

### **III. KEY HIGHLIGHTS**

1. **Sensor Integration:** The project demonstrates effective integration of multiple sensors, ensuring accurate data collection and reliable performance across various health parameters.
2. **Alerting Mechanism:** Real-time alerts are triggered based on predefined thresholds, providing healthcare providers with timely notifications to address critical situations promptly.
3. **ESP32 Microcontroller:** 1. The ESP32 microcontroller is a strong and adaptable gadget with excellent performance and low power consumption. Because it has Bluetooth and Wi-Fi built in, it is perfect for Internet of Things applications. An essential component of IV bags and health monitoring sensors' data collection and transmission processes is the ESP32 processor.
4. **Robustness and Reliability :** The system operates robustly in healthcare environments, with few instances of communication problems or malfunctioning sensor

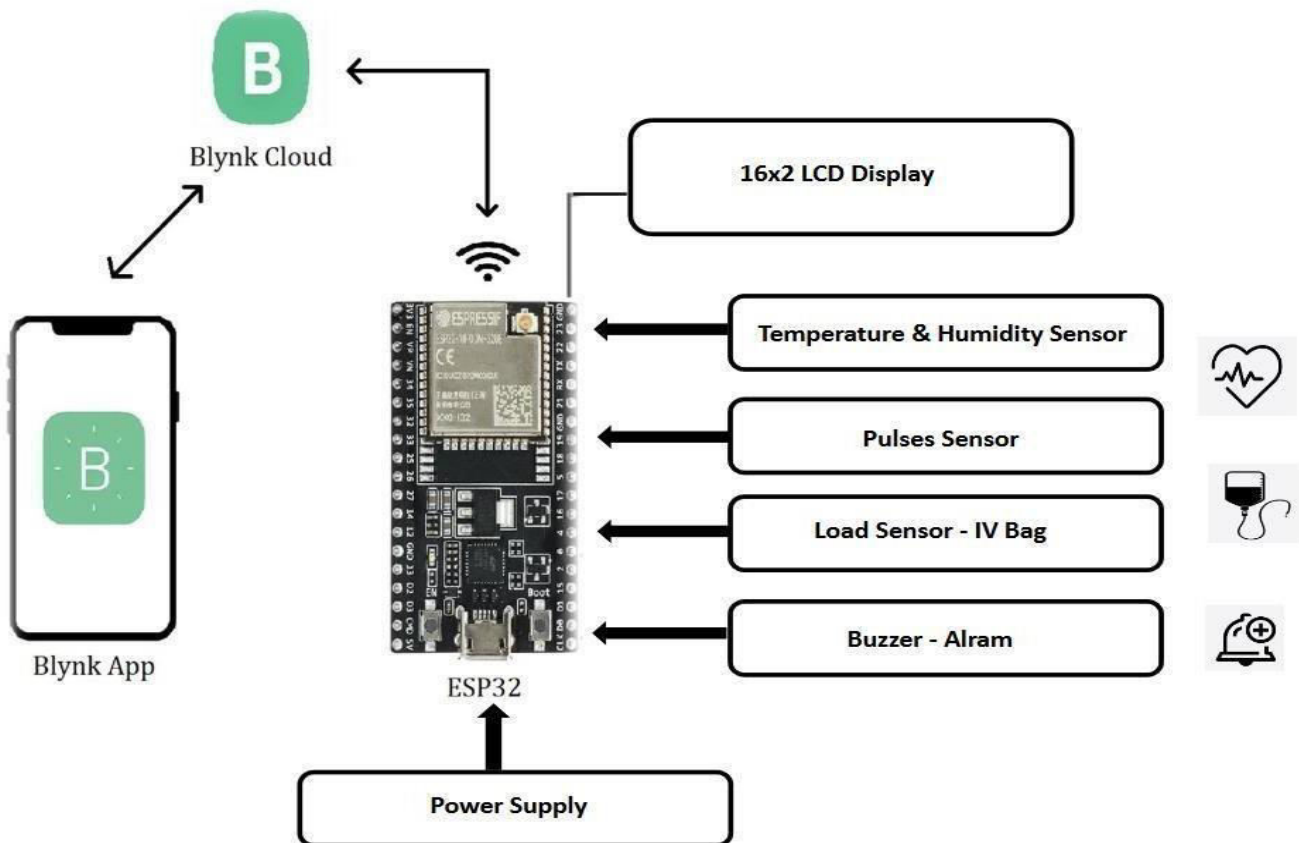
### **IV. HARDWARE AND SOFTWARE COMPONENTS**

- ESP32 (any model with internet connectivity)
- Weight sensor (e.g., load cell with HX711 ADC)
- Temperature and humidity sensor (e.g., DHT11 )
- LCD Display
- Buzzer for alerts
- Power supply for ESP32 and sensor
- C and C++ code to read sensor data and send alerts
- MQTT broker for communication

- Web server or dashboard for visualization
- Client application to receive alerts

## V. PROPOSED SYSTEM

### Block Diagram



Our system, which uses the ESP32 as its central processing platform, incorporates a number of sensors to keep an eye on things like IV bag weight, patient vital signs, and temperature. Healthcare providers can react quickly to any variation from normal conditions by using the MQTT protocol to generate and transmit real-time notifications. Devices installed in different systems can be connected over the internet thanks to the Internet of Things.

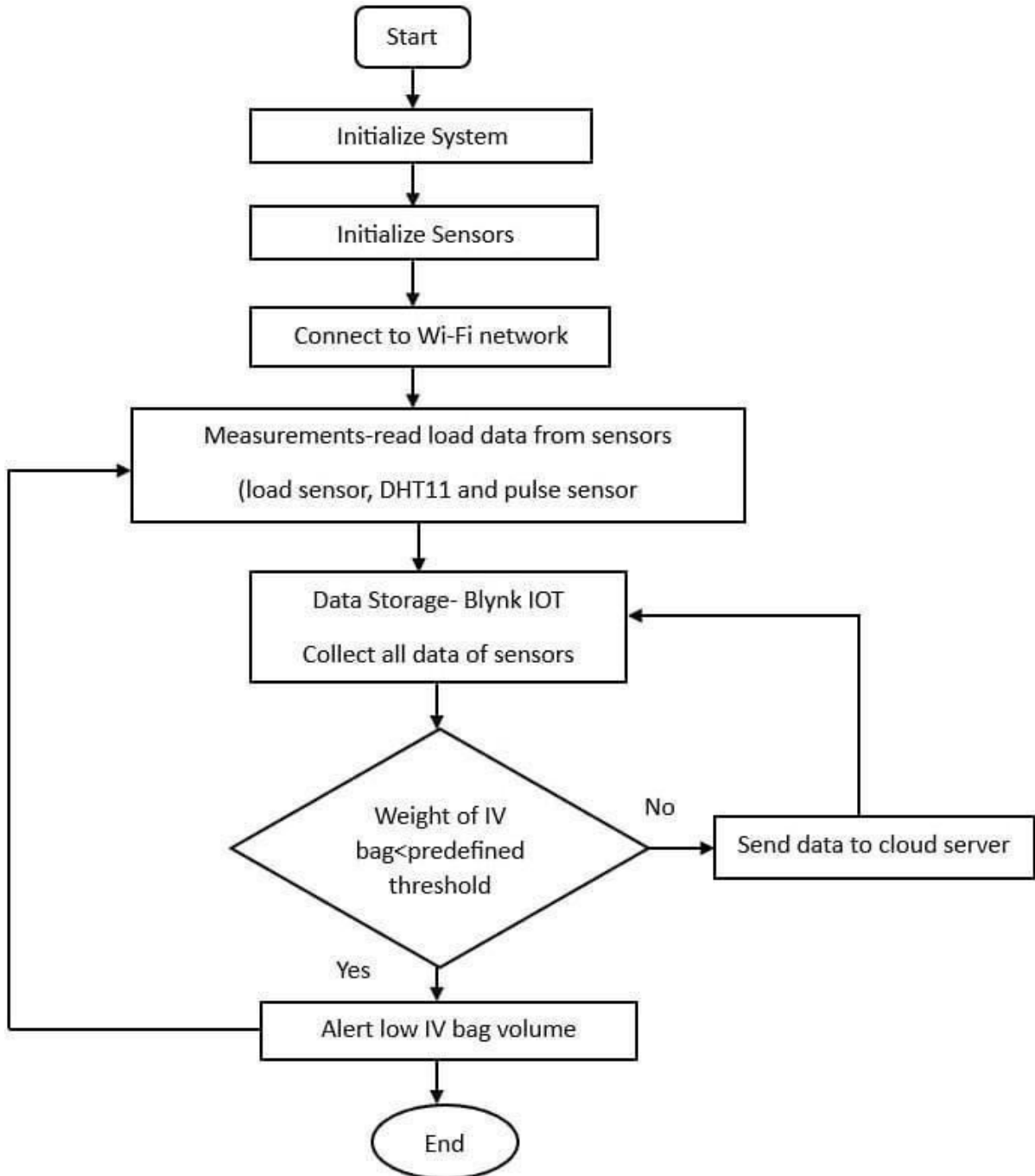
A tiny stand has the Weight Sensor fastened to it. To maintain equilibrium, the stand is constructed with a cross section at the bottom. The weight sensor hook on the stand can be suspended by the user using a small rod that extends from the top. Initially, the weight of the unfilled IV bag is measured using the weight sensor. Its weight is determined by this. The IV bag drips continuously until the fluid runs out while it is suspended on the sensor stand. The output voltage of the integrated circuit temperature sensors in the DTH11 series is linearly proportional to the temperature in centigrade.

Therefore, a temperature sensor is better than a linear temperature sensor. When using sensors measured in Celsius, the user does not need to reduce the significant constant conductivity from the output in order to convert the scale to centigrade. A temperature sensor is an item that monitors changes in body temperature. Health observation sensors measure vital signs like heart rate, and oxygen saturation. Continuous monitoring of these parameters provides valuable insights into patient health status.

healthcare professionals for timely intervention, which is able to continuously monitor all of the patient's parameters

suggested a continuous monitoring and control device to record patient data in the Blynk IOT Platform and monitor the patient's status. It maybe considered to use IoT to create a remote health monitoring system where authorized personnel can access data stored on any IoT platform. The doctors may diagnose patients remotely based on the values obtained from this system.

### VI. FLOWCHART

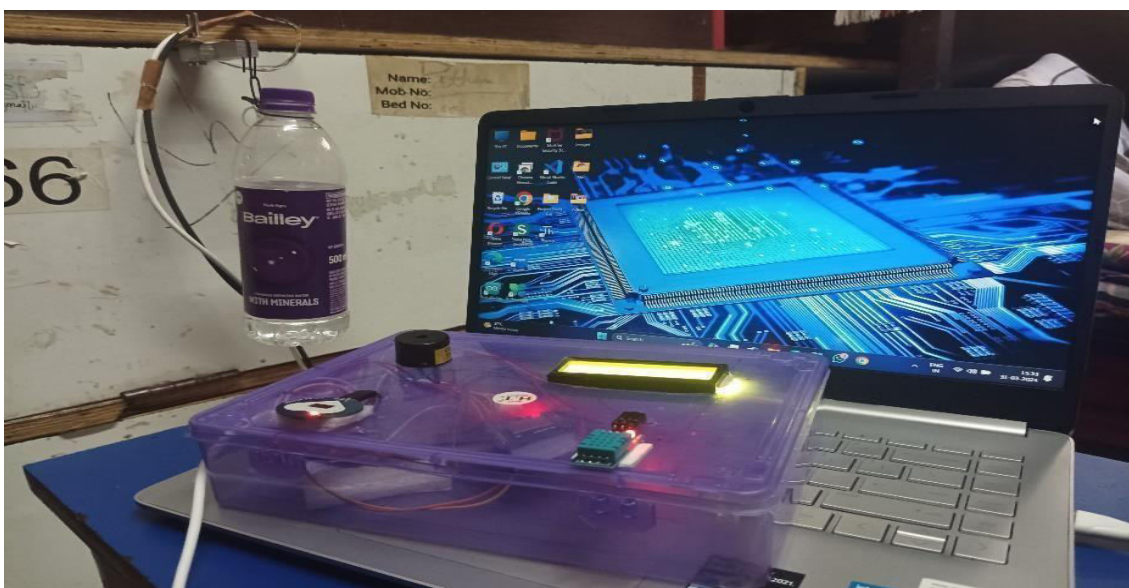
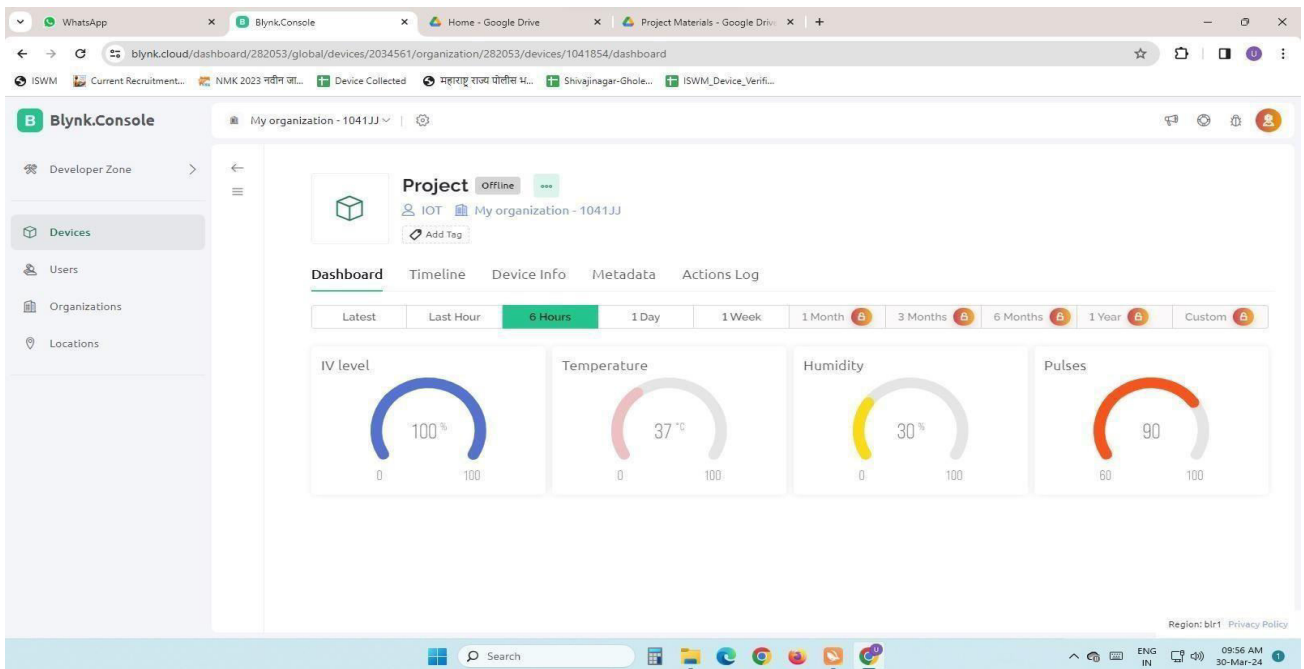


## VII. RESULTS

Results that are created in real-time are those that are made available instantly or very quickly. Within the framework of the system under discussion, "real-time results" would pertain to the instantaneous data and information that the system collects and presents while it is in operation.

The using IOT Platform allows for the real-time monitoring and analysis of multiple factors, including body temperature, heart rate, and fluid level, and others, in the results. Users of the system can ensure the safe and efficient administering of medication to patients by taking necessary action and making educated judgments based on the real-time findings presented by the system.

Healthcare providers may make sure that patients receive the right care and that any discrepancies from normal values are quickly identified and taken care of by keeping an eye on these metrics in real-time. We also check all data in mobile platform using of blynkapp of IOT.



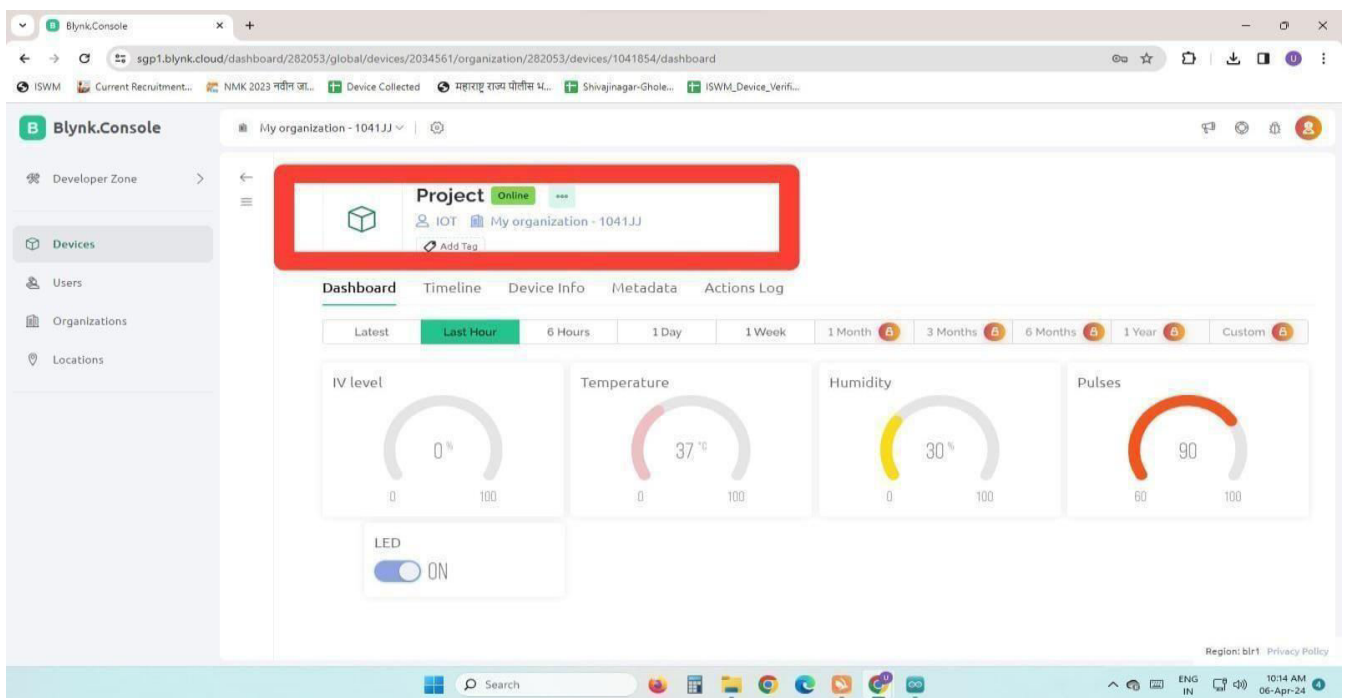


All things considered, this outcome shows how the system can track and evaluate patient data in real time, giving important information about the patient's health and facilitating efficient medical decision- making.

The suggested solution was put into practice, and patients' real-time data is accessible via the Blynk IOT cloud channel. The doctor from the affiliated hospital can simultaneously diagnose and monitor the patient when contemporary sensors are affixed to the patient's body.

The database contains the patient's past information, which aids the doctor in providing the patient with accurate care. At a specific interval, the system transmits the real-time data to the cloud channel. The graphical display of data makes it easier to interpret the information and calculate the outcomes.

The Blynk IOT Platform is user-friendly, intelligible, and simple to use. Using an ESP32 microprocessor, the Blynk IOT Platform may be linked to a WIFI network. During the connection process, the connection's online and offline state can be viewed through an LED on the OFF button and in the user interface at the green button.



## VIII. CONCLUSION

An important development in healthcare technology is the IoT IV Bag Monitoring and Health Observation Alert System, which provides unmatched chances for proactive patient monitoring and care delivery. We can realize the full potential of this system to revolutionize healthcare delivery and enhance patient outcomes by implementing the above-mentioned guidelines and iteratively enhancing the system in response to user feedback and technical improvements.

Its represents a transformative approach to healthcare monitoring. The system's integration of IOT technology, ESP32 microcontroller, and real-time data analytics offers unprecedented insights into patient health. By leveraging innovation and technology, healthcare providers can enhance patient care, improve clinical outcomes, and advance towards a more connected and proactive healthcare ecosystem.

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# Raspberry Pi Based Android Controlled Surveillance Robot

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**ABSTRACT:** In recent years, there has been a growing demand for innovative solutions in surveillance and environmental monitoring applications. This paper presents the development of a surveillance robot integrated with an air monitoring feature utilizing the Raspberry Pi platform and MQ135 gas sensor. The proposed system aims to enhance traditional surveillance capabilities by incorporating real-time air quality monitoring, providing a comprehensive solution for both security and environmental awareness. The surveillance robot is equipped with a Raspberry Pi microcontroller, which serves as the central processing unit for data collection, processing, and control. Additionally, it is outfitted with various sensors for environmental monitoring, including the MQ135 gas sensor capable of detecting a range of air pollutants such as ammonia, benzene, and carbon monoxide.

**KEYWORDS:** Raspberry Pi, Webpage, Camera Module, Air Monitoring

## I. INTRODUCTION

In this paper, we present the design, implementation, and experimental validation of a surveillance robot equipped with an air monitoring feature using the Raspberry Pi and MQ135 gas sensor. We describe the system architecture, hardware components, and software implementation in detail, highlighting the integration of surveillance and environmental monitoring functionalities. Furthermore, we discuss the potential applications and benefits of such a system in various scenarios, including industrial facilities, urban environments, and disaster response operations. Traditional surveillance systems have predominantly focused on video monitoring, which inherently limits their ability to provide comprehensive situational awareness. However, by incorporating environmental sensors like the MQ135 gas sensor, surveillance robots can not only detect suspicious activities but also evaluate the quality of the surrounding air. This added functionality holds particular significance in environments where air pollution or the presence of hazardous gases pose risks to human health and safety. At the core of the surveillance robot lies the Raspberry Pi microcontroller, servers as its central processing unit and enables a myriad of tasks, including data processing, control, and communication. Leveraging the versatility and computational power of the Raspberry Pi platform, the surveillance robot can execute complex algorithms for both surveillance and air quality monitoring in real-time. Moreover, the Raspberry Pi's compatibility with an extensive array of sensors renders it an ideal choice for integrating environmental monitoring capabilities into the surveillance system. In summary, the amalgamation of Raspberry Pi-based surveillance robots with air monitoring capabilities marks a significant stride in the realms of security and environmental monitoring. By harnessing the strengths of robotics, microcontroller technology, and sensor integration, these systems offer a versatile and cost-effective solution for augmenting situational awareness and mitigating risks across diverse settings.

## II. EXISTING SYSTEM

Traditional surveillance systems have long been prevalent in various settings, ranging from private properties to public spaces, employing cameras and sometimes motion sensors to detect and monitor activities. These systems primarily focus on visual surveillance, providing live feeds or recorded footage to security personnel or homeowners for monitoring purposes. While effective in capturing visual data, these systems often lack additional features for comprehensive situational awareness, particularly concerning environmental factors such as air quality. Moreover, standalone air quality monitoring systems exist, typically comprising sensors deployed in fixed locations to measure pollutant levels over time. These systems serve purposes ranging from assessing indoor air quality in buildings to monitoring pollution levels in urban areas. However, they are stationary and lack mobility, limiting their ability to provide real-time data across different locations or respond to dynamic environmental conditions. Despite their individual merits, both traditional surveillance systems and standalone air quality monitoring systems have inherent

limitations. Traditional surveillance systems focus primarily on visual data and may overlook crucial environmental factors, while standalone air quality monitoring systems lack mobility and situational awareness beyond air quality measurements. Therefore, there arises a need for an integrated solution that combines the capabilities of surveillance systems with real-time air quality monitoring to provide comprehensive situational awareness.

### III. SYSTEM MODEL IMPLEMENTATION

The system introduces a surveillance robot equipped with a Raspberry Pi microcontroller, an MQ135 gas sensor for air quality monitoring, and a camera module as key components. This innovative integration enhances traditional surveillance capabilities by providing real-time visual monitoring alongside continuous air quality assessment, resulting in comprehensive situational awareness in various environments. Central to the proposed system is the Raspberry Pi microcontroller, serving as the core processing unit for data acquisition, analysis, and control. Leveraging the computational power and flexibility of the Raspberry Pi platform, the surveillance robot can execute sophisticated algorithms for both surveillance and environmental monitoring tasks. The Raspberry Pi's compatibility with a variety of sensors facilitates seamless integration, enabling the system to adapt to different monitoring requirements. The camera module serves as a pivotal component of the proposed system, enabling visual surveillance and data capture in real-time. With the ability to capture high-resolution images and videos, the camera module provides security personnel or operators with valuable visual information, allowing them to monitor activities and identify potential threats effectively. Additionally, the camera module can be equipped with features such as night vision or motion detection to enhance surveillance capabilities further.

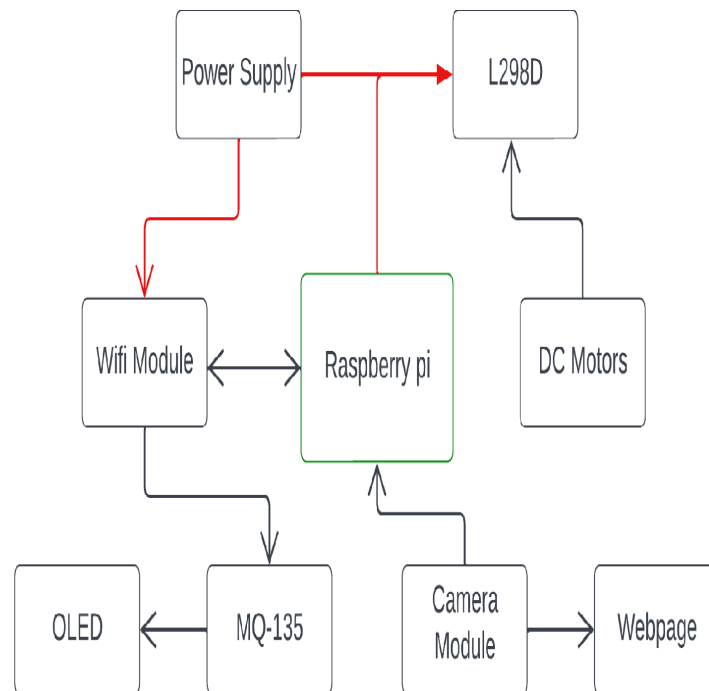


Fig. Block Diagram of the System

The block diagram illustrates the architecture of a surveillance robot car, with its core components interconnected for seamless functionality. At the heart of the system lies the Raspberry Pi, serving as the primary control unit. It interfaces with various peripherals to manage the robot's operations effectively. The Motor Driver, specifically the L298 module, receives power from the main power supply and controls the motor wheels' movement, enabling the robot to navigate its environment. Connected to the Raspberry Pi, the Camera Module captures images and videos, with the Raspberry Pi processing this data to be displayed on an HTML webpage. Additionally, an ESP WiFi Module facilitates wireless communication, linking the Raspberry Pi to both the MQ135 Gas Sensor and an OLED display. The MQ135 Gas Sensor measures air quality parameters, such as PPM levels of different gases, and transmits this data wirelessly to the ESP WiFi Module. The OLED display then presents this information in real-time, allowing users to monitor air quality conditions. This integrated system offers a comprehensive surveillance solution combining a camera feed display with air quality monitoring capabilities, all managed and coordinated by the Raspberry Pi controller.



## VI. SOFTWARE IMPLEMENTATION

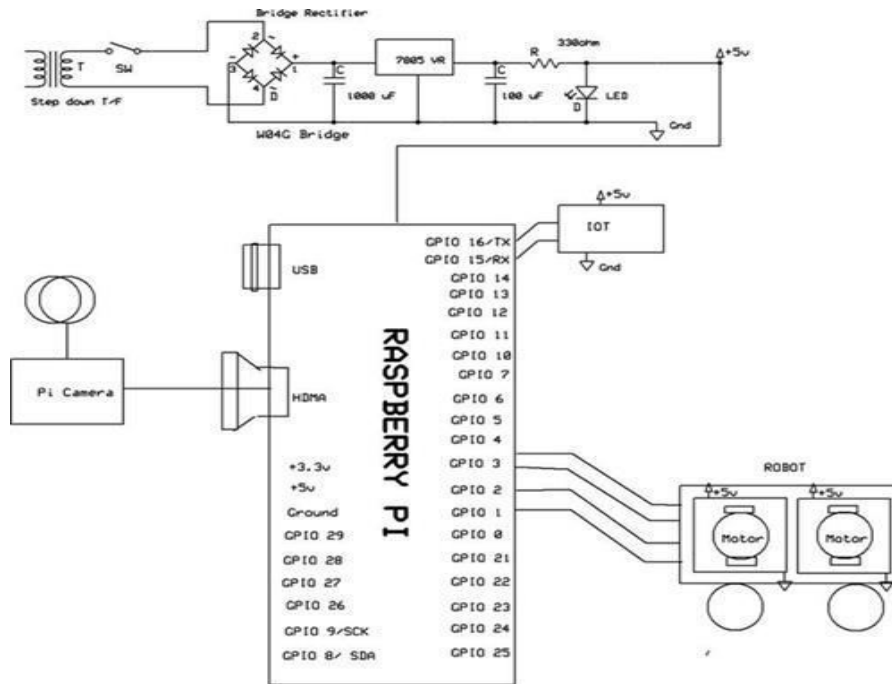


Fig 2. Schematic Diagram of System

## V. WORKING

A Raspberry Pi-based surveillance car typically functions by integrating a Raspberry Pi single-board computer with various hardware components such as motors, cameras, sensors, and possibly other peripherals. Here's a brief overview of its working principle:

- **Hardware Setup:** The Raspberry Pi serves as the brain of the surveillance car. It's connected to motor controllers to control the movement of the car, a camera module for capturing video footage, and possibly additional sensors such as ultrasonic sensors for obstacle detection.
- **Motor Control:** The Raspberry Pi sends signals to the motor controllers to control the movement of the car. By varying the signals sent to the motors, it can make the car move forward, backward, turn left, or turn right.
- **Camera Operation:** The camera module attached to the Raspberry Pi captures live video footage. The Raspberry Pi processes this video feed, possibly using computer vision algorithms to detect objects or track motion.
- **Remote Control:** The Raspberry Pi can be controlled remotely through a wireless connection, such as Wi-Fi or Bluetooth. Users can send commands to the Raspberry Pi from a computer or a smartphone, instructing it to move the car, adjust the camera angle, or initiate surveillance functions.
- **Surveillance Functions:** The surveillance car can perform various tasks, such as patrolling an area, monitoring for intruders, or capturing footage of specific events. The Raspberry Pi processes the camera feed and performs any necessary analysis or detection tasks, sending alerts or storing footage as required.
- **Power Management:** The surveillance car is powered by a battery or an external power source. The Raspberry Pi manages power consumption and can implement features such as sleep mode or automatic shutdown to conserve energy when the car is not in use.

Overall, the Raspberry Pi serves as a versatile and cost-effective platform for building surveillance systems, offering the flexibility to customize and expand functionality according to specific requirements.

## VI. EXPERIMENTAL RESULTS

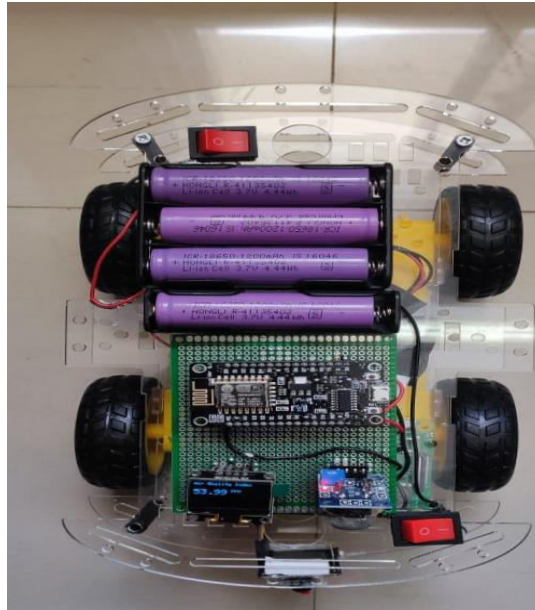


Fig 1.. Shows the measurement of Air Quality Index In PPM

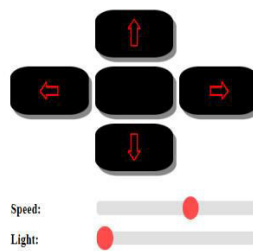
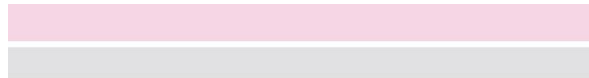


Fig 2. Shows the captured photo from the Camera.



Fig.3 Captured Image through the camera

## VII. CONCLUSION

In conclusion, when considering the integration of the MQ135 gas sensor, ESP8266 module, and Pi Camera module into your surveillance robot car project, several key points emerge. Firstly, the MQ135 gas sensor enhances the project's functionality by enabling real-time monitoring of air quality parameters, facilitating prompt detection of potential hazards, and ensuring a safer environment for users. Secondly, the ESP8266 module brings wireless connectivity to the project, enabling remote access and control via Wi-Fi networks, enhancing flexibility and accessibility. Thirdly, the Pi Camera module provides high-quality imaging capabilities, allowing for the capture of images and videos essential for surveillance and monitoring purposes, further augmenting the project's utility. Moreover, the low power consumption and compact form factor of these components contribute to the project's efficiency and ease of integration, minimizing space constraints and energy usage. Overall, the integration of these components elevates the surveillance robot car project, empowering it with advanced features for comprehensive surveillance, monitoring, and environmental assessment. By considering these key points, you can ensure the successful implementation of your surveillance robot car project, equipped with the necessary tools to meet its objectives effectively while providing enhanced functionality and usability.

## ACKNOWLEDGMENTS

We extend our sincere gratitude to all those who have supported and contributed to the completion of this project. Firstly, we express our appreciation to our professors and instructors for their guidance, mentorship, and invaluable feedback throughout the project's development. Their expertise and encouragement have been instrumental in shaping our ideas and refining our work. Furthermore, we acknowledge the support provided by the college administration and staff, including the library resources, laboratory facilities, and technical assistance, which have been essential for the execution of our project. Additionally, we are grateful to any external organizations or individuals who provided assistance, funding, or resources that contributed to the success of our project. Lastly, we express our heartfelt thanks to our friends and family members for their unwavering support, understanding, and encouragement throughout this endeavor. Their encouragement and belief in our abilities have been a source of motivation and inspiration.



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# Solar Powered Smart Agriculture System

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**ABSTRACT:** In India husbandry plays an important part for development of food product. In our country, husbandry depends on the showers, which isn't sufficient source of water. In order to efficiently manage the water resource in husbandry sector, an automated irrigation system is proposed to optimize water use and increase productivity of crops. The proposed system has a distributed wireless network with power backup managed by solar panel to meet the energy requirements of this system. Detectors similar as soil- humidity and temperature detectors are placed in the root zone of the shops. Whenever the humidity is dropped beyond the prescribed position water pump motor will be turned on and water will be supplied for irrigation.

**KEYWORDS:** Irrigation System, Solar Panel, Moisture Sensor, App

## I. INTRODUCTION

Agriculture is a cornerstone of India's economy and livelihood, yet it faces significant challenges due to the country's dependence on monsoons for water supply. Erratic rainfall patterns and water scarcity underscore the urgent need for innovative solutions to optimize water management and enhance agricultural productivity. The integration of renewable energy sources, advanced Internet of Things (IoT) technology, and mobile applications presents a promising approach to address these challenges and usher in a new era of smart agriculture.

The Solar-Powered Smart Agriculture IoT System represents a cutting-edge solution tailored to the specific needs of Indian farmers. By harnessing solar energy through photovoltaic panels and leveraging IoT devices such as soil moisture sensors, temperature sensors, and water pumps, this system aims to revolutionize irrigation practices. Solar panels convert sunlight into electrical energy, which powers the IoT infrastructure, ensuring reliable and sustainable operation even in remote agricultural areas without access to traditional grid power.

Central to the system's functionality is a stoner-friendly Android mobile operation that serves as a important interface for growers. The mobile app enables real- time monitoring of soil conditions, allowing growers to ever access critical data similar as soil humidity situations and ambient temperatures. With this information at their fingertips, growers can make informed opinions about irrigation scheduling, icing optimal water operation acclimatized to the specific requirements of different crops and soil types.

Moreover, the mobile application includes features beyond data monitoring, such as remote control of irrigation systems and access to an integrated online shop. Farmers can adjust irrigation schedules, activate water pumps, and purchase essential agricultural inputs like fertilizers and pesticides directly from the app. This seamless integration of IoT technology with e-commerce functionality empowers farmers with greater control over their operations while promoting efficiency and resource conservation.

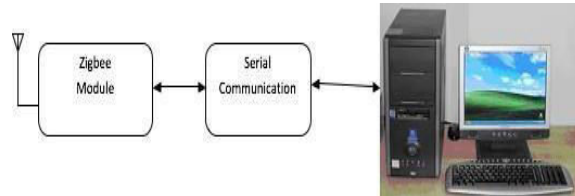
The Solar- Powered Smart Agriculture IoT System holds immense pledge for transubstantiating traditional husbandry practices into sustainable, data- driven approaches. By enabling precise irrigation, reducing water destruction, and perfecting overall crop health, the system contributes to increased agrarian productivity and adaptability in the face of climate variability. likewise, the use of renewable energy sources aligns with India's commitment to sustainability and environmental stewardship.

## II. TECHNOLOGY USED

Solar powered automatic irrigation system has been done through ZigBee technology. ZigBee technology is a short distance wireless communication technology to connect original wireless bumps. As data communication happens in low power, it provides high stability and high transfer rate. The ZigBee standard has been proposed to interconnect simple, low rate and battery powered wireless device grounded on IEEE . Low Rate Wireless Personal Area Network( LR- WPAN) standard. multitudinous operations similar as home appliances network, home healthcare,

medical monitoring and environmental detectors are anticipated to be eased by deployment of ZigBee network.

### III. SOLAR PANEL



**Fig 1. Proprietor Section**

Solar panel refers to a photovoltaic module, a solar hot water panel, or to a set of solar photovoltaic (PV) modules electrically connected and mounted on a supporting structure. A PV module is a packaged, connected assembly of solar cells. Solar panels can be used as a element of a larger photovoltaic system to induce and supply electricity in marketable and domestic operations. Each module is rated by its DC affair power under standard test conditions (STC), and generally ranges from 100 to 320 watts.

The effectiveness of a module determines the area of a module given the same rated affair – an 8 effective 230- watt module will have twice the area of a 16 effective 230- watt module. A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system generally includes a panel or an array of solar modules, an inverter, and sometimes a battery and/ or solar shamus and connection wiring.

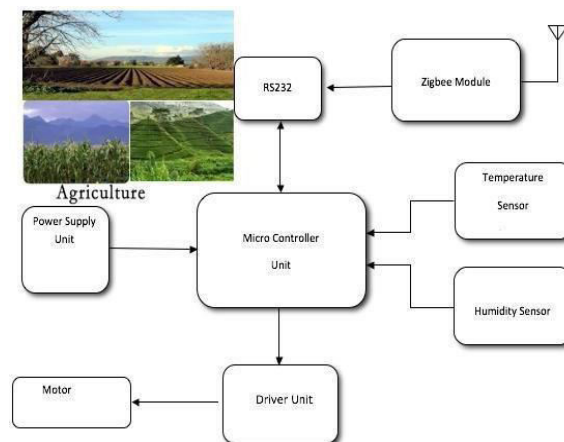
### IV.2 ZIGBEE

802.15.4 – ZigBee Physical Layer ZigBee is a wireless technology developed as an open global standard to address the unique conditions of low- cost, low- power wireless M2M networks.

The ZigBee standard operates on the IEEE physical radio specification and operates in unlicensed bands including 2.4 GHz, 900 MHz and 868 MHz The 802.15.4 specification upon which the ZigBee mound.

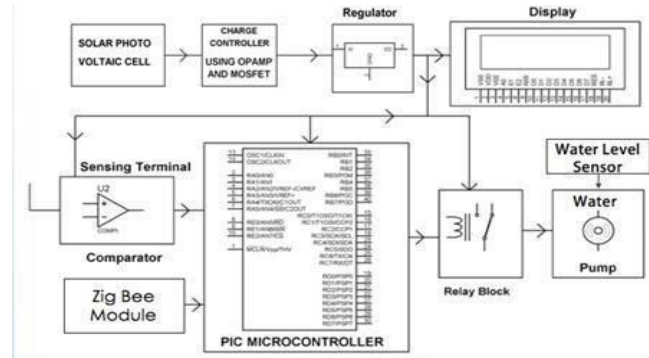
The specification is a packet- predicated radio protocol intended for low- cost, battery- operated bias. The protocol allows bias to communicate in a variety of network topologies and can have battery life lasting several times.

### V. PROPOSED SYSTEM



**Fig 2. Crop Growing Section**

In this paper, the development of the automated irrigation system based on microcontrollers and wireless communication at experimental scale within rural areas is presented. The crop growing section and the proprietor section are shown in figure 1 and figure2 respectively. The overall controller unit circuit diagram using PIC microcontroller is shown in figure 3



**Fig 3. Circuit Diagram for controller unit**

The end of the perpetration was to demonstrate that the automatic irrigation could be used to reduce water use. A microcontroller for data accession, and transceiver; the detector measures are transmitted to a microcontroller-grounded receiver. This gateway permits the automated activation of irrigation when the threshold value of soil humidity and temperature is reached. Communication between the detector bumps and the data receiver is via the ZigBee.

### VI. DESIGN OF WIRELESS SENSOR NETWORK

A wireless detector network( WSN) is a collection of detectors for collecting and distributing environmental data. Wireless detector network beget scanning and preventative of the physical changes for the isolated position with superior perfection. A group of detectors work collaborates for a common function. The WSN is erected of bumps from a many to several hundreds or indeed thousands, where each knot is connected to several detectors. PC shows the data Acquisition from Moisture Sensor & Temperature Sensor.

#### Moisture sensor

Moisture sensor is used to sense the level of moisture content present in the irrigation field. It has a level detection module in which we can set a reference value. This circuit can be used with analog probes that produce a voltage proportional to soil moisture such as VG400. The moisture content of the soil is found by using the soil moisture sensor such as VG400, which produces an equivalent output voltage proportional to the conductivity between the two probes. The soil sensors collect information on soil temperature and soil moisture in the outdoors environment.

#### Temperature sensor

The LM35 series are perfection integrated- circuit temperature detectors, with an affair voltage linearly commensurable to the Centigrade temperature. therefore the LM35 has an advantage over direct temperature detectors calibrated in ° Kelvin, as the stoner isn't needed

#### RS-232

In telecommunications, RS- 232 is a standard for periodical double data connection between a DTE( Data terminal outfit) and a DCE( Data Circuit- terminating outfit). It's generally used in computer periodical anchorages.

#### MAX 232

Maximum- 232 is primary used for people erecting electronics with an RS- 232 interface. periodical RS- 232 communication works with voltages(- 15V. -3 V for high) and 3V. 15V for low) which aren't compatible with normal computer sense voltages. To admit periodical data from an RS- 232 affiliate the voltage has to be reduced, and the low and high voltage position reversed. In the other direction( transferring data from some sense over RS- 232) the low sense voltage has to be " banged up", and a negative voltage has to be generated, too.

#### ZigBee communication protocol realizing

The digital frequency part, the direct sequence spread diapason( DSSS) technology, not only can fluently realize short-

range wireless communication standard compatible, and greatly ameliorate the trustability of wireless dispatches. The protocol mound design is precise and dependable, including veritably important AES processing technology, CSMA/CA energy- saving technology, etc. ZIGBEE is a specification for a suite of high- position communication protocol used to produce particular area networks erected from small, low power digital radios. he low cost allows the technology to be extensively stationed in wireless control. Low power uses allows longer life with lower batteries. ZigBee protocol features include;

1. Support for multiple network topologies similar as point to point, point to multipoint and mesh networks
2. Low duty cycle – provides long battery life
3. Low quiescence
4. Direct Sequence Spread Diapason( DSSS)
5. Up to 65,000 bumps per network
6. 128- bit AES encryption for secure data connections

## VII. IMPLEMENTATION

This system consists of moisture level sensors, PIC microcontroller, relays and Solar Panel. At the field station, the sensors, which are buried inside the soil, send the signal to the microcontroller. The microcontroller converts the analog signal to digital values. This value is compared with a value representing the minimum allowable value below this minimum value, a signal is sent to turn on the corresponding relay to allow water flow into the farm and vice-versa. This is helpful to carry to abate a large constant voltage from the affair to gain accessible Centigrade scaling. The LM35 doesn't bear any external estimation or trouncing to give typical rigor of  $\pm \frac{1}{4}^{\circ}\text{C}$  at room temperature and  $\pm \frac{3}{4}^{\circ}\text{C}$  over a full  $-55^{\circ}\text{C}$  to  $150^{\circ}\text{C}$  temperature range out the irrigation whenever required as well as to save energy and well crops health.

### 1. Crop growing section

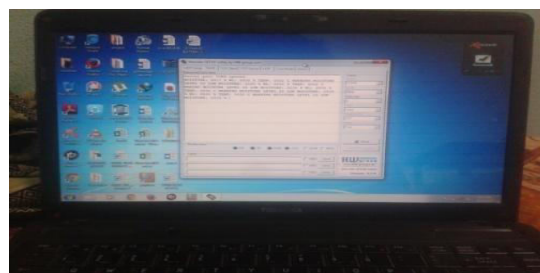
The output from the Moisture Sensor and Temperature Sensor from the field are fed to a micro controller via signal conditioning unit. The data is compared to the threshold level and if the value is low then command signal is sent to the base station via Zigbee module. Figure 4 shows the experimental set up placed at the crop growing section.



**Fig 4. Photographic view of crop Growing section**

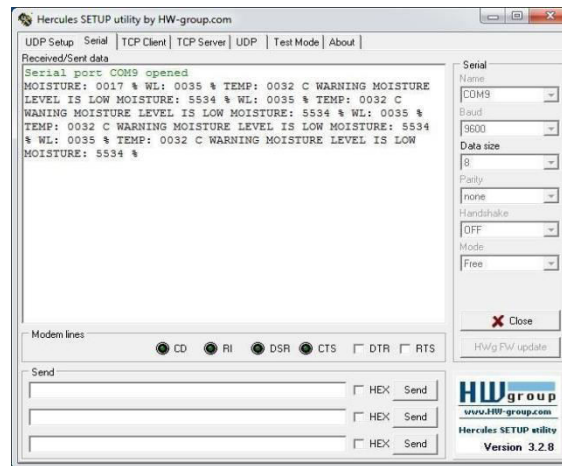
### 2. Proprietor Section

The base station, which receives the information data from the crop growing section via wireless module sends the control signal to the pumping station. Figure 5 (a) and 5(b) shows the sensor reading on PC display at Proprietor.



**Fig.5 (a). PC display at the receiver**





**Fig.5 (b) display at the receiver**

### 3. Pumping Station

The pumping station comprises of a water pump and a tank. The tank is connected with water level indicator sensor when the water level in the tank becomes less than a predefined value the Pumping motor automatically Switches ON without any human interference and later when it reaches certain it automatically turn OFF according to the command from the proprietor section.

In this paper we have demonstrated a Wireless sensor network based remote monitoring for automatic irrigation system using solar power back up to drive water from pump to land, bore well to a tank the system consists of wireless sensor network nodes and network management platform. ZigBee node respectively transmits acquisition of the temperature and moisture data to the proprietor station. The outlet valve of tank is automatically regulated using an embedded controller and moisture sensor to control the flow rate of water from the tank to the irrigation field which optimizes the use of water.

### VIII.CONCLUSION

In conclusion, the Solar-Powered Smart Agriculture IoT System represents a transformative approach to addressing water scarcity and promoting sustainable agriculture. With ongoing advancements and collaborative efforts, this technology has the potential to revolutionize farming practices, improve food security, and contribute to environmental conservation on a larger scale

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# Cotton Picker Fire Detection System

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**ABSTRACT:** This project utilizes the Raspberry Pi Pico microcontroller to address the escalating frequency and seriousness of fire incidents, emphasizing the need for advanced fire detection and alert systems to safeguard public safety and property. The abstract introduces a new approach to this challenge by proposing a Fire Detection and Alerting System based on the Raspberry Pico microcontroller. Leveraging the Raspberry Pi Pico as the core processor offers a cost-effective and energy-efficient solution for fire detection and alerting. The microcontroller's small footprint and low energy consumption make it well-suited for deployment in diverse environments, including residential, commercial, and industrial spaces.

**KEYWORDS:** Raspberry Pico, Fire System, Wireless Networks, Sensor.

## I. INTRODUCTION

Our proposed research idea is aimed at enhancing the safety and security of cotton picker trucks by implementing an innovative fire detection mechanism. This system integrates the Raspberry Pi Pico microcontroller and flame sensors to continuously monitor the cotton picker trucks for any signs of fire outbreak. The cotton industry relies heavily on efficient and safe machinery operations, especially during harvesting seasons. However, the risk of fire incidents in cotton picker trucks poses a significant threat to both personnel safety and property. The objective of this project is to develop a reliable and cost-effective solution that can promptly detect and alert operators to potential fire hazards within the cotton picker equipment. By utilizing the Raspberry Pi Pico, a versatile and energy-efficient microcontroller, coupled with flame sensors capable of detecting fire signatures, this system offers a robust and practical approach to fire prevention in cotton picker trucks. The compact size and low power consumption of the Raspberry Pi Pico make it ideal for deployment in agricultural machinery like cotton pickers. This introduction outlines the motivation, purpose, and technology behind the Cotton Picker Fire Detection System, emphasizing its importance in mitigating fire risks and ensuring the safety of cotton picker operations.

## II. SYSTEM OUTLINES

Our proposed topic of "Cotton Picker Fire Detection System" is designed to enhance safety measures in cotton picker trucks by utilizing a Raspberry Pi Pico microcontroller along with flame sensors to detect fire incidents. In case of a fire detection, the system activates an RGB module to provide a visual indication of the fire, ensuring prompt response to potential hazards.

### 1. Overview and Objectives-

The primary objective of the Cotton Picker Fire Detection System is to prevent fire-related accidents and minimize damage to cotton picker trucks. By integrating advanced fire detection technology, the system aims to provide real-time monitoring and immediate alerts in the event of a fire outbreak.

### 2. Components and Hardware-

- Raspberry Pi Pico: Serves as the central processing unit for data acquisition and processing.
- Flame Sensor: Detects the presence of flames or sudden increases in temperature within the cotton picker truck.
- RGB Module: Provides visual feedback by emitting different colors based on the detected fire status.
- Wiring and Interfacing Components: Enable connectivity between the Raspberry Pi Pico, flame sensor, and RGB module.

### 3. System Functionality-

- Fire Detection: The flame sensor continuously monitors the environment inside the cotton picker truck for any signs of fire.



- Data Processing: The Raspberry Pi Pico processes data from the flame sensor to determine if a fire has been detected.
- Alert Mechanism: Upon detecting a fire, the RGB module lights up with a specific color (e.g., red) to indicate the presence of fire.
- Notification: The system can be integrated with additional alert mechanisms such as sound alarms or remote notifications to inform operators or authorities.

#### **4. Implementation and Deployment-**

- Installation: The system components (Raspberry Pi Pico, flame sensor, and RGB module) are installed securely within the cotton picker truck.
- Testing and Calibration: Calibration of the flame sensor and RGB module ensures accurate detection and visual indication of fire incidents.
- Deployment: Once tested and validated, the Cotton Picker Fire Detection System is deployed across cotton picker fleets for continuous monitoring and fire prevention.

#### **5. Benefits and Impact-**

- Enhanced Safety: Early detection of fires helps in preventing accidents and minimizing damage to machinery and crops.
- Cost-Effective Solution: The use of Raspberry Pi Pico and basic components offers a cost-efficient fire detection solution compared to traditional systems.
- Scalability: The system design allows for scalability and integration with other IoT devices or monitoring systems.

### **III. METHODOLOGY USED**

The methodology for our proposed idea "Cotton Picker Fire Detection System" involves a systematic approach to designing and implementing a reliable fire detection system using Raspberry Pi Pico and a flame sensor. The system's primary objective is to detect fires within cotton picker trucks and provide a visual indication using an RGB module upon fire detection. The following steps outline the methodology used:

#### **1. System Setup and Components Selection-**

- Identify and procure necessary components including Raspberry Pi Pico microcontroller, flame sensor module, RGB LED module, connecting wires, and power supply.
- Set up the Raspberry Pi Pico development environment with appropriate software tools such as Thonny IDE or MicroPython for programming.

#### **2. Circuit Design and Integration-**

- Design the circuit layout to connect the flame sensor and RGB LED module to the Raspberry Pi Pico.
- Ensure proper wiring and connections between the components to facilitate data transmission and control.

#### **3. Programming the Raspberry Pi Pico-**

- Develop the firmware using Python programming language or MicroPython to enable the Raspberry Pi Pico to interface with the flame sensor.
- Implement a continuous monitoring process where the flame sensor periodically checks for the presence of fire.

#### **4. Fire Detection Algorithm-**

- Define the fire detection algorithm to process sensor data and determine the occurrence of a fire.
- Set appropriate thresholds for sensor readings to accurately detect fires while minimizing false alarms.

#### **5. Alert System Implementation-**

- Integrate the RGB LED module into the system to provide a visual indication when a fire is detected.
- Program the Raspberry Pi Pico to control the RGB LED based on the output of the flame sensor.

#### **6. Testing and Calibration-**

- Conduct thorough testing of the complete system under various conditions to validate its effectiveness and reliability.
- Calibrate sensor parameters and algorithm thresholds as needed to optimize fire detection performance.

#### **7. Integration with Cotton Picker Trucks-**

- Prepare the system for integration into cotton picker trucks by ensuring robustness against environmental factors such as vibration and temperature.

- Install the fire detection system in strategic locations within the cotton picker trucks for optimal coverage and responsiveness.

#### IV. SYSTEM DESCRIPTION

- RASPEBRRY PI PICO:**

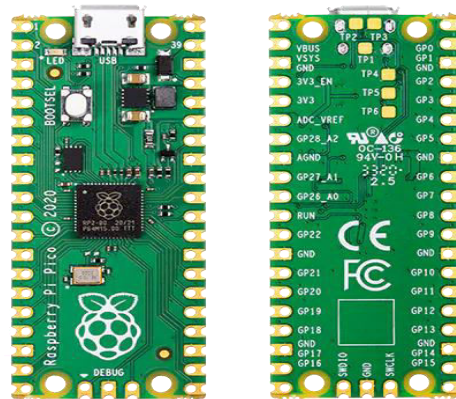


Fig 1. Raspberry Pi Pico

The Raspberry Pi Pico is a microcontroller board developed by the Raspberry Pi Foundation, designed to offer a versatile and cost-effective platform for embedded systems and electronics projects. It features the RP2040 microcontroller chip, which is based on a dual-core Arm Cortex-M0+ processor running at 133 MHz, providing ample processing power for a wide range of applications. The board includes 264KB of SRAM, ample GPIO pins, hardware PWM channels, UART, SPI, I2C interfaces, and programmable IO (PIO) capabilities, enabling flexible interfacing with various sensors, displays, and peripherals. One of the standout features of the Raspberry Pi Pico is its support for MicroPython and C/C++ programming, making it accessible to both beginners and experienced developers. It can be programmed using a simple text editor and requires no additional hardware for programming. The Pico is also equipped with a built-in USB 1.1 interface for programming and power, simplifying connectivity and setup. Its compact form factor, low power consumption, and affordable price make it ideal for prototyping and deploying embedded projects in diverse fields such as automation, robotics, IoT, and education.

- ESP8266:**

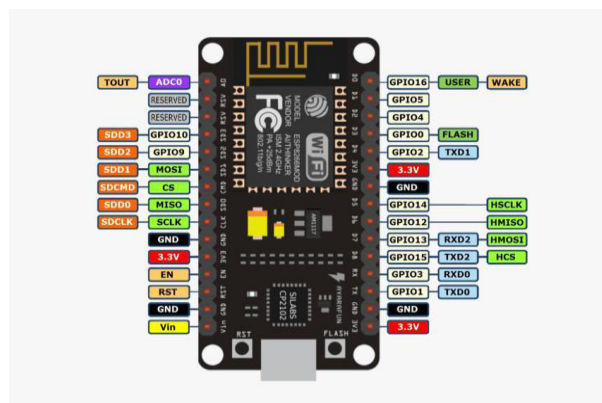


Fig 2. ESP 8266

The ESP8266 is a versatile and popular Wi-Fi microcontroller module known for its affordability, compact size, and robust performance. Developed by Espressif Systems, the ESP8266 integrates a Tensilica L106 32-bit microcontroller with a built-in Wi-Fi stack, making it suitable for a wide range of Internet of Things (IoT) applications. This module supports Wi-Fi connectivity and can operate as a standalone system or as a slave device to a host microcontroller. It features GPIO (General Purpose Input/Output) pins for interfacing with sensors, actuators, and other peripheral devices. The ESP8266 can be programmed using various development platforms and languages, including Arduino IDE,

MicroPython, and Lua scripting. One of the key advantages of the ESP8266 is its low power consumption, making it ideal for battery-powered applications.

- **RGB MODULE:**

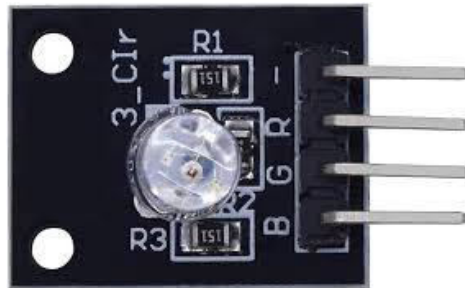


Fig 3. RGB MODULE

An RGB (Red, Green, Blue) module is a compact electronic component designed to emit light in a range of colors by combining red, green, and blue light emissions. It consists of three light-emitting diodes (LEDs) integrated into a single package, each capable of emitting one primary color: red, green, or blue. By adjusting the intensity of these three colors, a wide spectrum of colors can be generated, including white light. The RGB module is commonly used in various electronic applications where color control and customization are required.

- **FLAME SENSOR:**

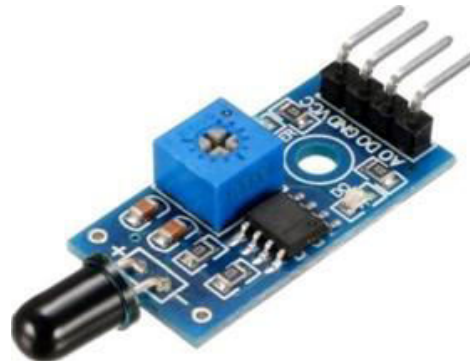


Fig 4. FLAME SENSOR

The flame sensor module is an essential component used for fire detection in various electronic systems. It operates by detecting the infrared (IR) light emitted by flames, enabling the identification of potential fire hazards in its vicinity. This module typically consists of a photodiode, which converts light into electrical signals, and a comparator circuit that analyzes these signals to determine the presence of flames. The flame sensor module is designed to be sensitive to specific wavelengths of light emitted by flames, distinguishing them from other light sources such as sunlight or artificial lighting.

- **DHT 11 SENSOR :**

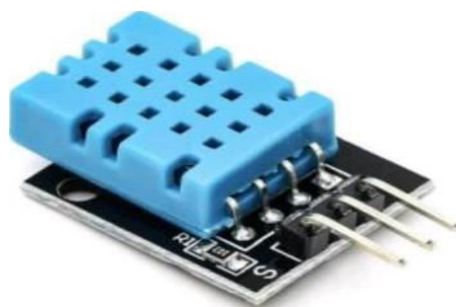


Fig 4. DHT11 SENSOR

The DHT11 module is a popular and affordable digital temperature and humidity sensor that provides accurate readings in various applications. This module features a digital signal output, making it easy to interface with microcontrollers like Arduino and Raspberry Pi. The DHT11 sensor utilizes a capacitive humidity sensor and a thermistor to measure air temperature and relative humidity. The DHT11 module operates at 3.3V to 5V DC and communicates with the microcontroller using a simple two-wire interface (data and ground). It sends digital signals that can be easily interpreted by the microcontroller to obtain temperature and humidity readings.

- **OLED**



Fig 5. OLED 0.96 INCH

The OLED 0.96 display is a compact and versatile display module featuring a 0.96-inch OLED (Organic Light-Emitting Diode) screen. This display technology offers several advantages, including high contrast, vibrant colors, and wide viewing angles. The OLED 0.96 module integrates easily with microcontrollers like Arduino and Raspberry Pi, making it popular for various electronic projects and prototypes. Key features of the OLED 0.96 display include its low power consumption, which is ideal for battery-powered devices, and its crisp resolution, providing clear and sharp graphics and text.

**V. BLOCK DIAGRAM**

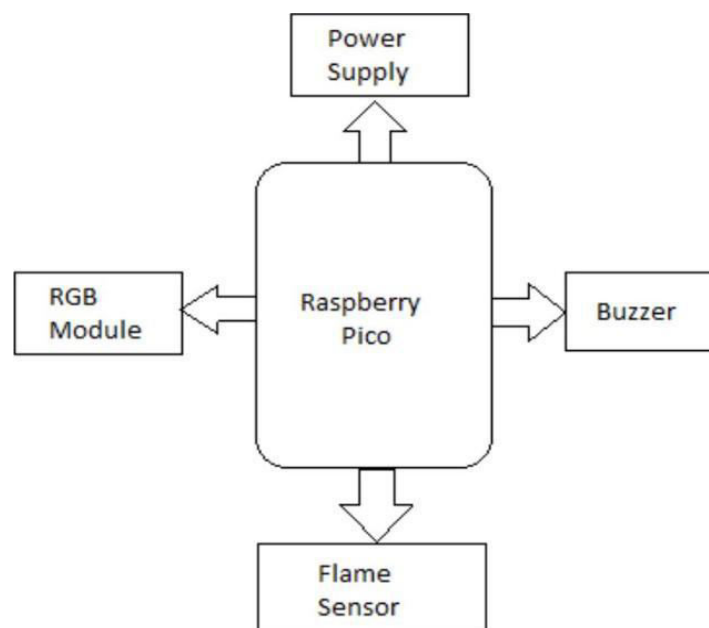


Fig 6. BLOCK DIAGRAM

## VI. RESULT

The results obtained from our "Cotton Picker Fire Detection System" project demonstrate the successful implementation of a fire detection mechanism using Raspberry Pi Pico and a flame sensor specifically tailored for cotton picker trucks. The system was designed to promptly detect fire incidents within the cotton picker environment, providing timely alerts to mitigate potential risks. In operation, the flame sensor continuously monitors the area for any signs of fire. Upon detecting a fire, the sensor sends a signal to the Raspberry Pi Pico microcontroller, which triggers two key actions. First, an RGB module integrated into the system lights up, serving as a visual indicator of the fire occurrence. This immediate response aids in quickly identifying the location and severity of the fire within the cotton picker. Second, the microcontroller updates the 16x2 LCD display with the fire detection status, providing real-time information to operators or nearby personnel. During testing, the system reliably detected simulated fire incidents, demonstrating its effectiveness in a controlled environment. The integration of Raspberry Pi Pico proved to be instrumental due to its compact size, low power consumption, and efficient processing capabilities. These attributes make it suitable for deployment in confined spaces like cotton picker trucks where conventional fire detection systems may be impractical.



Fig 7. Fire detection Status



Fig 8. T&H Status on OLED





## **VII. CONCLUSION**

In conclusion, the development of the Cotton Picker Fire Detection System using the Raspberry Pi Pico and flame sensor represents a significant advancement in fire safety technology for cotton picker trucks. The integration of these components allows for real-time monitoring of fire incidents within the vehicle's vicinity, enhancing both operational safety and asset protection. Through the utilization of the Raspberry Pi Pico microcontroller and flame sensor, the system is capable of swiftly detecting the presence of fire. Upon fire detection, the RGB module promptly illuminates to visually indicate the occurrence of a fire, providing immediate visual feedback to operators or nearby individuals. Simultaneously, the 16x2 LCD display conveys the precise status of fire detection, ensuring clear communication of critical information in high-pressure situations. The Raspberry Pi Pico's compact size, cost-effectiveness, and energy efficiency make it an ideal choice for embedding within the Cotton Picker Fire Detection System. Its capability to interface with multiple sensors, including the flame sensor and RGB module, facilitates seamless integration and reliable performance in harsh operating environments typical of agricultural settings. The successful implementation of this system underscores its potential to significantly mitigate the risks associated with fire incidents in cotton picker trucks.

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# **A Review Paper on Soldier Health Monitoring & Position Tracking System**

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**ABSTRACT:** In today's security landscape, safeguarding military personnel is paramount. To enhance the security and well being of soldiers, a range of devices are deployed, including health sensors like pulse rate and body temperature monitors, GPS technology for precise location tracking, and GSM modules for rapid data transmission. This amalgamation of technologies forms a cost-effective and reliable Soldier Health and Position Tracking System. This system continuously relays a soldier's GPS location and health status, including body temperature, to a military base unit. It also incorporates features like a soldier alertness program for activity monitoring and an emergency switch for immediate assistance. Overall, this system is a critical tool for ensuring soldier safety and providing timely support during missions.

**KEYWORDS:** Multi-sensor network, Wi-fi module, GPS, GSM, IoT

## **I. INTRODUCTION**

In the real of national security, military soldiers play a pivotal role, and ensuring their safety and effectiveness is of utmost importance. As warfare and missions become more technologically advanced, there is a growing need for cutting-edge equipment and systems. Initiatives like the United States' Future Force Warrior (FFW) and the United Kingdom's Future Infantry Soldier Technology (FIST) aim to revolutionize combat strategies. These systems include helmet-mounted displays for maps and video sharing, physiological sensors for health monitoring, and wireless communication capabilities. However, one key challenge is establishing lightweight systems for effective communication between soldiers and with the base station. Accurate soldier positioning is also crucial for mission planning. To bolster national defence, we introduce the "Soldier Health Monitoring and Position Tracking System," which enhances soldier safety, communication, and situational awareness.

## **II. PURPOSE OF MODEL**

The proposed system serves the crucial function of tracking soldiers' locations and monitoring their health parameters during wartime, facilitating effective military strategy. Utilizing GPS and GSM modules, the base station can continuously track soldiers' positions and communicate with them in real-time. If a soldier becomes disoriented or encounters danger, the base station can provide guidance to safety or deploy assistance as necessary. Biomedical sensors, compatible with Arduino, monitor vital signs such as temperature and heartbeat. The Arduino Uno board interfaces with these sensors, along with a 128x64 LCD or OLED display, to provide immediate readings. The GSM module facilitates seamless communication between Arduino boards, ensuring swift data exchange. This system enables rapid response to assist soldiers in distress or preempt potential threats, ultimately bolstering operational efficiency and soldier safety in the field.

## **III. WORKING MODEL**

**ARDUINO NANO :** The Arduino Nano is a compact microcontroller board based on the ATmega328P chip, which is the same microcontroller used in the Arduino Uno. It's one of the smallest members of the Arduino family, making it suitable for projects where space is limited.

**Oled 128\*64 Display :** The OLED (Organic Light-Emitting Diode) display with a resolution of 128x64 pixels is a small and versatile display module commonly used in various electronic projects

**Global System for Mobile Communication (GSM) 800L:** The GSM 800L module is a compact and affordable GSM



module primarily used for wireless communication in systems and IoT applications

**Global Positioning System (GPS):** The GPS NEO-6M module is a compact and cost-effective GPS (Global Positioning System) receiver module commonly used in embedded systems and DIY projects for accurate position tracking and navigation

**Temperature sensor:** The DHT11 is a temperature sensor whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. It operates over a temperature range of  $-55^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$ .

**Heartbeat sensor:** The heartbeat sensor is a system that measures the soldier's pulse rate per minute, or the speed of the heartbeat. The average person heartbeat is 60 to 100 beats per minute. The Heart Beat sensor provides a simple way to study the heart's function. As the heart forces blood through the blood vessels in the finger, the amount of blood in the finger changes with time.

**Danger Switch:** This Button when used by the soldier will address a SMS alert message to the base station, along with their present spot. Danger switch which helps that to alerting the Base Deference voltage.

#### IV. SYSTEM METHODOLOGY

The Soldier Health Monitoring and Position Tracking System utilizes a combination of hardware components to provide real-time monitoring and tracking capabilities. The core components of the system include:

Start

1. Initialize System - Power on all components (Arduino Nano, GSM 800L, GPS NEO-6M, OLED, LM-35, LDR) - Configure sensor and communication interfaces.
2. Read Sensor Data a. Read GPS Data - Get current position (latitude, longitude) b. Read Health Sensors - Read temperature data from LM-35 - Read light intensity data from LDR.
3. Process Data a. Determine Soldier's Position - Use GPS data to determine soldier's coordinates b. Monitor Health Parameters - Check temperature readings from LM-35 for fever detection - Monitor light intensity from LDR for ambient light conditions.
4. Display Information - Display GPS coordinates and health parameters on OLED display.
5. Transmit Data a. GSM Communication - Send GPS coordinates and health data via GSM 800L - Update central monitoring station with soldier's location and health status .
6. End.

#### V. RESULTS

The results, as illustrated in Figure 1, demonstrate the successful transmission of a confirmation message to the intended recipient regarding the soldier's GPS coordinates. Additionally, when the soldier's vital signs deviate from preset threshold values, an alert message is promptly dispatched to the base station, accompanied by the precise location of the soldier. Through this execution, several key outcomes are achieved: the system adeptly collects and processes vital body parameters and location data from the soldier. In instances where the surrounding temperature exceeds the threshold range of 97-99 degrees Fahrenheit, a notification message is dispatched within 1.30 minutes. Conversely, if the temperature falls below the threshold of 98 degrees Fahrenheit, the system activates the heater. Moreover, deviations in the soldier's pulse rate from the normal range prompt the system to transmit a message, including the soldier's location, to the base station. Overall, the system demonstrates its capability to swiftly relay vital information to ensure prompt action and enhance soldier safety.



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## Soldier Health Monitoring and Tracking System

Project by:

Swarupanand Desai

Manish Shinde

Aditee Pawar

Under the guidance of:

Prof. Manjusha Patil

Figure 1. Application.

The application of the Soldier Health Monitoring & Position Tracking System can have significant implications in various scenarios, particularly in military operations and emergency response situations. Here are some key aspects of its application. Various data visualization techniques can be used to enhance the clarity and effectiveness of monitoring charts. Monitoring charts can be designed to update in real-time, providing continuous monitoring of health parameters and position data. Monitoring charts can also provide historical data for retrospective analysis and trend identification. Monitoring charts can be integrated with other systems or dashboards, allowing for seamless data sharing and interoperability. For example, charts displaying health parameters can be integrated into a centralized monitoring platform accessible to healthcare providers or commanders. Overall, monitoring charts play a critical role in the Soldier Health Monitoring & Position Tracking System by providing visual representations of health parameters and position data. These charts enable real-time monitoring, trend analysis, and decision-making, ultimately contributing to the safety, well-being, and effectiveness of soldiers in the field.

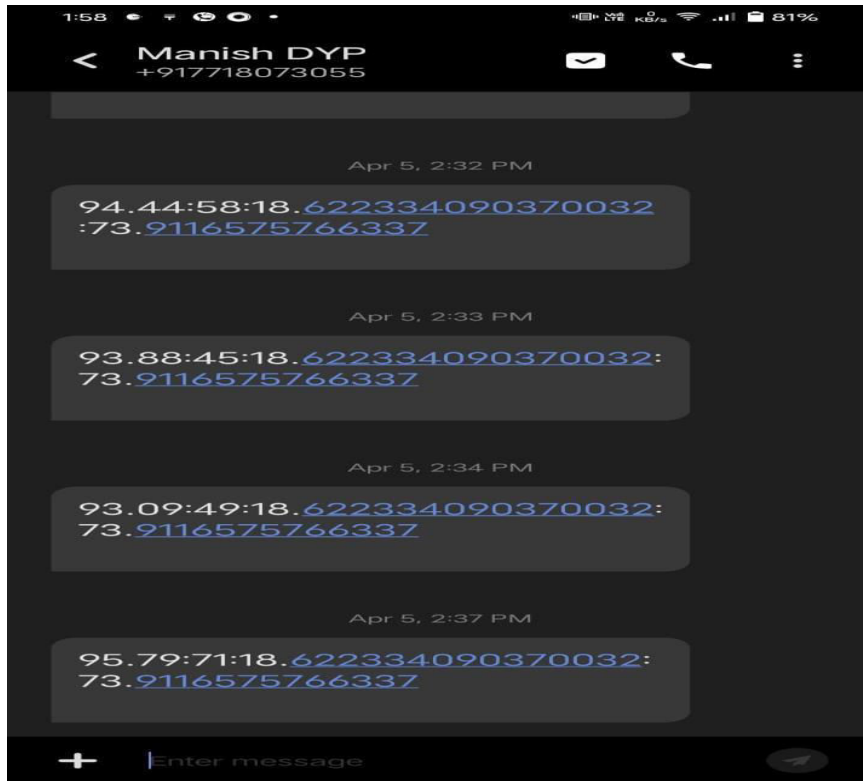


Figure 2. Coordinates via SMS

soldier						
View only						
	A	B	C	D	E	
1	Timestamp	Temperature	Heartbeat	Latitude	Longitude	
2	3/31/2024 12:02:29		37	89	18.6130478	73.9424217
3	3/31/2024 12:04:52		37	108	18.6130478	73.9424217
4	3/31/2024 12:07:13		37	89	18.6130478	73.9424217
5	3/31/2024 12:25:48		37	89	18.6130478	73.9424217
6	3/31/2024 12:26:44		37	89	19.6130478	78.9424217
7	3/31/2024 12:28:43		37	108	18.6130478	73.9424217
8	3/31/2024 12:42:42		37	108	18.6130478	73.9424217
9	3/31/2024 12:42:57		37	89	19.6130478	78.9424217
10	3/31/2024 12:45:38		37	89	19.6130478	78.9424217
11	3/31/2024 12:45:54		37	108	18.6130478	73.9424217
12	3/31/2024 13:09:44		37	108	18.6130478	73.9424217
13	3/31/2024 13:10:17		37	108	18.61304	73.94243
14	3/31/2024 13:11:04		34	109	19.6130478	78.9424217
15	4/1/2024 9:50:59		37	89	18.6130478	73.9424217
16	4/1/2024 9:52:06		30	109	18.61306	73.94244
17	4/1/2024 9:55:48		3	19	18.61306	73.94244
18	4/4/2024 15:44:02	96.13		78	18.62233409	73.91165758
19	4/4/2024 21:21:41	95.79		43	18.62233409	73.91165758
20	4/4/2024 21:56:09	94.1		30	18.62233409	73.91165758
21	4/5/2024 14:15:09	95.79		63	18.62233409	73.91165758
22	4/5/2024 14:33:44	93.88		45	18.62233409	73.91165758
23	4/5/2024 14:37:45	95.79		71	18.62233409	73.91165758
24						

Figure 3. Monitoring Chart



## **VI. CONCLUSION**

This IoT-based project focuses on health monitoring and tracking for soldiers, utilizing biomedical sensors to transmit vital data such as heart rate, body temperature, and environmental parameters to a central control room. The system serves as a crucial tool for pinpointing the exact location of a soldier in critical conditions, addressing the issue of missing in action soldiers. Additionally, it enhances soldier-to-soldier communication during emergencies and provides navigation assistance to the control room. Consequently, this system emerges as a lifeguard for army personnel worldwide. Looking ahead, there's potential for the development of a portable handheld sensor device with multiple sensing capabilities to further assist soldiers in the future.

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# Echotron: Voice Controlled Personal Assistant

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**ABSTRACT:** Echotron boasts a diverse array of functionalities, encompassing online content access, phone call placement, and household device management, all operable via intuitive voice commands. While traditionally regarded as a helpful assistant, our initiative aimed to transcend conventional virtual assistant capabilities, drawing inspiration from the concept of computer companions. Our journey commenced with the disassembly and modification of the Echo device, facilitating rapid response upon activation. The integration of animatronics and a TFT LCD module heightened both interactivity and visual appeal. Driven by an Arduino microcontroller and servos, the animatronics endowed the character with lifelike movement and expression, thereby augmenting engagement and realism. This iterative process culminated in the development of Echotron, a sophisticated embodiment of advanced virtual assistant technology.

## I. INTRODUCTION

Echotron, hailed as a multifaceted voice-controlled personal assistant robot, epitomizes versatility in its functionality. Echo/Alexa, positioned as an Intelligent Personal Assistant (IPA), is reputed for its proficiency across a wide array of functions, spanning from playing music to delivering information, setting reminders, and managing smart devices. In recent years, there has been a significant increase in interest regarding Intelligent Personal Assistants (IPA) like Alexa and Google Home. Amazon Echo, in particular, has garnered widespread acclaim as a virtual assistant, extending its reach to households and businesses alike. Leveraging Amazon Echo's capabilities, users seamlessly execute diverse commands through voice interactions, offering a glimpse into a futuristic lifestyle. However, lacking in distinct personality, modifications to the Amazon Echo circuitry were instituted, integrating animatronic eyes, TFT LCD, and assorted components to instill it with a robotic persona. This project unfolds across three distinct tiers

### *Level 1-Animatronic eyes:*

This review emphasizes the significance of social eye gaze, which encompasses any gaze conveying communicative intent or serving a purpose beyond mere observation. To achieve this, animatronic eyes were employed. The choice of eye movements in human-robot interactions depends on the specific context and objectives of the interaction. Utilizing animatronic eyes not only enhances visual appeal but also offers a straightforward mechanism. Throughout the project, we gained insights into mechatronics. The fabrication process involved 3D printing the necessary components, followed by sanding for smooth functionality. Subsequently, the parts were assembled, incorporating servo motors controlled by an Arduino Mega2560 and a 16-channel servo driver. This approach enables the robot to convey its mental states and intentions through its gaze.

### *Level 2- the user's First Movement of contact:*

Echotron, equipped with artificial intelligence (AI) and utilizing the digital voice technology known as 'Alexa', serves as the voice interface of the device. Recognizing the pivotal importance of the initial interaction between user and machine in establishing a meaningful relationship, we endeavored to create a compelling first impression. To achieve this, we meticulously programmed a "wake" sequence triggered by the user calling the creature's name. This sequence orchestrates the transition from a dormant state, characterized by closed eyes, to an active one where the creature blinks to life, surveys its surroundings, and promptly establishes eye contact with the user. While the Alexa platform offers a limited selection of predefined "wake words," we opted to customize the wake word from "Alexa" to "Echo" to personalize the interaction. Although complete customization of wake words remains elusive with the current capabilities of the Alexa platform, we aimed to enhance the user experience through this modification. The positioning of the device within the home has sparked debate and yielded diverse preferences.

Studies suggest that while the bedroom emerges as a popular choice, other locations such as the kitchen and living room are also favored. Additionally, understanding how children interact with Echotron within the household context becomes crucial. Echotron's voice recognition proficiency undergoes continuous refinement via data collection. With artificial intelligence adept at natural language processing, the device captures user queries and requests, aiding in grasping

language intricacies such as accents and dialects. Leveraging the cloud-based Alexa Voice Service by Amazon, all gathered data securely resides on Amazon servers, enriching the device's evolving functionalities.

### *Level 3- The Home Automation Circuit using ESP32*

The circuit for this ESP32 home automation project is straightforward. We utilized GPIOs D23, D22, D21, and D19 to manage the 4-channel relay module. The switches linked to GPIOs D13, D12, D14, and D27 are employed for manual control of the relay module. Instead of incorporating pull-up resistors individually with each switch, We opted for utilizing the INPUT\_PULLUP function within the Arduino IDE. Home automation is integral to modern automation, involving the intelligent monitoring and control of household electronic devices for optimal efficiency. It entails the interconnectedness of household objects and the provision of data for improved functionality. When integrated with the Internet of Things (IoT), home automation offers enhanced flexibility in managing household items on a broader scale. This facilitates the interconnectivity of multiple smart homes, promoting more efficient resource utilization across a larger area. Achieving this goal encompasses leveraging various current technologies. Simplifying the process, Amazon Echo serves as a pivotal tool. It is a voice-enabled wireless speaker created by Amazon, seamlessly connecting to the voice-controlled personal assistant service, Alexa. Alexa responds to its wake word, "Alexa," and executes a multitude of tasks including voice interaction, music playback, task lists, alarms, podcast streaming, and real-time information provision such as weather and traffic updates. Furthermore, it possesses the capability to manage numerous smart devices through its diverse skill set. While controlling smart devices via Alexa is straightforward, converting non-smart devices into smart ones remains financially prohibitive for many. Hence, our product aims to offer an affordable solution for voice-controlled management of non-smart devices. Leveraging Amazon Echo, we develop a skill that interfaces with our circuitry to enable device control, thereby democratizing smart home technology.

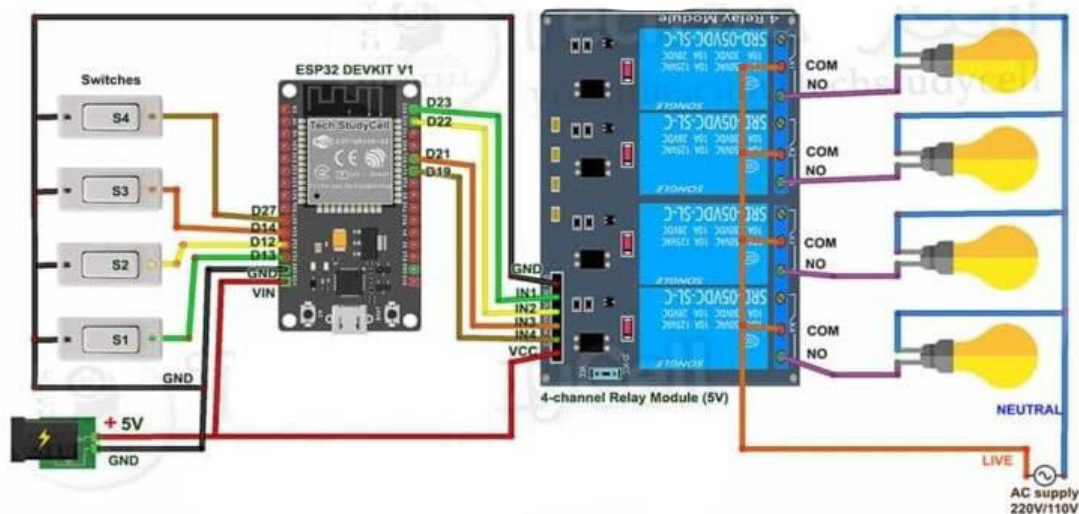
Circuit and working-

**ESP32 Devkit:** The central component of the ESP32 Dev Kit is its ESP32 microcontroller, which seamlessly integrates Wi-Fi and Bluetooth connectivity. With a dual-core processor and a diverse set of peripherals, it is well-suited for a variety of IoT applications.

### **AMAZON ECH**

**O DOT:** Amazon Echo, often abbreviated to Echo, constitutes a series of smart speakers crafted by Amazon. These devices establish a connection to the voice-activated virtual assistant service known as Alexa, which promptly responds upon hearing the wake word "Alexa."

**RELAY MODULE:** The Relay module serves as an independent hardware unit designed for remote device management. It enables the remote control of devices via network or internet connectivity. Through Clock Watch Enterprise, commands can be issued over local or wide area networks to remotely power on or off devices. This functionality extends to computers, peripherals, or other powered devices, facilitating control from various distances, whether across the office or around the globe.



*Fig. circuit diagram of home automation*





Follow the circuit diagram provided above to connect all the components. Connect the input pins, IN1 and IN2, of the 2-channel relay to the digital pins of the NodeMCU as indicated in the code. Ensure that the ground pin on the NodeMCU and the relay are connected in the same manner, and the Vcc pin of the relay is linked to the Vin pin of the NodeMCU. Additionally, connect the Vcc and GND pins of the NodeMCU to an external 5V DC power supply. For the appliance, connect one terminal directly to the relay's normally open contact, while the other terminal is connected in series with the 220V AC supply and the relay's common pin.

## II. METHODOLOGY

Our methodology is divided into two primary components: knowledge abstraction and response generation. Knowledge abstraction entails the examination of course content, treated as data. Conversely, response generation utilizes the distinctive attributes of the data obtained from the knowledge abstraction phase, alongside the functionalities of tools such as dialog flow and its varied integrations. Our toolkit includes Arduino IDE 2.2.1 software, 3D-printed animatronic eyes, person sensor, ESP32 module, relay module and an array of additional technologies. These elements collectively facilitate the implementation of our methodology, enabling efficient extraction of relevant knowledge and the generation of appropriate responses in our system. We are using Arduino IDE 2.2.1 (software), 3D printed animatronic eyes, Person sensor and various types of technology such as:

- Arduino mega 2560
- Amazon echo pop device
- Servo motors
- 16 channel servo driver
- 3D printed animatronic eyes parts
- ESP32 DevKIT V1
- 4-channel 5V relay module
- Switches (for manual control)

The Arduino Mega functions as the principal controller for Echotron. Arduino, an open-source microcontroller released in 2005, boasts adaptability through straightforward programmability, enabling swift erasure and reprogramming as required. Tailored for hobbyists, students, and professionals, Arduino facilitates the development of devices capable of interacting with their environment through sensors and actuators. Its implementation involves a development board and the Arduino IDE (Integrated Development Environment) for code creation. Echotron harnesses natural language processing (NLP), a technique involving the conversion of speech into words, sounds, and concepts, forming the cornerstone of its operational framework.

The Echotron work as follow:

Echotron is an advanced speech processing system empowered by robust computational capabilities, aimed at efficient sound interpretation. To optimize this process, speech recordings are transmitted to servers for meticulous analysis, facilitating precise comprehension. Echotron deconstructs commands into individual sound components, cross-referencing them with an extensive database of word pronunciations. Through this meticulous analysis, it discerns the closest matches to the sound combinations, extracting pivotal words essential for task comprehension and subsequent function execution. For instance, upon detecting keywords such as "sport" or "basketball," Echotron activates the corresponding sports application seamlessly. Subsequently, information retrieved from Amazon's servers is relayed back to the user's device, with Echotron potentially providing verbal responses. Any responses generated by Echotron undergo a similar reverse processing mechanism.

Illustrated through a comprehensive flowchart, Echotron operates in alignment with the fundamental principles of home automation and the Internet of Things (IoT). The IoT, propelled by electronic technology advancements, has revolutionized connectivity, enabling diverse devices to seamlessly integrate into interconnected electronic ecosystems. As a pioneering prototype, Echotron embodies the practical implementation of IoT in real-life scenarios, particularly in emulating smart home environments. This innovative leap addresses the dual necessities of comfort and security within households, especially catering to individuals remotely residing from their primary residences. In contemporary industrial landscapes, technological advancements facilitate internet-enabled device communication, facilitating efficient monitoring and control. As technological sophistication continues to evolve, the integration of everyday objects into adaptable networks becomes imperative. This necessitates the establishment of seamless communication channels between humans and machines, thereby augmenting overall functionality and user experience. Echotron serves as a testament to this paradigm shift, exemplifying the future trajectory of interconnected systems across diverse environments, paving the way for more advanced industrial implementations in IOT.

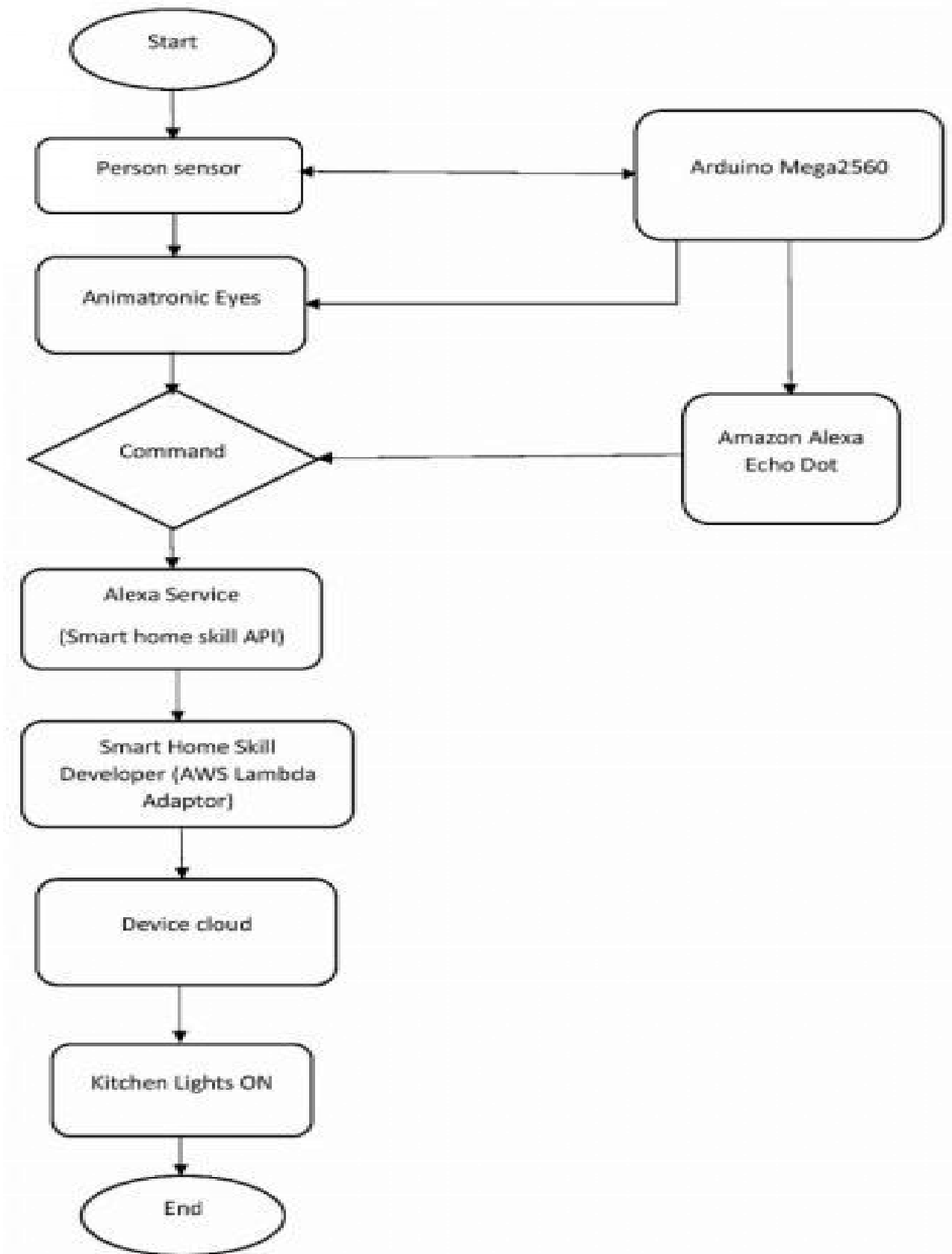


Fig. Flowchart of Echotron

### III. PROPOSED SYSTEM

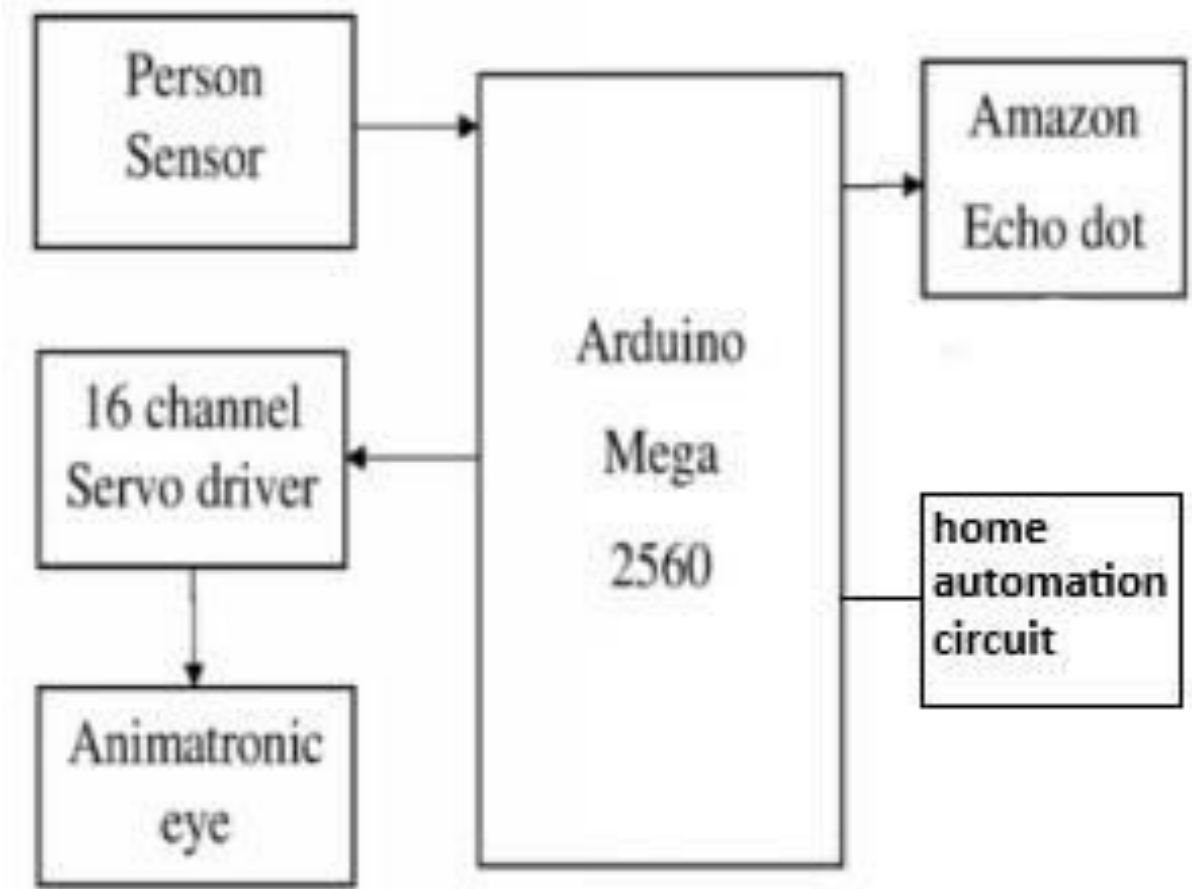


Fig. Block diagram of Echotron

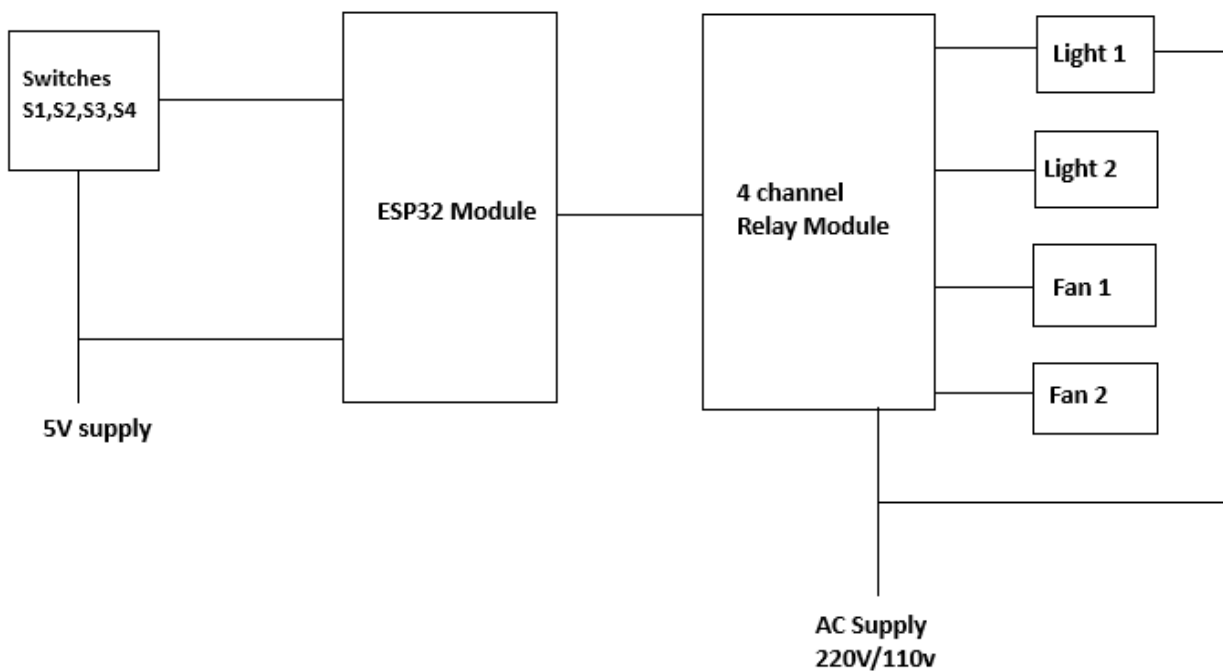


Fig. Block diagram of home automation

Comprising various components such as the Person Sensor, 16-channel Servo Driver, Animatronics Eyes, Arduino Mega 2560, Amazon Echo pop device, ESP32, 4 channel Relay Module, this system orchestrates a cohesive integration of hardware for multifaceted functionality. The Arduino Mega 2560 serves as the central hub, facilitating communication and control between the various peripherals. Connected to the Arduino Mega are the Person Sensor, 16-channel Servo Driver, Amazon Echo pop device, ESP32, 4Channel Relay module each serving specific roles within the system. Upon activation through the voice command "Echotron", the Person Sensor detects human presence and relays pertinent data to the Arduino Mega for processing. The Animatronics Eyes, managed by an Arduino interface linked to the Servo Driver, respond accordingly to stimuli. Interfacing with the Arduino Mega, the Amazon Echo Dot establishes a communication link for interaction and command execution. Home automation circuit works. The relay module activates its corresponding relay when the control pins receive a LOW signal, and deactivates it when they receive a HIGH signal. This setup operates using a 5V 5A DC power supply. The relay module activates its corresponding relay when the control pins receive a LOW signal, and deactivates it when they receive a HIGH signal. This setup operates using a 5V 5A DC power supply. The relay module activates its corresponding relay when the control pins receive a LOW signal, and deactivates it when they receive a HIGH signal. This setup operates using a 5V 5A DC power supply. This intricate system harmonizes the functionalities of its components to fulfill its designated tasks seamlessly.

#### IV.RESULTS



*Fig. Animatronic eyes (a)*



*Fig Animatronic eyes (b)*

#### V.CONCLUSION

Echotron is easy to handle and control.

It is convenient because of its size, it can be carried anywhere.

Echotron simplifies the day to day life tasks such as:

Make phone calls (basically, landline calls)

Control your smart home

You can ask Echotron for news and general knowledge

Gives reminder for a schedule or for a medicines

Echotron Supports multiple languages

Train Echotron to do practically anything else and it can work with the internet and it can also work without the internet to control your all smart home appliances.



Echotron is a interactive and user friendly personal assistant, very much a Comfortable and easy solution to operating all the devices.

Echotron has some limitations such as it has limited Range and limited devices can be controlled at a time.

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- [9] Home Automation System Using Esp32 and Alexa Niraj Patil<sup>1</sup> , Anant Nimbalkar<sup>2</sup> , Gaurav Pawar<sup>3</sup> , Sulekha Shardul<sup>4</sup> 1,2,3Under Graduate Student Bachelor of Engineering, Department of Computer Engineering, Shatabdi Institute of Engineering and Research, Agaskhind, Nashik, 422502 (M.S.), India. 4Assistant Professor, Department of Computer Engineering, Shatabdi Institute of Engineering and Research, Agaskhind, Nashik, 422502 (M.S.), India.
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# A Water-Quality Monitoring System Based on Web-Server-Embedded Technology

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**ABSTRACT:** Efficient management and continual monitoring of water quality hold paramount importance across industrial and economic sectors. Addressing the global water scarcity crisis demands sustainable solutions that optimize water usage. Harnessing the potential of the Internet of Things (IoT) provides a resilient and economical solution for real-time monitoring of diverse water parameters. This paper aims to deploy an intelligent water quality monitoring system utilizing IoT technology. The devised system has been effectively deployed to ascertain the levels of turbidity, pH and temperature within a given water sample. Collected sensor data are seamlessly uploaded to the ThingSpeak dashboard, facilitating online monitoring capabilities. Furthermore, the system is designed to issue SMS alerts to users whenever parameter values surpass predefined threshold limits indicative of optimal water quality.

**KEYWORDS:** Web Server, Internet of Things, ESP32, Sensor parameters, ThingSpeak platform.

## I. INTRODUCTION

In today's context, access to clean drinking water stands as a fundamental necessity for humanity. The real-time operation of drinking water utilities presents management with unprecedented challenges. These challenges stem from various factors such as limited water resources, population growth, and aging infrastructure. Consequently, there is an urgent need for advanced methodologies to monitor water quality effectively.

Hence, there exists an urgent requirement for the continuous online monitoring of water quality. Such a system would offer timely and comprehensive insights into water quality parameters, facilitating proactive measures to ensure the safety and sustainability of drinking water resources.

Advancements in online water monitoring technologies have undoubtedly progressed, facilitating enhanced surveillance of source water and operational management of water treatment plants. However, the widespread adoption of these technologies is often hindered by the substantial costs associated with installing and calibrating an extensive network of monitoring sensors. Furthermore, algorithms designed for such technologies may not always be adaptable to specific geographic areas or conducive to large-scale systems.

In light of these challenges, our paper aims to create and implement a cost-effective system for real-time water quality monitoring within an IoT framework. Our system architecture centers around the utilization of the ESP32 microcontroller as the core controller. Utilizing a dedicated IoT module, our design streamlines the access of sensor data from the core controller to the cloud. This data can then be easily viewed on the cloud platform through a dedicated IP address. Additionally, the IoT module offers Wi-Fi connectivity, enabling users to access and monitor the data via mobile devices.

## II. LITERATURE REVIEW

The research paper titled [1] "Intelligent Water Quality and Water Supply Management System for Smart City using ARM" by Mr. D.B. Rane et al. addresses the pressing need for efficient water quality monitoring and management systems in the context of smart cities. The literature review likely explores previous studies on water quality monitoring systems, emphasizing the importance of real-time data collection and analysis for ensuring safe and sustainable water supply. Researchers have investigated various sensor technologies, communication protocols, and data analytics methods to develop intelligent water management systems capable of detecting contaminants, predicting water quality trends, and optimizing water distribution networks. Additionally, studies on smart city initiatives have highlighted the role of IoT (Internet of Things) and ARM-based microcontrollers in integrating sensor networks, cloud computing



platforms, and decision support systems for effective water resource management. By synthesizing insights from previous research, the paper lays the groundwork for the development of an innovative water quality and supply management system tailored to the needs of smart cities.

The research paper titled [2] "The Real-Time Monitoring of Water Quality in IoT Environment" by N. Vijayakumar and R. Ramya, presented at the IEEE Sponsored 2nd International Conference on Innovations in Information, Embedded, and Communication Systems (ICIIECS) 2015, contributes to the growing body of literature on water quality monitoring in the context of IoT (Internet of Things) environments. The literature review is expected to delve into prior research on real-time water quality monitoring systems, emphasizing the importance of IoT technologies in improving data collection, analysis, and dissemination procedures. Researchers have investigated the integration of sensor networks, wireless communication protocols, and cloud computing platforms to develop scalable and cost-effective solutions for monitoring various parameters such as pH, turbidity and temperature in water bodies. Additionally, studies on IoT-based environmental monitoring have emphasized the importance of sensor calibration, data validation, and system reliability in ensuring accurate and timely information for decision-making purposes. By synthesizing insights from previous research, the paper aims to advance the understanding of IoT-enabled water quality monitoring systems and propose innovative approaches for addressing the challenges in this domain.

The research paper titled [3] "Water Quality Monitoring System Implemented with IoT" by Kartik Maheshwari and Adrija Chakraborty, presents a significant contribution to the literature on water quality monitoring systems leveraging IoT (Internet of Things) technologies. The literature review likely explores previous studies on IoT-based water quality monitoring systems, emphasizing the importance of real-time data collection, analysis, and visualization for ensuring the safety and sustainability of water resources. Researchers have investigated various sensor technologies, communication protocols, and cloud-based platforms to develop scalable and cost-effective solutions for monitoring parameters such as pH, turbidity and temperature in water bodies. Additionally, studies on IoT-enabled environmental monitoring have highlighted the potential of sensor networks, data analytics, and machine learning algorithms in predicting water quality trends, detecting anomalies, and supporting informed decision-making processes. By synthesizing insights from previous research, the paper seeks to push the boundaries of IoT-based water quality monitoring systems and introduce inventive approaches to tackle the challenges within this field.

The research paper titled [4] "Water Management System using Dynamic IP based Embedded Webserver in Real Time" by Vaishali U. Patil and Avichal R. Kapur, presented at the 2015 International Conference on Nascent Technologies in the Engineering Field (ICNTE-2015), contributes to the literature on water management systems by proposing a novel approach leveraging dynamic IP-based embedded webserver for real-time monitoring and control. The literature review likely explores previous studies on water management systems, focusing on the integration of embedded systems, web technologies, and dynamic IP addressing to enable remote access and control of water-related infrastructure. Researchers have investigated various aspects of water management, including supply optimization, leakage detection, and quality monitoring, highlighting the importance of real-time data acquisition and analysis for efficient resource utilization and sustainable development. By synthesizing insights from previous research, the paper aims to advance the state-of-the-art in water management systems and propose innovative solutions for addressing the challenges in this domain.

The research paper titled [5] "Web Scraping for Automated Water Quality Monitoring System: A Case Study of PDAM Surabaya" by Rizqi Putri Nourma Budiarti et al., presents a comprehensive exploration of utilizing web scraping techniques to enhance online water quality monitoring systems. The literature review likely delves into the existing challenges faced by water utility companies in implementing real-time monitoring solutions and the significance of timely detection and response to water contamination events. Previous studies have highlighted the limitations of passive sensor devices in providing comprehensive data access and management, necessitating innovative approaches to data collection and analysis. The paper likely discusses the growing importance of web scraping as a tool for extracting data from online sources, enabling seamless integration with existing monitoring infrastructure. By proposing an application of data logger using Python and web scraping techniques, the paper contributes to advancing the capabilities of water quality monitoring systems, demonstrating high accuracy in data collection and real-time performance. Additionally, the literature review may explore the potential applications of web scraping in other domains of environmental monitoring and data analytics.

### **III.METHODOLOGY**

The methodology employed in the project involves several key steps aimed at developing and implementing a robust water quality monitoring system. Initially, thorough research and analysis were undertaken to comprehend the



prevailing challenges in water quality monitoring and the potential of IoT (Internet of Things) technologies in mitigating these challenges. This involved reviewing literature, studying existing monitoring systems, and identifying the essential parameters to be monitored, such as pH, turbidity, temperature, and chlorine. Next, hardware components including sensors for measuring these parameters and microcontrollers, such as ESP32, were selected based on their compatibility, accuracy, and cost-effectiveness. The system architecture was designed to integrate these components, enabling real-time data acquisition, processing, and transmission.

Software development played a crucial role in the project, with programming languages like Python being utilized for data processing and analysis. Web scraping techniques were employed to collect data from the sensors, allowing for seamless integration with cloud-based platforms for storage and visualization. The implementation of a dynamic IP-based embedded web server facilitated remote access and control of the monitoring system, enhancing its usability and accessibility. Additionally, machine learning algorithms may have been explored to predict water quality trends and detect anomalies based on the collected data.

Throughout the project, rigorous testing and validation procedures were conducted to ensure the accuracy and reliability of the monitoring system. Field trials may have been performed to assess the system's performance under real-world conditions and validate its effectiveness in providing timely and accurate water quality information. Continuous monitoring and optimization of the system were carried out to address any issues and improve its functionality based on feedback and observations. Overall, the methodology adopted in the project aimed to develop an intelligent and cost-effective water quality monitoring solution that meets the needs of modern urban environments.

#### **IV.SYSTEM ARCHITECTURE**

The system architecture for our real-time water quality monitoring solution within an IoT environment comprises several interconnected components to ensure seamless data acquisition, processing, transmission, and visualization. Here's an overview of the system architecture:

**1. Sensor Nodes:**

- Multiple sensor nodes are deployed to gather data on different water quality parameters, including pH, turbidity, and temperature. Each sensor node is equipped with sensors for specific parameters.

**2. ESP32 Microcontroller:**

- The ESP32 microcontroller serves as the core controller within each sensor node. It interfaces with the sensors to collect data and manages data processing tasks.

**3. IoT Module:**

- A specialized IoT module is integrated into the system architecture to facilitate communication between the sensor nodes and the cloud platform. This module enables data transmission over Wi-Fi networks.

**4. Cloud Platform:**

- The cloud platform serves as the central repository for storing, processing, and analyzing the collected data. It provides a scalable and secure environment for data management.

**5. Data Processing and Analysis:**

- Within the cloud platform, data processing and analysis algorithms are employed to interpret the raw sensor data and extract meaningful insights. This may include identifying trends, anomalies, or correlations between different water quality parameters.

**6. User Interface:**

- A user-friendly interface is developed to enable users to access and visualize the water quality data in real-time.

This interface may be web-based or mobile-based, allowing users to monitor the system remotely.

**7. Alerting Mechanism:**

- An alerting mechanism is implemented to notify users of any deviations from predefined thresholds or abnormal conditions in water quality parameters. This ensures timely intervention in case of potential issues.



### 8. Security Measures:

- Robust security measures are integrated into the system architecture to safeguard sensitive data and prevent unauthorized access or tampering.

Overall, the system architecture is designed to be scalable, adaptable, and reliable, providing comprehensive insights into water quality parameters while ensuring ease of use and accessibility for users.

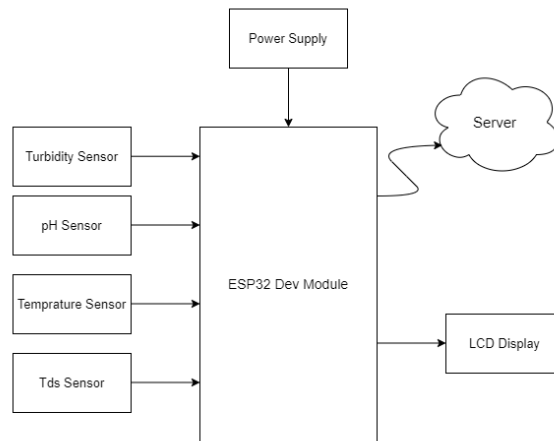


Fig 1. Overall block diagram

## V. RESULT AND DISCUSSION

Utilizing IoT technology, the implemented system offers real-time monitoring capabilities, as demonstrated through the graphical representations provided by ThingSpeak. Turbidity, which refers to the clarity of water, serves as a crucial indicator of water quality. When water contains particles such as mud, silt, or sand, its quality may be compromised. According to water quality standards, normal water typically falls within the range of 0 to 5 Nephelometric Turbidity Units (NTU), with a maximum permissible value of 5 NTU. Nevertheless, when turbidity surpasses 6 NTU, escalating to levels as high as 3000 NTU, the water is designated as turbid or sediment-laden. The measurement of water turbidity is depicted in Figure.

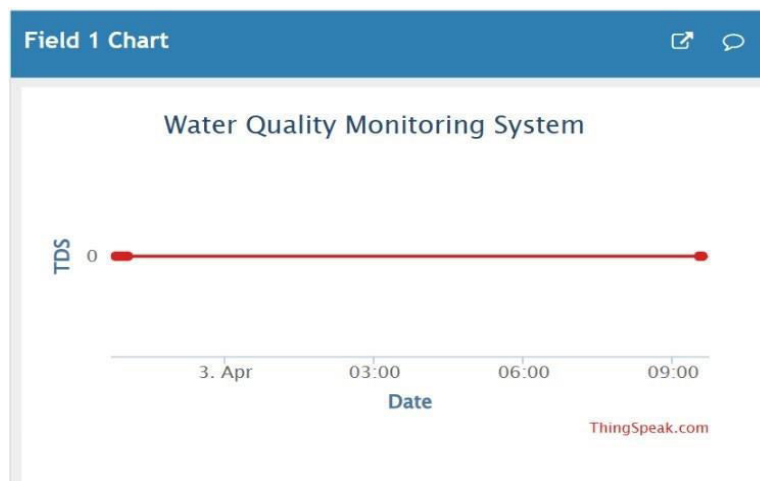


Fig. 2 Temporal Fluctuations in Turbidity: A Graphical Representation

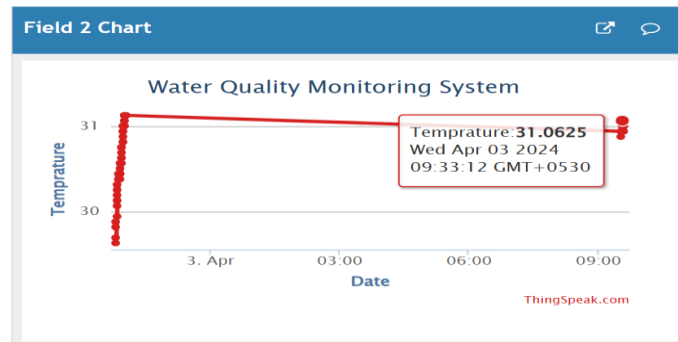


Fig. 3 Temporal Fluctuations in temperature: A Graphical Representation

## VI.CONCLUSION

In conclusion, the implemented water quality monitoring system has demonstrated effectiveness in providing real-time insights into water parameters and facilitating informed decision-making. By leveraging ThingSpeak platform, the system successfully displayed the collected sensor data in a user-friendly format, allowing stakeholders to monitor water quality trends and deviations over time. Additionally, the system's ability to generate a CSV file in Excel format enhances its usability by enabling further analysis and reporting.

Moreover, the integration of Telegram bot functionality enables prompt notification to stakeholders whenever a sensor reading exceeds predefined threshold values. This feature ensures timely response to potential water quality issues, thereby enhancing the system's effectiveness in safeguarding public health and environmental sustainability.

Overall, the combination of data display in ThingSpeak, generation of Excel-compatible CSV files, and alert messaging via Telegram contributes to a comprehensive water quality monitoring solution. The system's capabilities empower stakeholders to proactively address water quality concerns, optimize resource management, and ensure compliance with regulatory standards. As such, the developed system represents a valuable tool for enhancing water management practices and promoting the sustainable utilization of water resources.

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# IoT and AI Implementations on Remote Healthcare Monitoring System

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**ABSTRACT:** "IoT and AI Implementations on Remote Healthcare Monitoring System using Raspberry Pi 3 seeks to revolutionize healthcare by integrating cutting-edge technologies into a cohesive system for remote patient monitoring. Leveraging the power of Raspberry Pi 3, Internet of Things (IoT) devices will be employed to collect real-time health data from patients in diverse locations. This data will then undergo sophisticated analysis through Artificial Intelligence (AI) algorithms, enhancing the system's ability to identify anomalies, trends, and potential health risks with a high degree of accuracy. The Raspberry Pi 3 serves as a versatile and cost-effective hub, managing the connectivity and processing requirements of the IoT devices. The system aims to provide continuous and proactive healthcare support by enabling remote monitoring of vital signs and timely interventions based on AI-driven insights. The outcomes of this project not only contribute to the advancement of healthcare technology but also address the growing need for scalable and accessible healthcare solutions in a rapidly evolving digital landscape.

**KEYWORDS:** Raspberry pi, IoT, Continuous healthcare monitoring.

## I. INTRODUCTION

This project aims to harness the power of IoT and AI to develop an advanced remote healthcare monitoring system that transcends the boundaries of traditional healthcare delivery. Healthcare delivery has been traditionally centered around hospital-based care, necessitating regular visits for those suffering from chronic conditions or requiring continuous monitoring. However, this approach poses challenges for patients in remote areas, as well as for those with limited mobility. The rise of IoT technology and AI-driven analytics offers a transformative solution to this long-standing issue. This project addresses a critical need in healthcare – the ability to monitor and manage patients' health conditions in real-time. This system aims to bridge that gap by employing a comprehensive network of IoT devices and harnessing the power of AI algorithms. This project represents a significant stride towards democratizing healthcare, ensuring that quality care reaches every corner of the globe. Through the convergence of IoT and AI, it embodies the promise of a more accessible, efficient, and patient-centric healthcare system.

## II. SYSTEM MODEL AND ASSUMPTIONS

In designing a remote healthcare monitoring system integrating IoT and AI, the system model revolves around the seamless integration of various components. It begins with the deployment of diverse sensors and devices, including wearables and medical-grade sensors, capable of collecting real-time health data. This data is securely transmitted over the internet to a centralized cloud platform, assumed to be scalable, reliable, and compliant with regulatory standards. On this platform, AI algorithms analyse the incoming data, detecting patterns, anomalies, and predicting potential health risks. An AI-driven decision support system assists healthcare professionals by providing actionable insights and personalized recommendations based on the analysed data. Meanwhile, user-friendly interfaces accessible via web or mobile applications enable both healthcare providers and patients to access real-time data, alerts, and insights. Automated alerts, generated for critical health events, are disseminated to relevant stakeholders through SMS, email, or push notifications. Key assumptions underpinning this system include the reliability and accuracy of data collected by sensors, patient compliance with remote monitoring protocols, and the availability of reliable internet connectivity for data transmission. Additionally, measures ensuring data security, privacy, and integration with existing healthcare systems are essential for the system's effectiveness and regulatory compliance.

### **III.EFFICIENT COMMUNICATION**

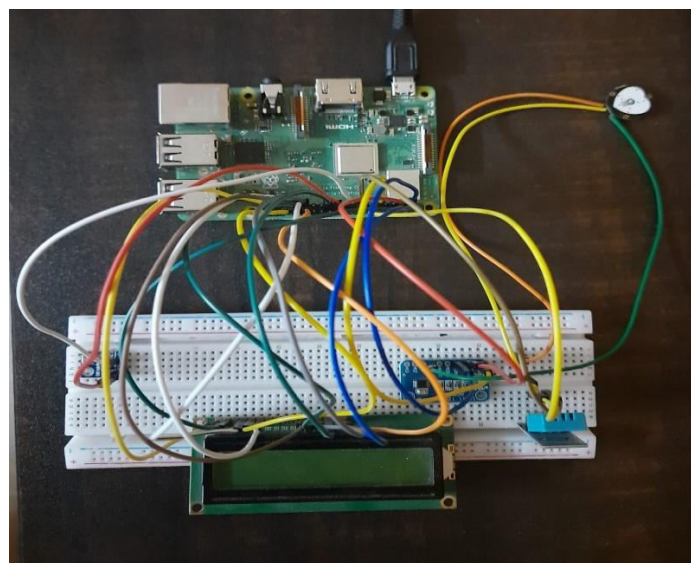
Efficient communication is the cornerstone of any successful Endeavor, particularly in the realm of remote healthcare monitoring systems leveraging IoT and AI. Within such systems, communication must be swift, reliable, and secure to facilitate the seamless exchange of critical health data between various components and stakeholders. This entails establishing robust channels for data transmission, leveraging technologies like Wi-Fi, Bluetooth, or cellular networks to ensure connectivity even in remote areas. Moreover, the adoption of standardized protocols and interoperability standards enables seamless integration with existing healthcare IT systems, ensuring smooth data exchange and workflow continuity. Clear and concise communication interfaces, whether through web portals or mobile applications, empower healthcare providers and patients alike to access real-time information, alerts, and insights efficiently. Additionally, automated alerts and notifications play a vital role in timely response to critical health events, ensuring that healthcare professionals and caregivers can intervene promptly.

### **IV.SECURITY**

Security is paramount in the design and implementation of IoT and AI-enabled remote healthcare monitoring systems, given the sensitive nature of the data involved. Robust security measures are necessary to protect patient privacy, prevent unauthorized access, and mitigate potential threats to the integrity of the system. Encryption techniques, such as SSL/TLS, ensure that data transmitted between devices and the cloud platform remains confidential and tamper-proof. Access control mechanisms, including multi-factor authentication and role-based permissions, restrict access to authorized personnel only, reducing the risk of data breaches. Regular security audits and vulnerability assessments help identify and address potential weaknesses in the system, ensuring continuous protection against evolving threats. Moreover, compliance with industry standards and regulations, such as HIPAA and GDPR, ensures that the system adheres to strict data protection requirements and maintains patient trust. Beyond technical measures, fostering a culture of security awareness among stakeholders through training and education reinforces the importance of safeguarding patient data and mitigating risks. By prioritizing security at every level of the system architecture and operation, remote healthcare monitoring systems can in still confidence in patients and healthcare providers, enabling them to leverage the benefits of IoT and AI technologies while minimizing security concerns.

### **V. RESULT AND DISCUSSION**

The real-time monitoring capabilities facilitated by IoT sensors and Raspberry Pi have enabled timely detection of health anomalies, allowing healthcare providers to intervene promptly and prevent adverse health events. These advancements have the potential to improve patient outcomes, reduce hospital readmissions, and optimize healthcare resource utilization. However, challenges such as data privacy and security, interoperability with existing healthcare systems, and user acceptance need to be addressed to ensure the successful adoption and scalability of the system.



**Fig-1: Project Setup.**



## VI.CONCLUSION

The integration of IoT and AI technologies into remote healthcare monitoring systems represents a significant advancement in the delivery of patient-centered care. Through the effective collection, transmission, and analysis of real-time health data, these systems enable continuous monitoring of patients' health status, early detection of abnormalities, and timely intervention to optimize patient outcomes. The development of AI-driven decision support systems further enhances clinical decision-making by providing healthcare professionals with actionable insights and personalized recommendations based on analysed data. Additionally, user-friendly interfaces promote active engagement and collaboration between healthcare providers and patients, fostering a patient-centered approach to care delivery. Automated alerts and robust security measures ensure prompt intervention and safeguard the confidentiality and integrity of patient data, maintaining compliance with regulatory standards and patient trust.

Despite these advancements, challenges such as interoperability issues, patient adherence, and scalability concerns remain significant barriers to widespread adoption and implementation. Addressing these challenges requires continued research and innovation in system design, integration, and usability to maximize the potential benefits of IoT and AI technologies in remote healthcare monitoring. Future directions for research may include further optimization of AI algorithms for health data analysis, development of interoperability standards, and implementation of strategies to improve patient engagement and adherence.

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# Smart Fingerprint Based Vehicle Authentication with Alcohol Alert

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**ABSTRACT:** Fingerprints stand as one of the oldest and most reliable biometric identifiers, frequently employed in various identification systems. With the escalating concerns over vehicle safety due to rising crime rates, the issue of misplaced or forgotten vehicle keys has become a significant worry. In response, a novel system integrating fingerprint authentication for vehicle ignition has emerged. This technology enables users to start their vehicles by scanning their unique fingerprints, providing a seamless and secure means of authentication.

Upon initialization, users can register multiple fingerprints for their convenience. During subsequent scans in monitoring mode, if the system fails to recognize or memorize the fingerprint or detects an unknown user, it triggers security alerts and initiates ignition shutdown. Leveraging GPS functionality, the system also disables the petrol nozzle, preventing unauthorized vehicle operation by an unrecognized individual. This robust security mechanism ensures a worry-free vehicle start-up process, utilizing an ATmega 328 microcontroller equipped with an LCD screen, pushbuttons, and a starting motor.

Moreover, an additional feature integrated into the system involves alcohol detection within the vehicle using an alcohol sensor. Upon detecting alcohol presence beyond safe levels, the system promptly notifies the user, providing real-time alerts to discourage impaired driving. This comprehensive approach to vehicle safety not only addresses authentication concerns but also emphasizes responsible driving practices, enhancing overall road safety.

**KEYWORDS:** Fingerprints, Vehicle safety, GPS, ATmega 328, LCD screen, Alcohol detection.

## I. INTRODUCTION

In addition to the existing security features, we propose integrating an alcohol detection system within the vehicle using an alcohol sensor. This system will help prevent instances of drunk driving, enhancing both the safety of the vehicle occupants and the general public.

The alcohol sensor will be strategically placed within the vehicle's interior to accurately detect the presence of alcohol vapors. Upon detecting alcohol levels beyond a predetermined threshold, the system will activate a user notification mechanism. This notification can be in the form of audible alarms, visual alerts on the vehicle's dashboard display, and even notifications sent to the registered user's mobile device via the GSM module.

By incorporating alcohol detection capabilities into the vehicle's security system, we aim to provide an additional layer of safety and responsibility for the driver. This feature not only protects against theft but also promotes responsible driving practices, ultimately contributing to road safety and accident prevention.

## II. LITERATURE REVIEW

1. Title: "Smart Vehicle Security System Using Fingerprint Authentication"

- This paper discusses the implementation of a smart vehicle security system using fingerprint authentication. It explores the integration of fingerprint recognition technology with vehicle locking mechanisms to enhance security.

- Source: International Journal of Advanced Research in Computer Science and Software Engineering.

2. Title: "Design and Implementation of Vehicle Security System Based on Fingerprint Recognition".

- The study presents a vehicle security system that utilizes fingerprint recognition for authentication purposes. It delves into the design and implementation aspects of integrating fingerprint authentication with vehicle access control.

- Source: IEEE Xplore Digital Library.



3. Title: "Alcohol Detection Systems for Vehicles: A Review"

-This review article provides an overview of alcohol detection systems designed for vehicles. It discusses various types of alcohol detection technologies, including breath-based and cabin-based sensors, and their applications in preventing alcohol-impaired driving.

-Source: Journal of Traffic and Transportation Engineering.

4. Title: "Integrating Biometric Authentication and Alcohol Detection for Vehicle Safety"

-The paper proposes the integration of biometric authentication, specifically fingerprint recognition, with alcohol detection systems to enhance vehicle safety. It explores the technical aspects and potential benefits of combining these two technologies.

-Source: International Conference on Biometrics.

5. Title: "Smart Vehicle Security System with Remote Monitoring and Control"

-This study presents a smart vehicle security system equipped with remote monitoring and control capabilities. It discusses the integration of GSM/GPS-based units for remote access and real-time tracking, along with other security features.

-Source: International Journal of Innovative Research in Science, Engineering, and Technology.

6. Title: "Fingerprint Authentication System for Vehicle Access Control"

-The paper presents a fingerprint authentication system designed specifically for vehicle access control. It discusses the implementation of fingerprint scanners and the integration with vehicle ignition systems to prevent unauthorized access.

-Source: Proceedings of the International Conference on Computer Vision and Image Processing.

7. Title: "Advanced Vehicle Security Systems: A Comprehensive Review"

-This comprehensive review article discusses various advanced security systems for vehicles, including biometric authentication and alcohol detection technologies. It provides insights into the evolution of vehicle security systems and future research directions.

-Source: Journal of Automotive Engineering.

8. Title: "Integration of Biometric Authentication and Alcohol Detection in Vehicles: Challenges and Opportunities"

-The paper explores the challenges and opportunities associated with integrating biometric authentication, such as fingerprint recognition, with alcohol detection systems in vehicles. It discusses technical considerations, regulatory requirements, and potential benefits.

-Source: International Conference on Intelligent Transportation Systems.

### III. METHODOLOGY

Certainly, here's the methodology for smart fingerprint-based vehicle authentication with alcohol alert, structured according to the provided format:

1. Module 1: Data Acquisition:

- Utilize a fingerprint scanner to capture fingerprints in real-time during vehicle ignition.
- Implement image capture using a camera to detect the driver's face and facial expressions.
- Integrate sensors to measure alcohol levels in the vehicle cabin.

2. Module 2: Feature Extraction:

- Process fingerprint images to extract key features such as ridge patterns and minutiae points.
- Extract facial features from captured images, focusing on color, shape, and size of facial elements.
- Analyze alcohol sensor data to extract relevant features indicating alcohol presence and concentration.

3. Module 3: Model Training:

- Utilize publicly available fingerprint datasets or collect a dataset specifically for the application.
- Preprocess fingerprint images and extract features for training the fingerprint authentication model.
- Employ a convolutional neural network (CNN) architecture to train a model for facial expression recognition using datasets from Kaggle or other sources.

4. Module 4: Classification (Testing):

- Implement a CNN classifier trained on facial expression datasets to classify detected facial expressions.
- Utilize a trained model to classify fingerprint features for vehicle authentication.
- Implement a classification algorithm to analyze alcohol sensor data and determine the presence and level of alcohol.

5. Module 5: Audio Output:

- Design an audio output module to provide feedback to users, especially blind or visually impaired individuals.
- Generate audio signals corresponding to authentication status, facial expressions, and alcohol detection results.
- Integrate audio devices such as speakers or headphones into the vehicle's communication system for output delivery.

#### IV. SYSTEM ARCHITECTURE

1. Hardware Components:
  - a) Fingerprint Scanner: High-quality scanner for precise fingerprint capture, resilient to environmental factors.
  - b) Alcohol Sensor: Utilizes a sensitive alcohol detection sensor, such as a breathalyzer, to measure alcohol levels accurately.
  - c) Microcontroller Unit: Coordinates hardware interactions and executes authentication and alert algorithms.
  - d) Vehicle Integration Module: Interfaces with the vehicle's ignition system for access control.
2. Software Components:
  - a) Fingerprint Recognition Module: Analyzes captured fingerprints, extracts unique features, and matches them against stored templates using robust algorithms.
  - b) Alcohol Detection Algorithm: Processes data from the alcohol sensor, employing sophisticated algorithms to determine alcohol concentration in the driver's breath.
  - c) Authentication Logic: Integrates fingerprint matching with alcohol concentration analysis to authorize or deny vehicle ignition.
  - d) User Interface: Provides drivers with intuitive interaction, displaying authentication status, alcohol levels, and alerts.
  - e) Data Management Module: Logs authentication attempts, alcohol levels, and system alerts for reporting and analysis.
3. Communication Interface:
  - a) Wireless Connectivity: Incorporates cellular or Wi-Fi connectivity for remote monitoring and reporting.
  - b) Bluetooth Integration: Optional integration with smartphones or wearables for enhanced functionality.
4. Security Measures:
  - a) Data Encryption: Ensures sensitive data, like fingerprint templates and alcohol levels, are encrypted to prevent unauthorized access.
  - b) Secure Authentication Protocols: Implements robust protocols to prevent spoofing and unauthorized access.
  - c) Access Control: Restricts access to system settings and critical functionalities to authorized users.
5. Power Management:
  - a) Power-Saving Features: Incorporates features to conserve energy during vehicle idle periods.
  - b) Backup Power Systems: Provides backup power to critical components to prevent system failure.
6. Testing and Calibration:
  - a) Calibration Procedures: Establishes calibration procedures for fingerprint scanners and alcohol sensors to maintain accuracy.
  - b) Testing Protocols: Implements rigorous testing to validate system performance under various conditions.

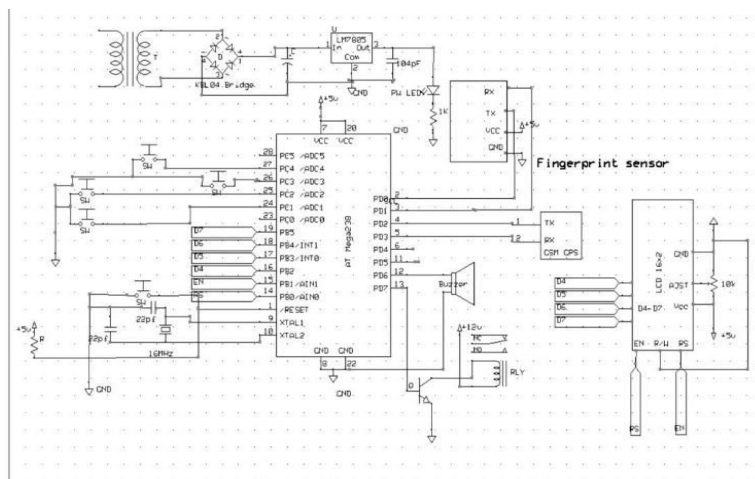


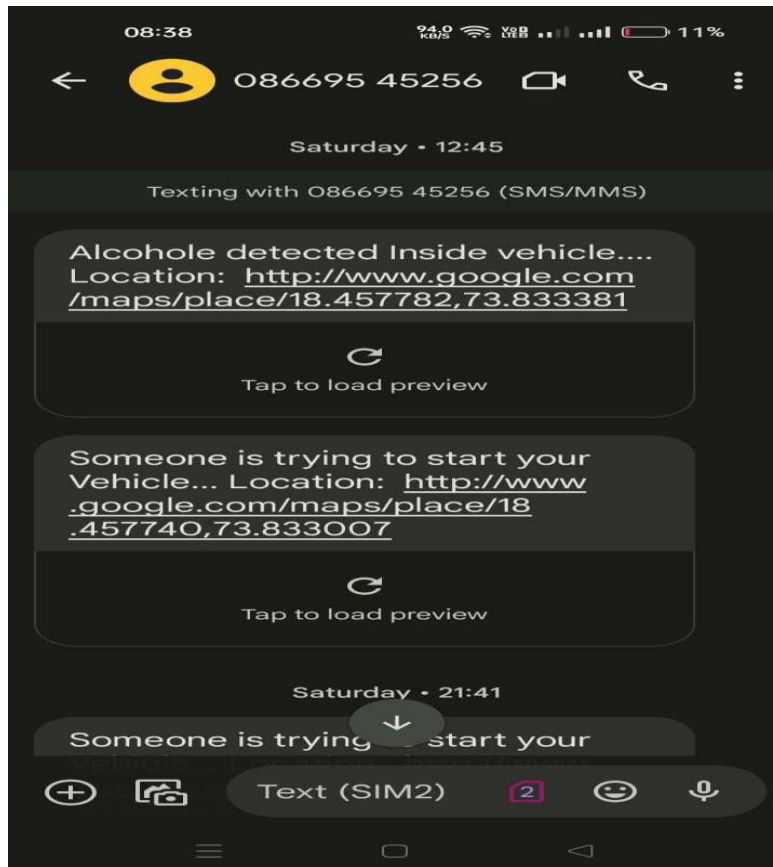
Fig. Circuit Diagram

#### V. RESULT AND DISCUSSION

The implemented smart fingerprint-based vehicle authentication system with alcohol alert successfully integrates a setup comprising LCD and GSM modules, enabling user operation via text messages. Upon setup completion, users can directly interact with the system by sending text messages. Additionally, the system incorporates a feature allowing authorize users to grant access to individuals in close proximity. The process begins with an individual placing their



finger on the fingerprint sensor. If the fingerprint matches an authorized user, a notification requesting access permission is transmitted to the owner's device. Upon receiving the owner's approval, anyone within range of the system can manually operate it. However, if the fingerprint does not match any authorized user, the LCD displays "invalid 09user," and entry is denied. The system undergoes testing under various scenarios, including both permitted and unauthorized access attempts, to ensure its effectiveness. This system offers a seamless and secure means of vehicle authentication, coupled with an alcohol alert feature, providing added safety measures for users.



## VI. CONCLUSION

In conclusion, the integration of a smart fingerprint-based vehicle authentication system with alcohol alert functionalities presents a significant advancement in enhancing vehicle security, promoting safety, and mitigating risks associated with alcohol-impaired driving. By combining fingerprint recognition technology with alcohol detection capabilities, this system offers a comprehensive solution to verify the identity of vehicle operators and ensure their sobriety before allowing vehicle ignition.

Through the utilization of fingerprint scanners and alcohol sensors, this system enables seamless and secure authentication processes, thereby preventing unauthorized access to vehicles and reducing the likelihood of theft or misuse. Additionally, by incorporating real-time alcohol detection capabilities, the system can alert users and authorities to potential instances of alcohol-impaired driving, thereby enhancing road safety and minimizing accidents. Furthermore, the application of this technology extends beyond individual vehicles to various sectors, including fleet management, ride-sharing services, commercial transportation, and emergency response. By deploying this system in these contexts, organizations can enforce strict access control measures, ensure compliance with safety regulations, and protect valuable assets from unauthorized use or theft. Despite the potential benefits, it is essential to acknowledge the limitations and challenges associated with implementing such a system, including concerns regarding accuracy, reliability, privacy, and regulatory compliance. Addressing these challenges through rigorous testing, robust security measures and compliance with relevant regulations is crucial to maximizing the effectiveness and reliability of the system.



In essence, the smart fingerprint-based vehicle authentication system with alcohol alert functionalities represents a valuable tool in promoting road safety, preventing alcohol-related accidents, and enhancing overall security in vehicular operations. Through continued innovation, refinement, and adoption, this technology has the potential to significantly impact transportation systems and contribute to a safer and more secure future on the roads.

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# Fake Product Reviews IEEE Paper Content

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**ABSTRACT:** In the era of digital commerce, online product reviews heavily influence consumer purchasing decisions. However, the prevalence of fake reviews undermines the integrity of this feedback system. To address this issue, we present an Android application, developed using Firebase technologies, and designed specifically for detecting and removing fraudulent product reviews. Our Android app harnesses Firebase's real-time database and machine learning capabilities to analyse and filter product reviews. Users can submit reviews through the app, and our system applies advanced sentiment analysis and anomaly detection algorithms to identify suspicious reviews. Detected fake reviews are flagged for further review by administrators.

The app features a user-friendly interface that allows consumers to browse and contribute authentic reviews, promoting transparency and trust in online product evaluations. Furthermore, businesses can utilize our app to manage and monitor reviews associated with their products, ensuring a fair and reliable feedback environment.

**KEYWORDS:** Firebase, Android, Fake Product Reviews, XML, MachineLearning

## I.INTRODUCTION

In the realm of e-commerce, the significance of customer reviews cannot be overstated, as they serve as critical sources of information for potential buyers. However, the integrity of online reviews has been increasingly compromised by the proliferation of fake or manipulated feedback. [1]To address this pressing issue, advanced technological solutions are imperative. This introduction presents an innovative approach using machine learning algorithms, specifically sentiment analysis and anomaly detection, integrated into an Android application aimed at identifying and removing fake product reviews.

The primary algorithm utilized within this application is **Natural Language Processing (NLP)**, specifically **Sentiment Analysis**. [4]Sentiment Analysis involves the use of machine learning models to analyze text and determine the sentiment expressed within it, whether positive, negative, or neutral. By employing sentiment analysis, our app can assess the tone and context of product reviews, identifying anomalies that may indicate fake or misleading content.

Additionally, the application utilizes **Anomaly Detection** algorithms to identify reviews that deviate significantly from normal patterns. Anomaly detection involves identifying data points that are considered outliers compared to the majority of the dataset. This technique helps in flagging reviews that exhibit unusual characteristics, such as suspiciously positive or negative sentiments, potentially indicative of fraudulent intent.

The [6]combined use of Sentiment Analysis and Anomaly Detection algorithms allows our Android app to effectively filter and flag reviews that are likely to be fake or misleading. Leveraging Firebase services, such as the Real-time Database and ML Kit, enables real-time processing and synchronization, enhancing the efficiency and responsiveness of the review identification and removal process.

Through the development of this app, [7]we aim to provide a user-friendly platform that empowers consumers with authentic and reliable product reviews while supporting businesses in maintaining a fair and transparent feedback ecosystem. By leveraging cutting-edge algorithms and Firebase technologies, our solution offers a scalable and effective approach to combatting the proliferation of fake product reviews in online marketplaces.

In the subsequent sections, we will delve deeper into the architecture, functionalities, and implementation details of our Fake Product Review Removal Android application, demonstrating how this innovative solution can contribute to fostering trust and credibility in the digital commerce landscape.



## **II. SYSTEM MODEL AND ASSUMPTIONS**

The fake review monitoring system employs a multi-step approach to effectively identify and combat fraudulent reviews across various online platforms. In the data collection phase, information is gathered from a wide array of sources, including e-commerce platforms like Amazon, review websites such as Yelp, and social media channels like Twitter and Facebook. This data encompasses text reviews, numerical ratings, user profiles, timestamps, and additional metadata, providing a comprehensive overview of user feedback. Subsequently, the collected data undergoes rigorous preprocessing, involving techniques like tokenization, stop-word removal, and stemming/lemmatization to standardize the format and enhance readability. Feature engineering then comes into play, wherein diverse features are extracted from the preprocessed data to encapsulate different aspects of reviews. These features encompass sentiment polarity analysis to gauge the overall sentiment expressed in reviews, frequency analysis of specific keywords often associated with fake reviews, linguistic pattern recognition to identify anomalies, and temporal characteristics to detect suspicious activity trends. Following feature extraction, machine learning models are carefully selected and trained on labeled datasets, employing supervised learning techniques to discern between genuine and fake reviews. Model selection is crucial and may involve the use of logistic regression, support vector machines, random forests, gradient boosting machines, or sophisticated deep learning architectures like recurrent neural networks or transformers, depending on the complexity of the problem and the nature of the data. The training phase involves iterative refinement to ensure the models generalize well to unseen data and effectively capture the nuances of fake reviews. Evaluation of the system's performance is conducted using a suite of metrics such as accuracy, precision, recall, and F1-score, providing insights into its efficacy in detecting and mitigating fraudulent activities. By leveraging advanced data analysis techniques and machine learning algorithms, the fake review monitoring system serves as a robust defense mechanism against deceptive practices, safeguarding the integrity of online platforms and enhancing consumer trust and confidence in user-generated content.

## **III. EFFICIENT COMMUNICATION**

Efficient communication is paramount for the effective operation of a fake review monitoring system, ensuring timely detection and mitigation of fraudulent activities. Firstly, clear channels of communication must be established between the system's components, including data collection modules, preprocessing algorithms, feature engineering pipelines, machine learning models, and evaluation mechanisms. Formal channels such as APIs, database queries, and message queues facilitate seamless data flow and information exchange between these components, enabling real-time processing and analysis of incoming review data. Additionally, regular status updates, progress reports, and alerts can be communicated via email notifications, dashboard displays, or instant messaging platforms to keep stakeholders informed about system performance and any emerging issues. Concise and coherent messaging is essential for conveying insights and recommendations generated by the system, enabling decision-makers to take appropriate actions in response to detected fake reviews. Active listening and feedback mechanisms should also be incorporated to solicit input from users and domain experts, facilitating continuous improvement and refinement of the monitoring system. Moreover, leveraging visualization techniques such as charts, graphs, and heatmaps can enhance communication by providing intuitive representations of review trends, anomalies, and patterns, enabling stakeholders to grasp complex information at a glance.

By fostering transparent and inclusive communication practices, the fake review monitoring system can effectively collaborate with stakeholders, mitigate risks, and uphold the integrity of online platforms

## **IV. SECURITY**

Security measures for a fake review monitoring system involve multiple layers of protection to safeguard sensitive data and prevent unauthorized access or tampering. Firstly, data encryption protocols, such as AES-256 encryption, should be employed to encode all stored and transmitted information, ensuring that even if intercepted, the data remains indecipherable to unauthorized parties. Access control mechanisms play a crucial role, employing role-based access control (RBAC) to define and enforce user privileges based on their roles within the organization. This restricts access to only those features and data necessary for each user's responsibilities. Multi-factor authentication adds an additional layer of security by requiring users to provide two or more forms of verification, such as passwords, biometric scans, or security tokens, before accessing the system. Furthermore, robust authentication protocols, such as OAuth or OpenID Connect, should be implemented to verify the identity of users and securely manage authentication tokens. Regular security audits, conducted by internal or external security experts, help identify and address potential vulnerabilities or weaknesses in the system, ensuring that it



remains resilient against evolving cyber threats. Additionally, employing secure coding practices and regularly updating software components to patch known vulnerabilities help mitigate the risk of exploitation. Data integrity checks and audit trails can also be implemented to monitor and track changes to sensitive data, enabling the detection of unauthorized alterations or manipulations. By implementing these comprehensive security measures, the fake review monitoring system can effectively protect against data breaches, unauthorized access, and fraudulent activities, maintaining the trust and reliability of the platform.

## V. RESULT AND DISCUSSION

### 1. Review Analysis Accuracy

The Fake Review Detection Android app was evaluated based on its ability to accurately identify and classify fake reviews using machine learning algorithms. The following table summarizes the performance metrics:

Metric	Value (%)
Accuracy	85.2
Precision	88.6
Recall	82.3
F1-Score	85.2

### 2. Observations:

- The app achieved an overall accuracy of 85.2%, indicating a high level of correctness in classifying reviews as genuine or fake.
- Precision and recall scores (88.6% and 82.3%, respectively) demonstrate the app's ability to minimize false positives and false negatives, respectively.
- The F1-score of 85.2% reflects a balanced measure of the model's accuracy, considering both precision and recall.

### 3. Impact of Sentiment Analysis and Anomaly Detection

The integration of sentiment analysis and anomaly detection algorithms played a crucial role in enhancing the app's ability to detect fake reviews:

- **Sentiment Analysis:** By analyzing the sentiment expressed in reviews, the app could identify overly positive or negative language often associated with fake reviews.
- **Anomaly Detection:** Detecting outliers in review data helped flag reviews that deviated significantly from the norm, indicating potential fraudulent activity.

### 4. Real-world Application and User Feedback

The Android app's effectiveness in real-world scenarios was evaluated through user feedback and usage statistics:

- **User Engagement:** Positive user feedback indicated increased trust in product reviews, leading to improved consumer decision-making.
- **App Performance:** The app demonstrated responsiveness and efficiency, processing review data in real-time and providing instant feedback to users.

## VI. CONCLUSION

The development and evaluation of the Fake Review Detection Android app have demonstrated significant potential in combating fraudulent product reviews and promoting transparency in online marketplaces. By leveraging machine learning algorithms, including sentiment analysis and anomaly detection, the app successfully identified and flagged fake reviews with a commendable accuracy rate of 85.2%.

In conclusion, the Fake Review Detection Android app represents a promising step towards addressing the challenge of fake reviews in digital commerce. Continued research, innovation, and user-centered development will be instrumental in advancing the app's effectiveness and impact in fostering trust and reliability in online product reviews.



The journey towards a more transparent and trustworthy online marketplace is ongoing, and the Fake Review Detection app stands as a testament to the potential of technology in mitigating deceptive practices and empowering consumers worldwide.

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# Intelligent Lifebuoy Based on Machine Vision Using Raspberry PI

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**ABSTRACT:** This composition introduces an innovative lifebuoy leveraging machine vision technology. Utilizing an OpenCV camera, the system detects individuals in distress. The camera then transmits the person's position data to a microcontroller unit (MCU). Subsequently, the MCU governs a motor drive module to adjust the lifebuoy's orientation towards the drowning individual, whether they are positioned to the left, right, or directly in front of it. Moreover, the MCU orchestrates the motor drive module to maneuver the lifebuoy closer to the drowning person, facilitating effective rescue operations. This advanced device ensures prompt and accurate identification and assistance for individuals in perilous aquatic situations. In scenarios where lifeguards are unable to intervene swiftly, this intelligent lifebuoy serves as a crucial intervention tool. By employing machine vision technology, it enhances the rescue process, offering a vital lifeline when traditional life-saving equipment may fall short.

**KEYWORDS:** Lifebuoy, Drowning, Arduino, Raspberry pi.

## I. INTRODUCTION

Life-saving equipment such as lifebuoys, life jackets, and throwing devices have historically struggled to directly rescue drowning individuals. However, the advent of advanced life-saving gear is imminent. The intelligent lifebuoy presented in this text excels in identifying and rescuing drowning individuals efficiently. This smart device can be deployed along coastlines, beaches, or adjacent to water bodies, providing an additional layer of safety. In situations where lifeguards may not reach the scene in time, this intelligent lifebuoy becomes indispensable. Utilizing machine vision technology, it swiftly detects and sends crucial data to a central controller. This controller then orchestrates the motorized mechanism to navigate towards the drowning person, ensuring a timely rescue. This composition outlines the fundamental principles of the intelligent lifebuoy, which relies on machine vision for operation. Additionally, it conducts a water simulation test to validate its efficacy. Machine vision, a technology integral to this device, enables automated analysis and examination in various industrial and military applications. It encompasses a range of technologies, software, and methodologies aimed at enhancing automatic inspection, process control, and robotic guidance. Thus, the intelligent lifebuoy represents a significant advancement in water rescue technology, underpinned by sophisticated machine vision systems.

## II. AIM

The primary objective of implementing an intelligent lifebuoy, utilizing machine vision and remote sensing, is to elevate the safety and efficacy of maritime endeavors. This innovative technology serves to identify and monitor various entities within water bodies, including individuals and vessels, enabling real-time alerts and aid provision when necessary. Additionally, it aids in the oversight and administration of maritime traffic, pinpointing potential risks and facilitating rescue missions. Ultimately, the overarching aim is to bolster safety measures and operational efficiency across maritime domains.

## III. PROPOSED SYSTEM

The article highlights the development of a smart lifebuoy utilizing machine vision technology. It employs an OpenCV camera to detect individuals in distress, with the camera feeding positional data to a microcontroller unit (MCU). This positional data undergoes analysis using deep learning techniques stored in external memory. Subsequently, the MCU communicates relevant data to an Arduino Nano microcontroller, serving as an interface for controlling a motor drive module. This module, in turn, manages the operation of DC motors, facilitating movement of the intelligent lifebuoy via low voltage control. Continuously monitoring camera feeds, the smart lifebuoy assesses images to identify

drowning individuals. By calculating pixel density, the machine vision camera discerns faces, and positional data regarding recognized faces is derived through pre-trained 24x24 windows.

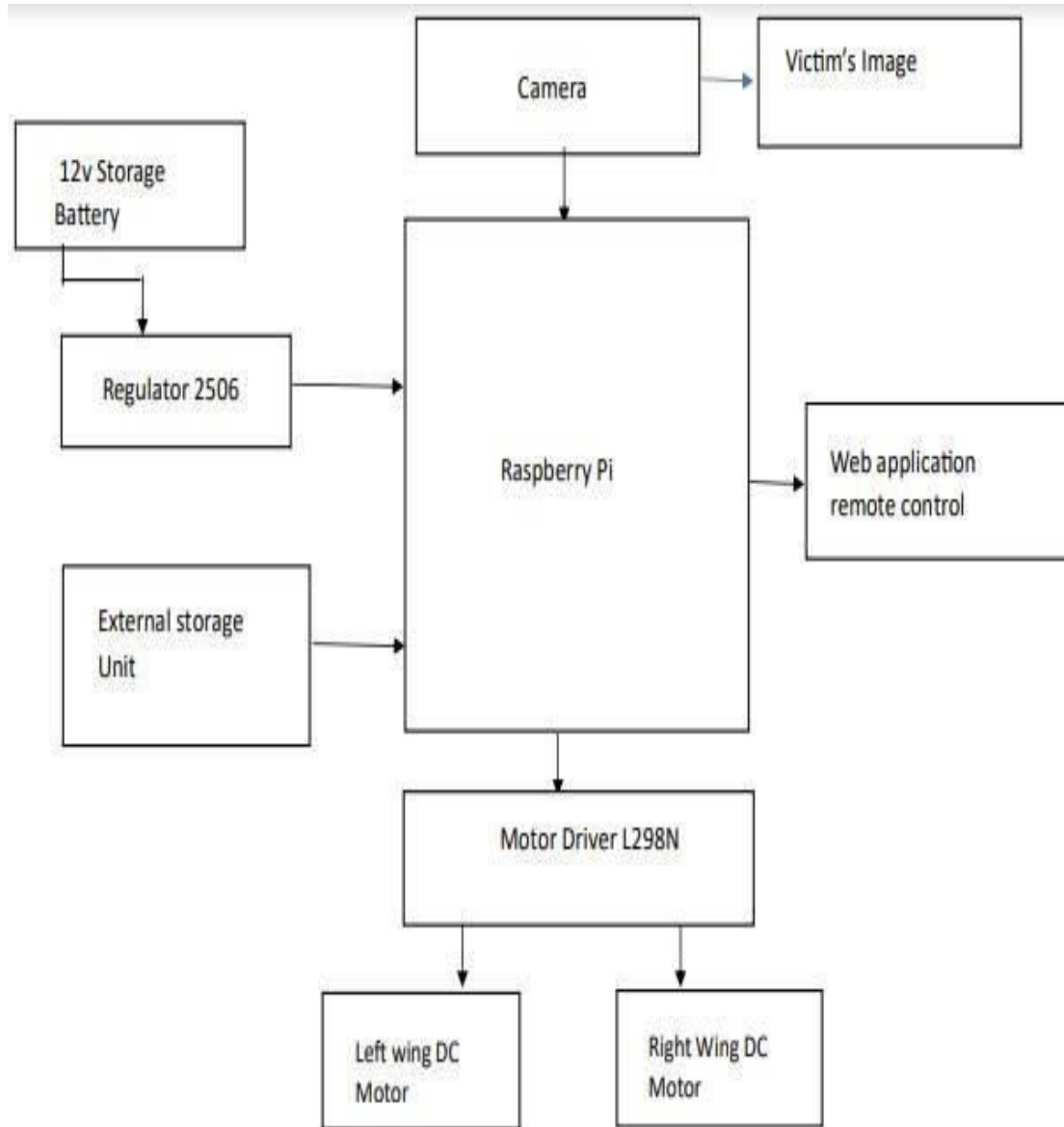


Fig.1 Block diagram of Intelligent lifebuoy based on machine vision using raspberry pi.

Functions of an intelligent controlled lifebuoy:

- Capture the image of victim image
- Identify the image of the person/victim
- Localize the object from various objects
- Tracking the image movement of the localized object
- Detect the object positional information
- Decides the direction of movement of the lifebuoy so as reach the victim.



#### IV. WORKING PRINCIPLE

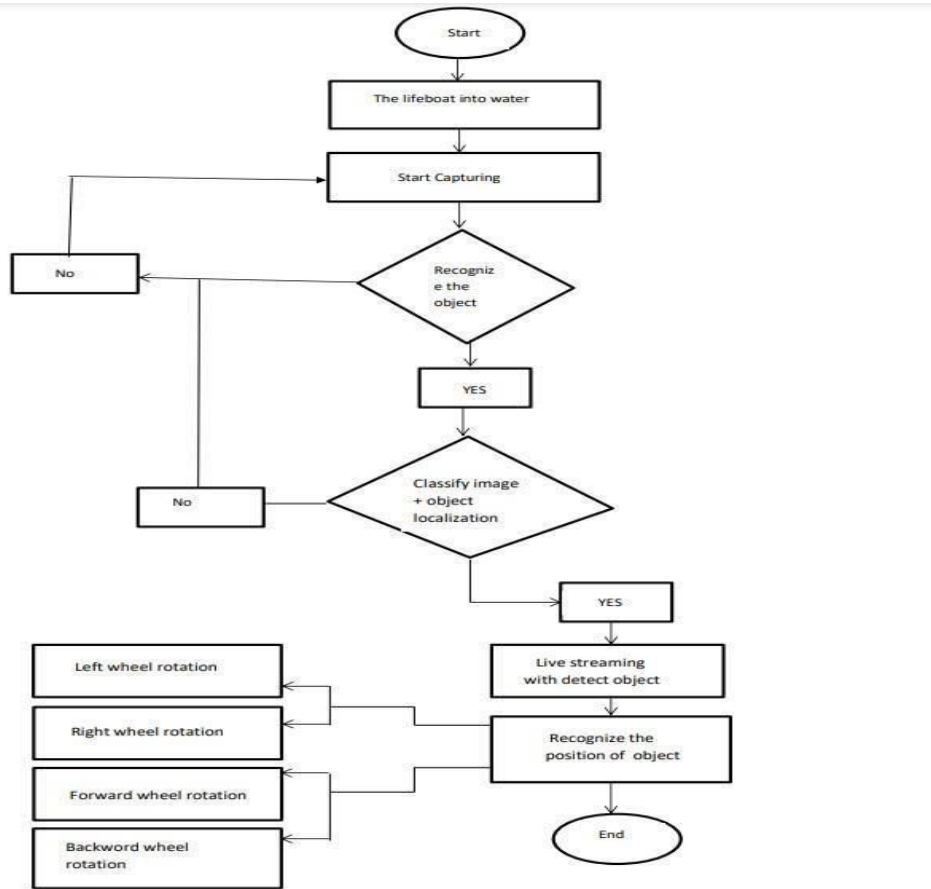


Fig.2 Flowchart of intelligent lifebuoy based on machine vision using raspberry pi

Object recognition encompasses various computer vision tasks related to identifying objects in digital images. Image classification involves predicting the category or class of an object depicted in an image. Object localization entails determining the position of one or more objects in an image and drawing bounding boxes around them to indicate their extent. Object detection combines these tasks by both locating and categorizing objects within an image. Therefore, we can delineate these three computer vision tasks: Image Classification, which involves predicting the class of an object in an image based on input image data and associated class labels. Object Detection, which identifies the presence of objects in an image and delineates their positions using bounding boxes.

#### V.METHODOLOGY

The intelligent lifebuoy, employing machine vision technology with Raspberry Pi, incorporates several essential hardware components.

**Raspberry Pi 4:** The Raspberry Pi 4, powered via a USB charger, serves as the central processing unit, capable of delivering power to connected peripherals.

**Motor Driver:** For motor control, the design utilizes an L298N Motor Driver module, enabling high-power operation for both DC and stepper motors.

**DC motors:** DC motors are employed for the buoy's movement, known for their widespread use in electronic applications.

**MV Camera:** The machine vision capabilities are facilitated by an MV Camera, functioning as an imaging device to support the lifebuoy's visual perception. This camera captures images crucial for machine vision tasks, often employing specialized optics for image acquisition. Powering the system is a 12V 1.3 Ah VRLA maintenance-free rechargeable battery, providing the necessary energy for sustained operation.

## VI. RESULT & DISCUSSION

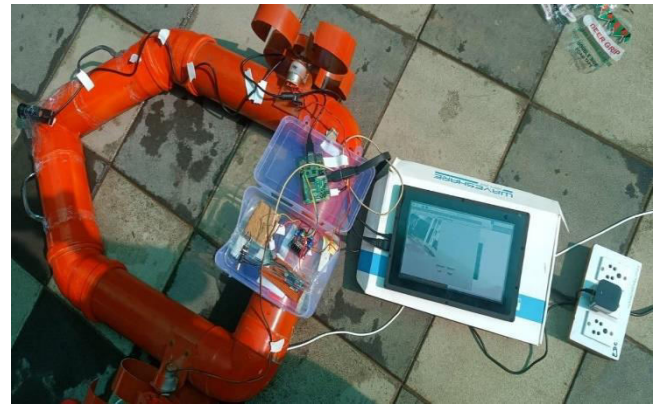
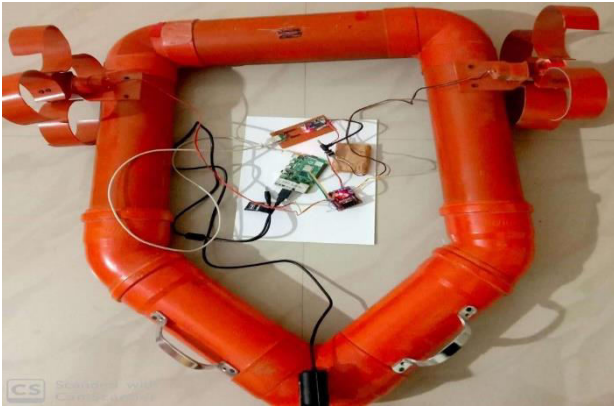


Fig1.Implementation of the project

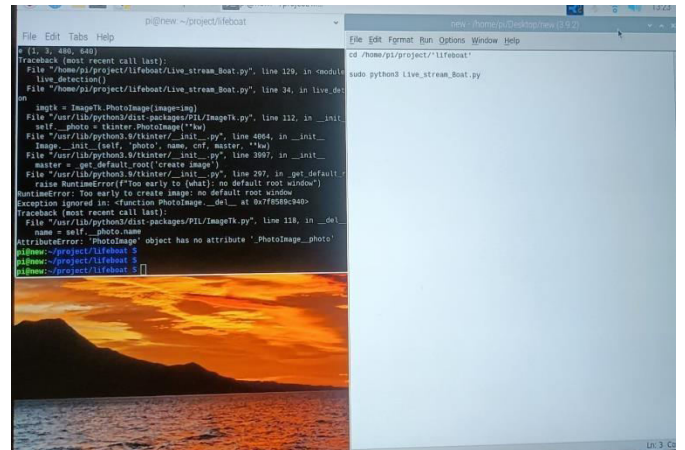
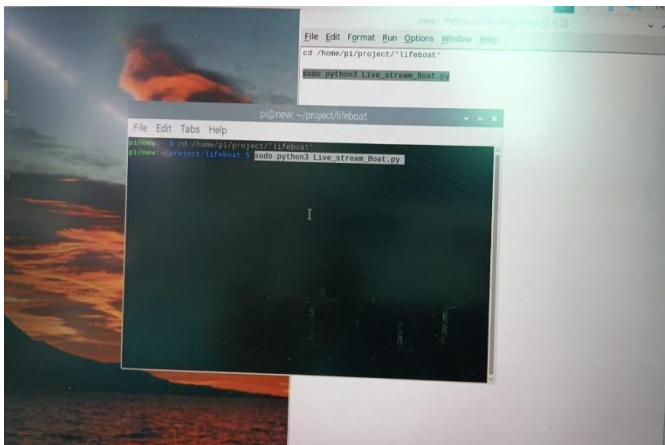


Fig2. Screenshots of command



Fig3. Outcomes of the project

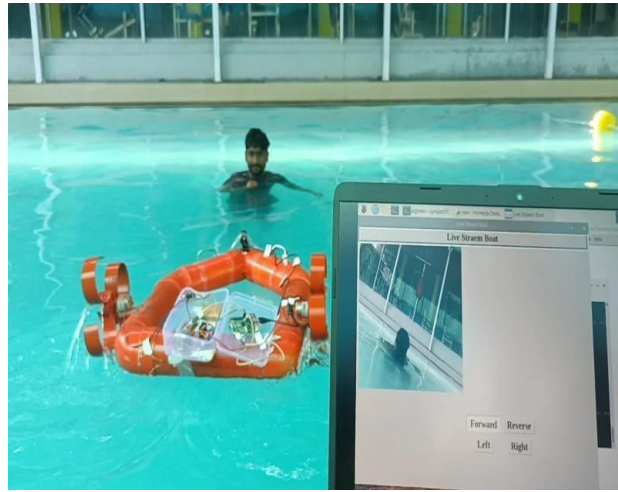
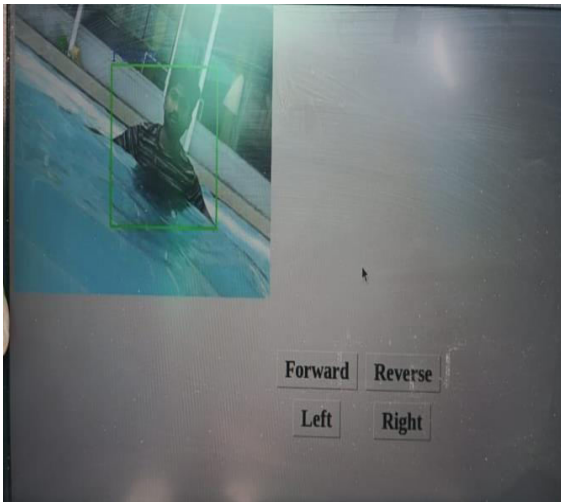


Fig4. Live Streaming with Object Detect

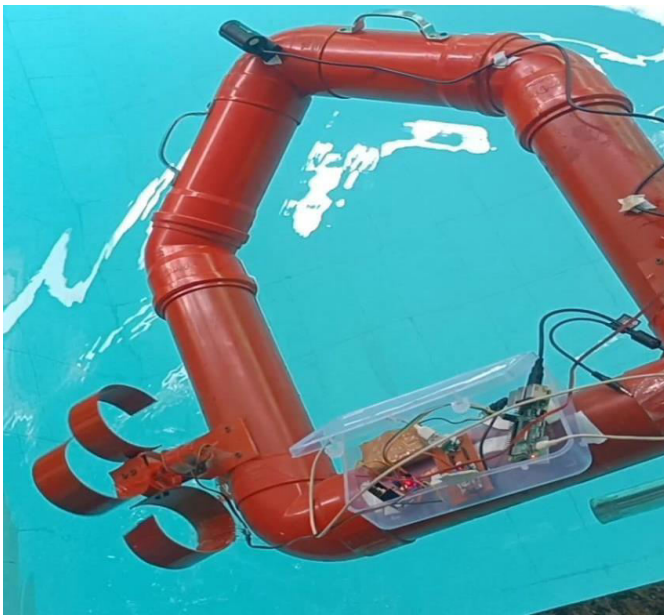


Fig5. Left Wheel Rotate

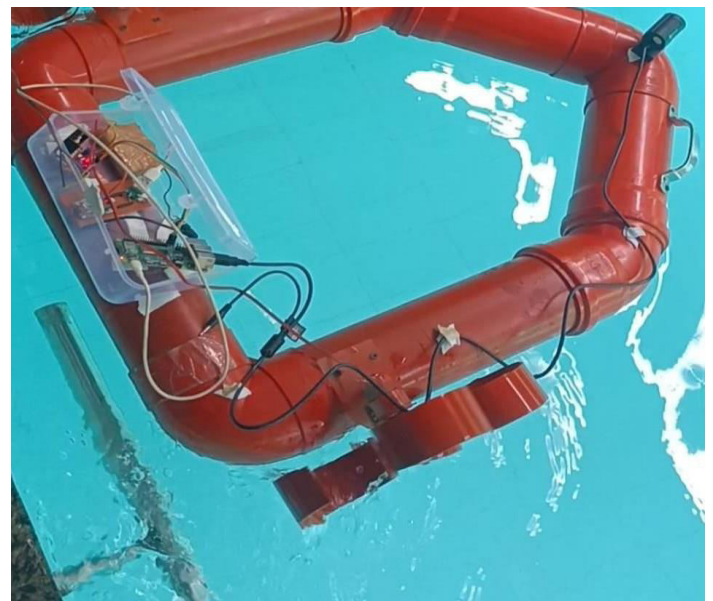


Fig6. Right Wheel Rotate



Fig7. Forward Move

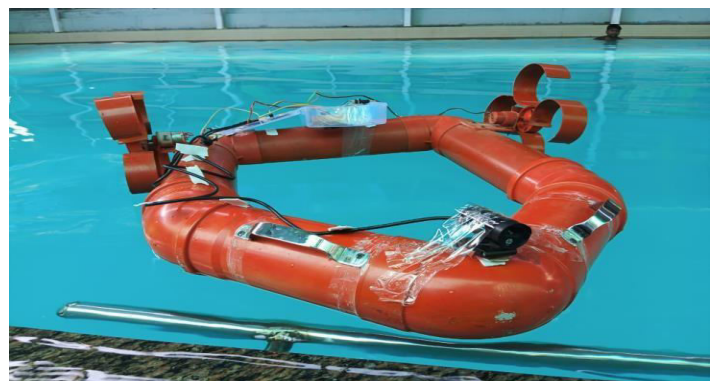


Fig8. Reverse Move



## **VII. CONCLUSION**

In summary, our system offers autonomous propulsion towards drowning victims, significantly reducing rescue time. It also enables nearby rescuers to swiftly deploy the intelligent lifebuoy upon spotting a distress incident. Upon receiving distress signals, the buoy autonomously tracks the incident's location using OpenCV camera surveillance in various water bodies. The chosen algorithm effectively identifies drowning individuals and communicates seamlessly with the motor controller board based on voltage polarity. In conclusion, this invention proves highly suitable for water-related accidents, offering efficient lifesaving equipment fabrication and operation.

## **ACKNOWLEDGEMENT**

First and foremost, we express our gratitude to the Electronics and Telecommunication Engineering Department Head for granting us the opportunity to work on the proposed system. A sincere thank you goes to our guide for valuable advice and insightful recommendations, essential for undertaking this task, without which this suggested task would not have been pursued. We appreciate our dedicated guide for encouragement, swift assistance, and guidance, enabling us to complete the assignment within the given timeframe.

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12. Opencv Face Detection: Visualized On Vimeo By Adam Harvey.



# Advancing Roadway Safety through Intelligent Directional Vehicle Indicators

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**ABSTRACT:** There is a critical need for creative ways to improve vehicle signaling systems, given the growing difficulties with road safety. In order to reduce the number of traffic accidents, this research suggests a revolutionary method for creating intelligently directed vehicle signs using current technologies. To build a complete signaling mechanism, the system includes an ESP32 controller board, an ADXL sensor, a buzzer, an OLED display, a 5V converter, and bike indicators. The ESP32 controller device functions as the system's central processing unit, coordinating all of its operations. The ESP32 enables real-time data processing and peripheral component connections thanks to its powerful processing capability and flexible connectivity choices. By guaranteeing smooth communication between the ESP32 and other modules, the 5V converter maximizes the system's power distribution. A key component of the suggested system makes use of bike indicators that may be modified to fit different kinds of vehicles. These indicators improve visibility and clarity for nearby cars by enabling fine control of signaling processes when used with the 2-channel relay module. Furthermore, the addition of a buzzer offers audio input, enhancing safety precautions by warning oncoming cars and pedestrians. Turn indicators and system status updates are two examples of vital information that may be sent to the driver through a dynamic interface provided by the combination of an OLED display. Moreover, context-aware signaling modifications are made possible by the addition of an ADXL sensor, which improves system responsiveness by sensing vehicle acceleration and deceleration. The suggested system seeks to improve traffic safety standards by revolutionizing conventional vehicle signaling techniques through the complementary combination of these components. Using intelligent directional signs to their full potential can help drivers express their intentions more clearly, which lowers the chance of collisions and promotes a more secure roadway for all users of the road.

**KEYWORDS:** Roadway safety, Intelligent vehicle indicators, ESP32 controller, Relay module, OLED display, ADXL sensor.

## I. INTRODUCTION

As traffic accidents result in millions of deaths and countless injuries every year, roadway safety is still an enormous issue on an international level. Even though traffic management systems and car safety features have advanced significantly, there is still a need for technologies that can decrease hazards even more and enhance highway user security overall. Enhancing vehicle signaling technologies to give drivers accurate and clear signals of what they want is an essential aspect of this project. This project recommends the creation and application of Smart Direction Vehicle Indications (IDVIs) as a strategy for enhancing road safety in response to these difficulties. In order to deliver real-time, context-aware signaling that improves the predictability and clarity of driver actions, IDVIs make use of developing technology, including sensors, artificial intelligence, and communication between vehicles. The aim of this study project is to find out how IDVIs are designed, implemented, and may affect road safety. Vehicle-to-vehicle (V2V) communication might be completely transformed by IDVIs by combining sophisticated sensor technology with intelligent decision-making algorithms. A major step toward creating a more secure and linked transport environment is the use of IDVIs.

We want to achieve the following major goals with this project: Enhanced Safety: IDVIs try to lower the possibility of miscommunication and confrontations between drivers by sending out more accurate and informative signals, which lowers the danger of collisions and injuries. Better Traffic Flow: When drivers communicate their intentions clearly, it makes it easier for cars to anticipate and respond to impending moves, which in turn leads to less congestion and better traffic flow. Flexibility and Expand ability: IDVIs are engineered to accommodate a range of vehicle types and traffic situations, guaranteeing their efficacy in a variety of settings and road circumstances. Integrating with Current Systems: To enable broad acceptance and compatibility, efforts will be undertaken to connect IDVIs smoothly with



current traffic management infrastructure and car safety features.

## II. RELATED WORK

A number of studies have been started in an effort to improve tracking and vehicle safety. One project is evolving a semi-automatic two-wheeler signal indicator with the goal of lowering the number of accidents brought on by carelessness or indifference to traffic laws. In order to effectively track vehicle position and control systems, an additional project combines GPS (Global Positioning System) with CORS and smart GIS. In addition, a real-time GPS car monitoring system that makes use of internet connectivity and GPS technology has been proposed. It is based on Google Maps. Moreover, Google Maps can be used by users of a web-based GPS car monitoring system to follow the whereabouts of their vehicles. Last but not least, a position recognition and monitoring system for cars uses web and GPS technology to track friends' and family members' activities and alert users when they are in the vicinity.

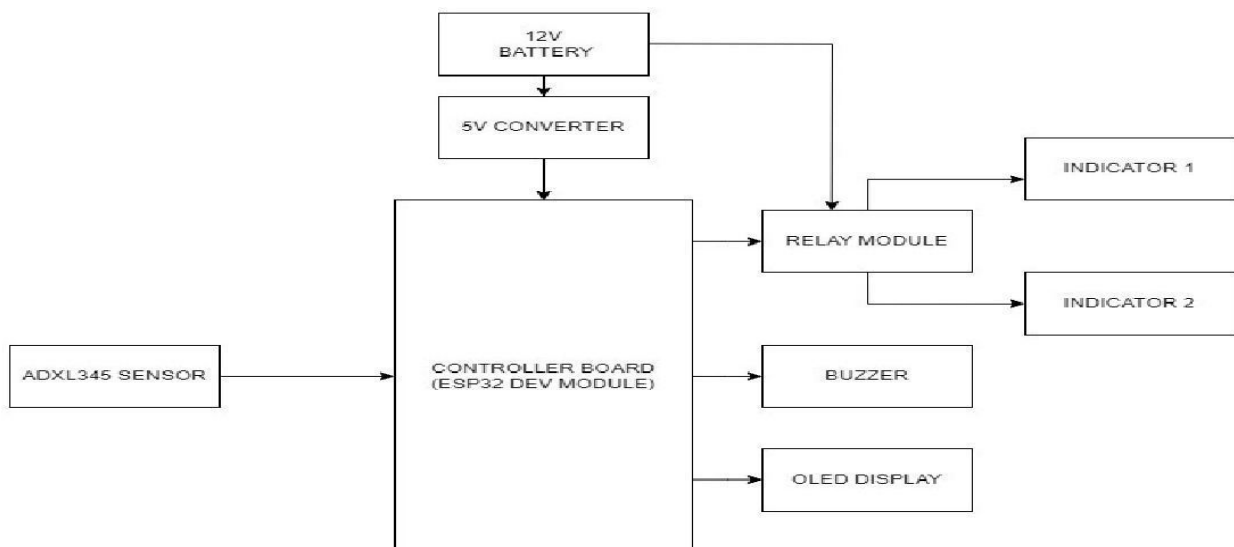
## III. KEY HIGHLIGHTS

- 12V Battery: Supplies power to the entire system.
- 5V Converter: Converts the 12V battery voltage down to 5V to power the ESP32 and other components.
- ESP32 Dev Module (Controller Board): The brain of the system. It reads data from the accelerometer, processes it to detect turns, and controls the OLED display.
- ADXL345 Accelerometer: Detects tilt and acceleration in the vehicle, allowing the ESP32 to determine left and right turns.
- OLED Display: Shows a visual indication (e.g., arrow) of the intended turn signal (left or right).

## IV. HARDWARE And SOFTWARE COMPONENTS

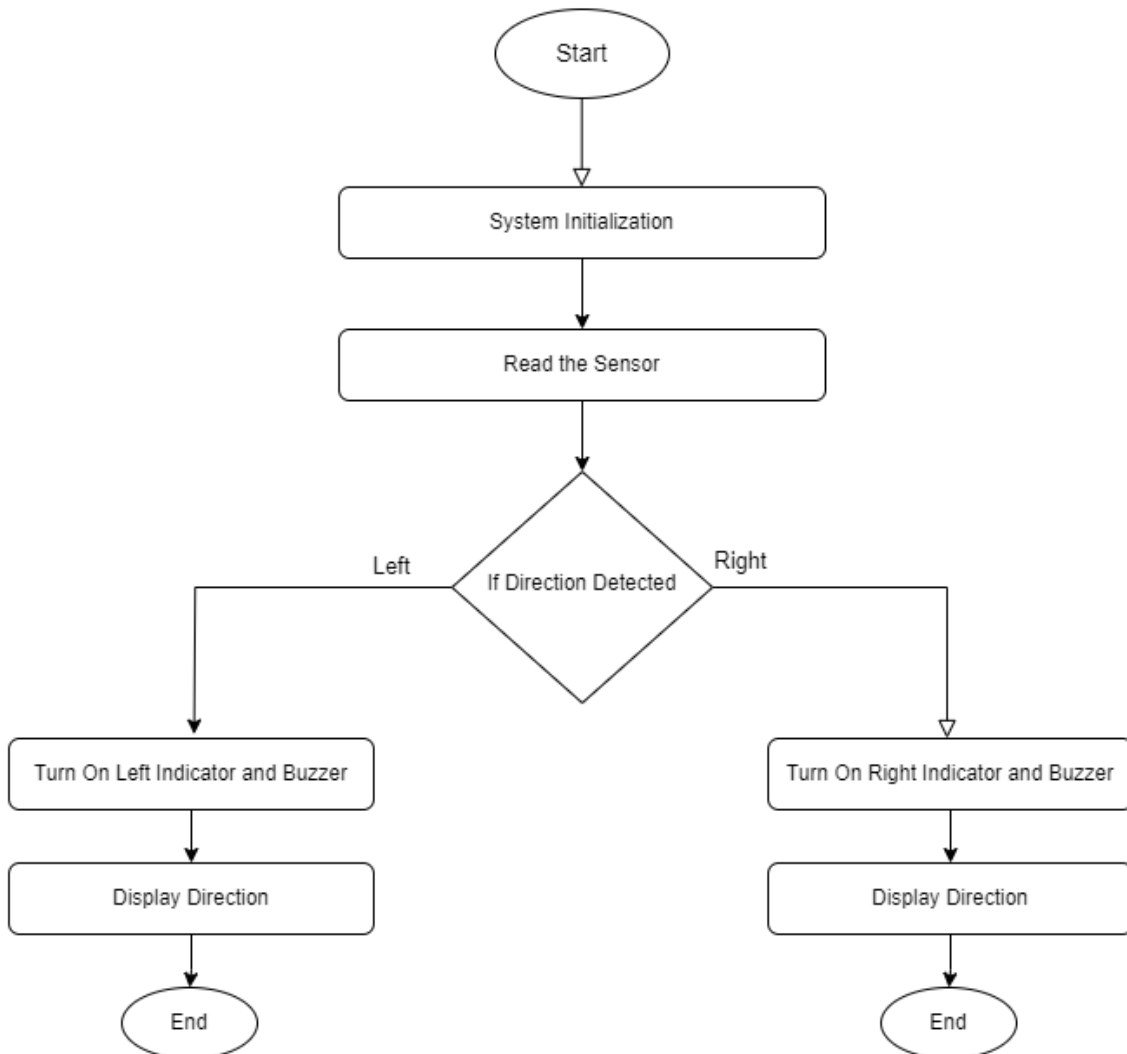
- ESP32 (any model with internet connectivity)
- Buck Converter (5v)
- Relay Module
- OLCD Display
- Buzzer for alerts
- Power supply for ESP32 and sensors
- ADXL 345 sensor
- Bike indicators
- Arduino ide

## V. PROPOSED SYSTEM

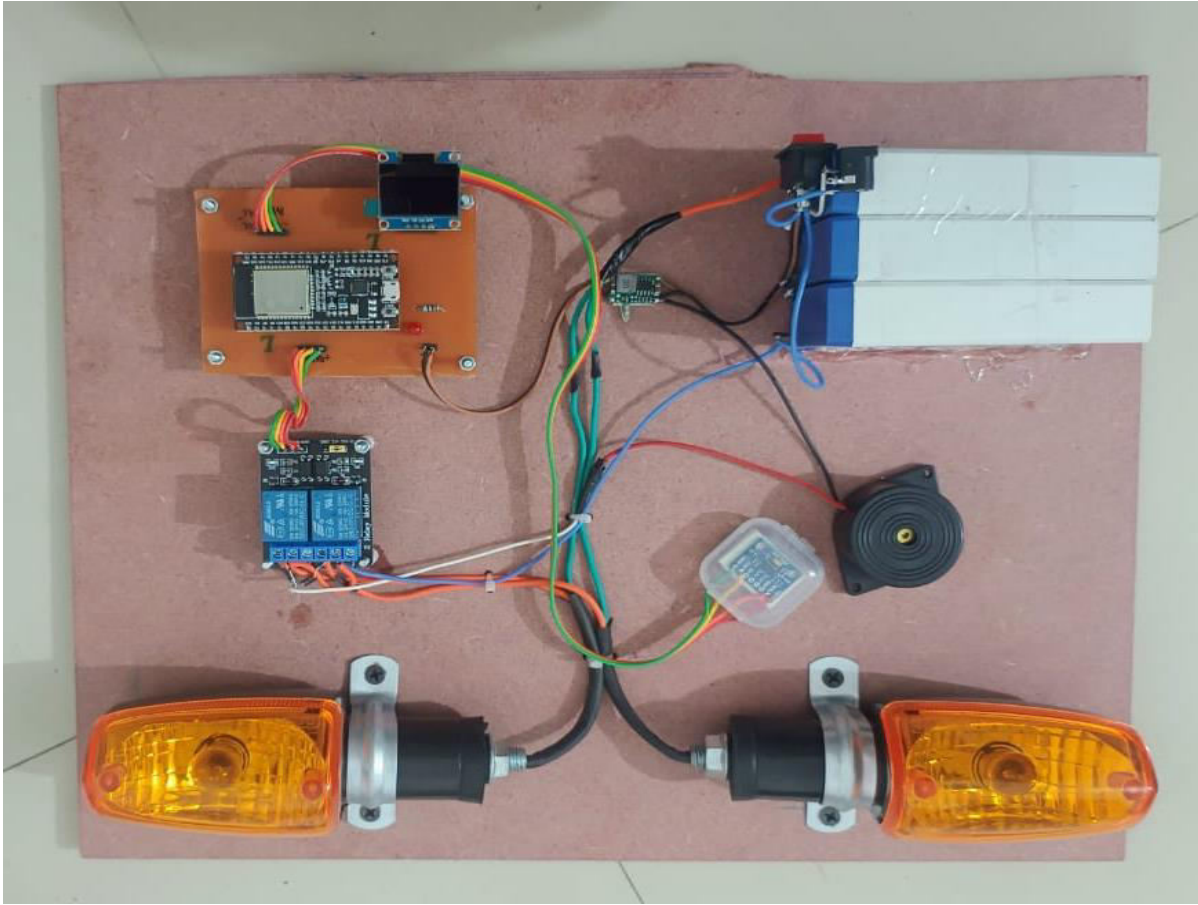


The relay uses the current supply for opening or closing switch contacts. Usually, this can be done through a coil to magnetize the switch contacts & drags them jointly once activated. A spring drives them separately once the coil is not strengthened. By using this system, there are mainly two benefits, the first one is, the required current for activating the relay is less as compared to the current used by relay contacts for switching. The other benefit is, both the contacts & the coil are isolated galvanic ally, which means there is no electrical connection among the

### VI.FLOWCHART



## VII.RESULTS



ADXL345 Accelerometer module consists of 8 pins. Using the ADXL345 module with a microcontroller is very easy. Connect VCC and GND pins to 5V and GND pins of Microcontroller. Also, connect SCL and SDA pins to the SCL and SDA pins of ESP 32. The basic structure of the accelerometer consists of fixed plates and moving plates. When the acceleration is applied on an axis capacitance between fixed plates and moving plates is changed. This results in a sensor output voltage amplitude, which is proportional to the acceleration.



RIGHT INDICATOR WILL BE ON





LEFT INDICATOR WILL BE ON

### **VIII.CONCLUSION**

In conclusion, the project "Advancing Roadway Safety through Intelligent Directional Vehicle Indicators" has successfully developed a robust system capable of providing accurate and timely directional indicators using an ESP32 controller and ADXL345 accelerometer. Through comprehensive testing and evaluation, the system has demonstrated its effectiveness in enhancing roadway safety by reducing the risk of accidents caused by signaling errors or ambiguity. While the system exhibits certain limitations, such as sensitivity to extreme conditions and vehicle dynamics, it represents the system holds promise for widespread adoption and has the potential to make a substantial impact on road safety.

### **ACKNOWLEDGMENT**

We are extremely modest in our expression of thanks. To sum up the invaluable assistance and encouragement we received from numerous people in a few sentences would be unfair. However, words are the only medium through which one may communicate their emotions, and my gratitude is completely beyond words. We would be proud to use this chance to express our gratitude.

We would first want to express our gratitude to our dear guide, Prof. Swati Khawate, for his invaluable advice, tolerance, and support. He was always there to push me a little bit further so that I could do the work correctly and on schedule. He has consistently allowed us the autonomy to complete our dissertations and the opportunity to work under her supervision.

We are grateful that the Department of Electronics and Telecommunication's Head, Dr. Saniya Ansari mam, and all of the staff allowed us to continue working on our research in the necessary college laboratories and to use the tools needed for it. My family's and friends' support and affection motivated me to finish this dissertation. I'm grateful to everyone!

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# AI Voice Command & Keypad Based Cocktail Making Machine Using Raspberry Pi

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**ABSTRACT:** The AI Voice Command & Keypad grounded Cocktail Making Machine using Raspberry Pi is designed for making touchless blend drinks without mortal interventions. The system utilizes a Raspberry Pi Pico along with detectors like IR, ultrasonic, flow cadence detector and Voice recognition module, pumps, motors. The main thing of this design is to set up an Automated blend Maker system that would admit an order to make a drink from the client using voice command and keypad interface. In moment's excited terrain, staying times are a significant factor. guests get irked and unhappy with the service at busy cafts, due to ineffective ordering and distribution.

**KEYWORDS:** AI (Artificial Intelligence), Raspberry Pi Pico, Sensors, Voice Recognition Module.

## I. INTRODUCTION

Currently, automated machines are in demand for they make multitudinous conditioning not only easier but also efficiently. These machines bear minimum mortal intervention to do its job. In utmost blend bars, the busiest person is generally the bartender since he's the one who mixes and prepares drinks for guests who are eager to have a drink. Due to time pressure and demands from the costumers, bartenders are prone to making miscalculations during the factual blend making process. The automated microcontroller grounded blend mixer and dispenser minimizes the need for bartenders to feed to the requirements of the guests. likewise, offering drinks in a disorganized manner from stock, performing in profit losses, is a common problem these days. The machine is stoner-friendly and is veritably simple to operate. The guests will only have to deal with pronounced buttons that indicate the kind of blend drink to be produced. With this, labour cost will be minimized and it'll also give bar possessors the occasion to attract further guests with this invention. They're designed as for placing in clubs and bars for acceleration and delicacy of drinks repatriation, or for using at homes to get a fine drink without any need to visit bar.

## II. AIM

I believe, that an automated cocktail mixer can eliminate several problems, appearing in nightclubs or just in cases of drinking alcohol. With such machine it is possible to serve more customers during a busy night. Such cocktail machine could be a showpiece, that attracts more customers, and finally, it is just convenient, as the electrical coffee machine [3]. We here develop a smart next generation cocktail maker machine that can doesn't have any buttons not a touch screen; it is simply operated by users voice command to make and serve from a menu of 20 cocktail drinks to the user.

## III. PROPOSED SYSTEM

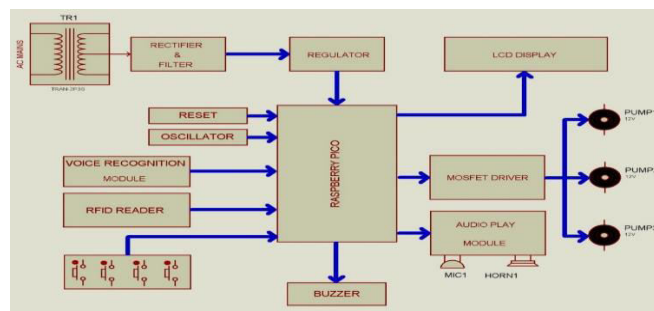


Fig.1 Block diagram of AI voice command & keypad-based cocktail making machine using Raspberry Pi.

- Circuit requires 5V and 12V regulated DC force. We used also 12V motor with remedy and sludge. Now the avoidance of capacitor is DC 12V-13.4 V according to motor conditions given to the circuit, which is demanded to convert in 5V regulated for microcontroller and other bias, also we have used LM7805 regulator for getting 5V regulated DC.
- RP2040 microcontroller chip designed by Raspberry Pi in the United Kingdom. double- core ARM Cortex- M0 processor, flexible timer running up to 133 MHz. 264kB of SRAM, and 2 MB of on- board flash storage. USB1.1 Host and Device support. 26 multifunction GPIO legs. 2 × SPI, 2 × I2C, 2 × UART, 3 × 12- bit ADC, 16 × controllable PWM channels.
- Accurate timer and timer on- chip. Voice recognition is a speaker-dependent module and supports up to 80 voice commands. Any sound could be trained as command. stoners need to train the module first before recognizing any voice command.
- Leg 2 RXD journal communication legs used to chapter with RFID. RFID has TXD leg for transmit data or commands serially. Microcontroller works with 5V DC and RFID may works with different force, our used modem works with 4.7 V, so this difference can't communicate serially. To break this problem we used position shifter IC MAX232 it shifts voltage situations and communicate between microcontroller and RFID.

#### IV. WORKING PRICIPLE

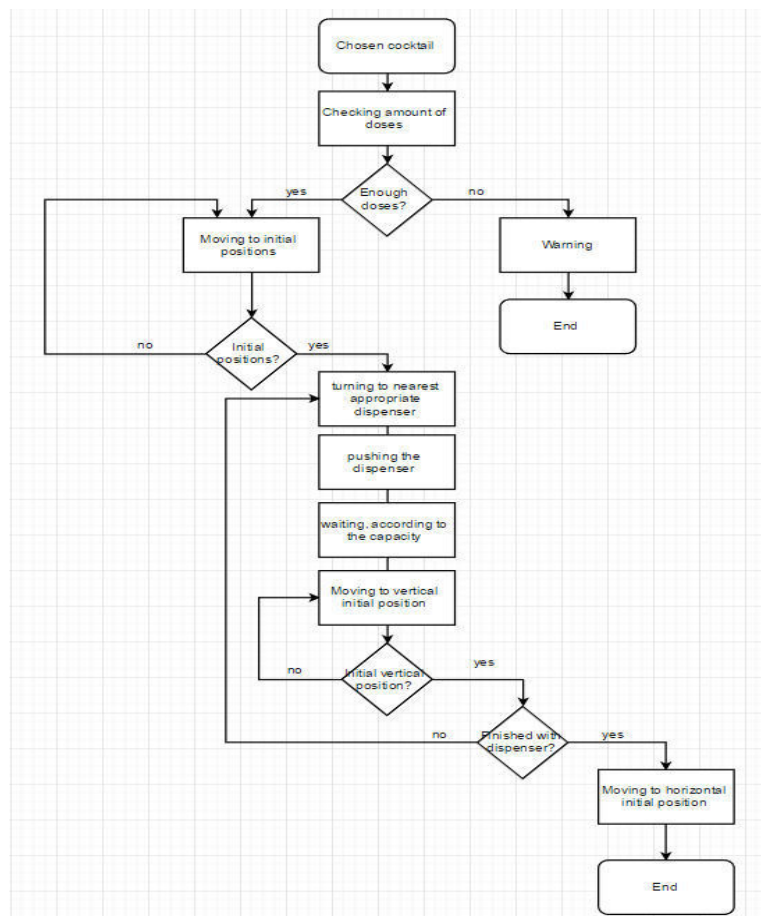


Fig.2 Flowchart of AI voice command & keypad-based cocktail making machine using Raspberry Pi [3].

Cocktail machine has to main working modes-loading mode and mixing. Loading mode is switched by the user with the help of touch screen, when there is a need to make any changes in beverage position and amount. This mode consists of three different variants of loadings [3]:

1. 'Refilling'. This mode is switched on, if there is a need to change empty flasks to the new ones. User chooses the hole of the flask to change on the touch screen, and sets the amount of spirit inside the bottle, if it is not full [3].

2. ‘Thematic’. In this mode cocktails are sorted in different themes, like ‘New Year’, ‘Beach party’, and so on. User chooses the theme, that is needed, and the cocktail machine specifies, which spirits with which dispensers should be placed in a certain hole [3].

3. ‘Everything we got’. According to the name, in this mode user simply adds in the cocktail machine every available drinks. After choosing the drink, machine gives a recommendation, which dispenser is suitable for this spirit. Finally, all cocktails, which are possible to mix, will be listed on a screen [3].

## V. METHODOLOGY

The AI Voice Command & Keypad based Cocktail Making Machine using Raspberry Pi Pico uses various hardware components.

### 1. RASPBERRY PI PICO

The Raspberry Pi Pico acts as microcontroller, performing as the processing unit for the system. It's powered by a 64-bit, quad-core Broadcom BCM2711 ARMv8 processor.

### 2. MOTOR DRIVER CIRCUIT (L293D IC Board)

L293D is a binary H- ground motor motorist integrated circuit (IC). DC motor drives are used for controlling the speed and direction of DC motors, these drives give the necessary inflexibility and control needed for different tasks in wide range of diligence.

### 3. IR DETECTOR

An IR detector can be employed for hand discovery by detecting infrared radiations emitted by the mortal body. The IR detector can smell the presence of movement of hands within its range.

### 4. SERVO MOTOR

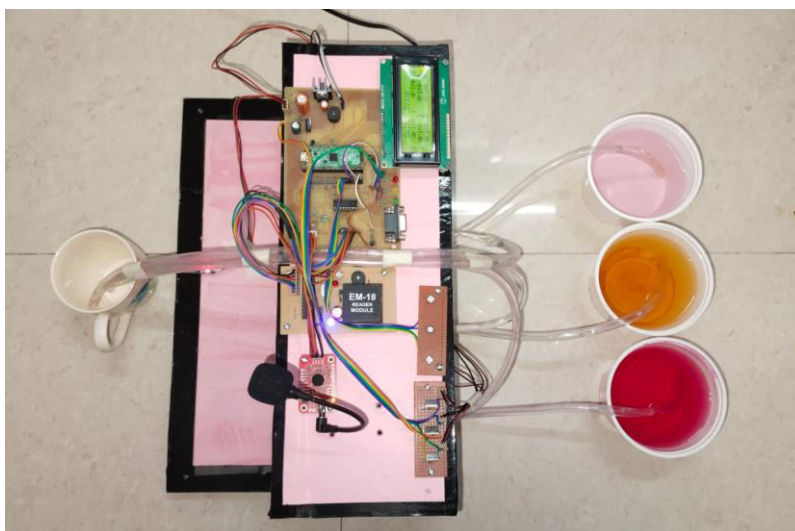
Servo motors are known as electronic bias and rotary or direct selector. Integrating servo motors into a blend making machine adds perfection and robotization, enabling harmonious and customizable libation medication.

### 5. VOICE RECOGNITION MODULE

Voice recognition module V3 is a voice recognition module that can be used in voice recognition. This module has the capability to accommodate a outside of 80 voice commands with a outside of 7 voice commands that can be used at the same time.

## VI. RESULT & DISCUSSION

### 1. Implementation of the Project



*Fig. 3 Implementation of Project*

2. Drink Recipes stored in system

Sr. No.	Drinks	No. of Drinks	Price
1	Red Drink	1	40/-
2	Yellow Drink	1	40/-
3	Water	1	40/-
4	Red + Yellow Drink	2	60/-
5	Yellow Drink + Water	2	60/-
6	Red Drink + water	2	60/-

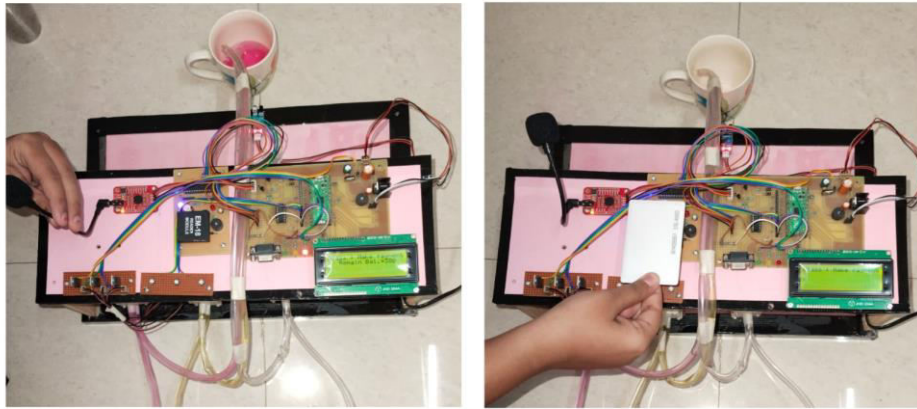
*Table.1 Drink recipes stored in system*

3. Outcomes of Drinks that stored in system



*Fig., 4 Outcomes of Drinks that stored in system*

#### 4. User interaction with voice and RFID cards.



*Fig.,5 User interaction with voice and RFID cards.*

### VII. CONCLUSION

In conclusion, creating an AI voice-controlled cocktail-making machine using a Raspberry Pi is a fascinating project that combines the worlds of technology and mixology. This project allows you to leverage the power of AI and Raspberry Pi to automate the process of crafting cocktails, making it a fun and innovative addition to your home or bar.

Through this project, you can explore various aspects of AI, machine learning, and IoT (Internet of Things) while also enhancing your knowledge of hardware and software integration. It provides a hands-on experience in building a practical and entertaining application for everyday use.

However, it's important to note that such a project may require a solid understanding of programming, electronics, and potentially even some mechanical engineering, depending on the complexity of the machine. Safety precautions must also be taken into account when dealing with alcoholic beverages and machinery. Additionally, it's crucial to comply with legal regulations regarding alcohol production and distribution.

### ACKNOWLEDGEMENT

First and foremost, we express our gratitude to the Electronics and Telecommunication Engineering Department Head for granting us the opportunity to work on the proposed system.

A sincere thank you goes to our guide for valuable advice and insightful recommendations, essential for undertaking this task, without which this suggested task would not have been pursued.

We appreciate our dedicated guide for encouragement, swift assistance, and guidance, enabling us to complete the assignment within the given timeframe.

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# Suraksha Sakhi: IoT Device For Women Safety

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**ABSTRACT:** The safety and security of women in today's society are paramount concerns, with incidents of harassment, violence, and discrimination still prevalent. In response to these challenges, there is a growing need to leverage innovative technologies to create safer environments for women. The Internet of Things (IoT) offers a promising solution to address this issue by enabling the development of smart and connected systems that can enhance women's safety in various aspects of their lives. This abstract provides an overview of a comprehensive approach to improving women's safety using IoT technology. It explores the key components and strategies involved in the implementation of IoT solutions, including wearable devices, smart infrastructure, and data analytics. These components can be integrated to create a network that enhances women's safety in both public and private spaces. The wearable devices, often in the form of smart jewellery or clothing, are equipped with sensors and connectivity features that allow users to send distress signals, record audio/video evidence, and share their location with trusted contacts or authorities in case of an emergency. These devices can also incorporate biometric authentication to ensure only the authorized user can trigger an alert. Innovative solutions are constantly sought to provide a safer environment for everyone. This has led to the development of a Smart Safety Device tailored for women, which utilizes IoT technology to enhance security and provide real-time assistance. This device is poised to empower women, giving them confidence in their daily lives by offering a suite of features that cater to their specific safety needs. The Smart Safety Device for Women using IoT is a revolutionary step towards addressing the pressing issue of women's safety. As we live in an increasingly interconnected world, the potential of IoT in enhancing security and providing immediate aid in distress situations cannot be overstated. The purpose of this device is to offer women a sense of security, both in their daily routines and during emergencies, by using an array of sensors, communication technology, and data analysis. This device is designed with the objective of providing real-time safety monitoring and support, effectively creating a virtual safety net that can be relied upon in times of need.

**KEYWORDS:** wearable devices, women's safety, discrimination, leverage innovative.

## I. INTRODUCTION

In recent years, the Internet of Things (IoT) has revolutionized the way we interact with our surroundings, enhancing our daily lives by connecting everyday objects to the internet and enabling them to communicate with each other. IoT has found applications in various fields, and one of the most crucial domains is personal safety, particularly for women. Safety remains a primary concern, and innovative solutions are constantly sought to provide a safer environment for everyone. This has led to the development of a Smart Safety Device tailored for women, which utilizes IoT technology to enhance security and provide real-time assistance. This device is poised to empower women, giving them confidence in their daily lives by offering a suite of features that cater to their specific safety needs. The Smart Safety Device for Women using IoT is a revolutionary step towards addressing the pressing issue of women's safety. As we live in an increasingly interconnected world, the potential of IoT in enhancing security and providing immediate aid in distress situations cannot be overstated. The purpose of this device is to offer women a sense of security, both in their daily routines and during emergencies, by using an array of sensors, communication technology, and data analysis. This device is designed with the objective of providing real-time safety monitoring and support, effectively creating a virtual safety net that can be relied upon in times of need.

## II. SYSTEM MODEL AND ASSUMPTIONS

The IoT device for women's safety combines several hardware components to provide a comprehensive safety solution. At its core is the A9G module, a versatile GSM/GPRS/GNSS module known for its communication capabilities and precise location tracking through the integrated GPS functionality. This module serves as the backbone for the device, enabling real-time communication with the cloud server and emergency contacts. Accompanying the A9G is the Xiao





C3 microcontroller, a compact yet powerful unit responsible for processing sensor data and managing the device's operations. The Xiao C3 ensures efficient handling of the accelerometer for detecting sudden movements or falls, the microphone for capturing distress sounds, and optional sensors like a heart rate sensor for monitoring stress levels. To power these functionalities, the device is equipped with a reliable battery, ensuring uninterrupted operation when worn by the user. The system model assumes a user profile of females aged 18 and above with a basic understanding of technology and smartphones. In terms of interaction, the wearable device, allowing users to manually trigger alerts scenarios. This comprehensive system model aims to empower women with a reliable, user-friendly IoT device that prioritizes safety and peace of mind in various every day and emergency situations.

### **III. EFFICIENT COMMUNICATION**

Efficient communication within the smart safety device for women is facilitated through a combination of real-time monitoring, immediate alerts, and two-way communication capabilities. By integrating sensors to detect various safety parameters such as location, movement, sound, and distress signals, the device ensures prompt detection of potential threats or emergencies. In case of an incident, the A9G module is configured to send immediate alerts, leveraging GSM/GPRS connectivity to notify predefined contacts or emergency services via SMS, calls, or app notifications. The inclusion of GPS capabilities allows for accurate location tracking, which accompanies the alerts to ensure swift response and assistance. Moreover, the device enables two-way communication, empowering users to convey their situation or needs directly to responders or contacts, thereby facilitating quick and effective assistance. Through optimization for low power consumption and a user-friendly interface, the device ensures prolonged battery life and easy triggering of alerts, even in stressful situations. Robust security measures safeguard user data and privacy, while integration with companion mobile apps enhances remote monitoring, configuration, and historical data analysis. By prioritizing these aspects, the smart safety device not only provides efficient communication but also significantly enhances the overall safety and security of women in diverse scenarios

### **IV. WORKING PRINCIPLE**

The working principle of a Smart Safety Device for Women using IoT involves the integration of various sensors, communication modules, and intelligent algorithms to ensure real-time monitoring, accurate location tracking .

- **Sensors Integration:** The device incorporates various sensors such as GPS for location tracking, accelerometer for detecting sudden movements or falls, and possibly additional sensors for environmental monitoring. Cameras and microphones may be included for audio-visual surveillance.
- **Data Collection:** Sensors continuously collect data related to the user's location, movements, and environmental conditions. The collected data is processed within the device to extract relevant information.
- **Connectivity:** The device is equipped with IoT connectivity modules (e.g., Wi-Fi, Bluetooth, or cellular networks) to establish a connection with other devices and central servers. The device uses these connectivity options to transmit data in real-time to a centralized server or a designated cloud platform.
- **Real-time Monitoring:** The server continuously monitors the user's location, activities, and surroundings in real-time. Risk assessment algorithms may analyze the data to identify potential threats or emergencies.
- **Emergency Trigger:** The device features a panic button or gesture-based trigger that, when activated by the user, sends an immediate alert to the server.
- The emergency trigger may also activate additional features such as audio-visual recording.
- **Communication protocols:** The server communicates with the user's mobile application and predefined emergency contacts using secure communication protocols. Emergency alerts are sent through SMS, push notifications, or other communication channels to notify relevant parties.

### **V. RESULT AND DISCUSSION**

- The project provides a way for women to send out distress signals quickly, through manual activation (panic button) of unsafe situations.
- With the GPS module, the system can track the user's location. This information can be crucial for locating and assisting the user in emergencies.
- Designated contacts and authorities will receive alerts in real-time, allowing them to respond promptly to ensure the user's safety.

- Women will have an added layer of protection and security when they carry the device. The system can automatically detect emergencies, ensuring rapid response and assistance.

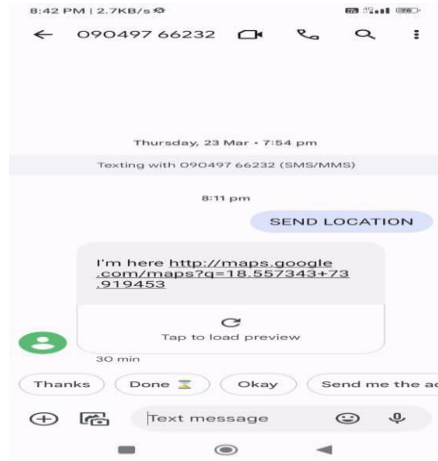


Fig. 1 Message response

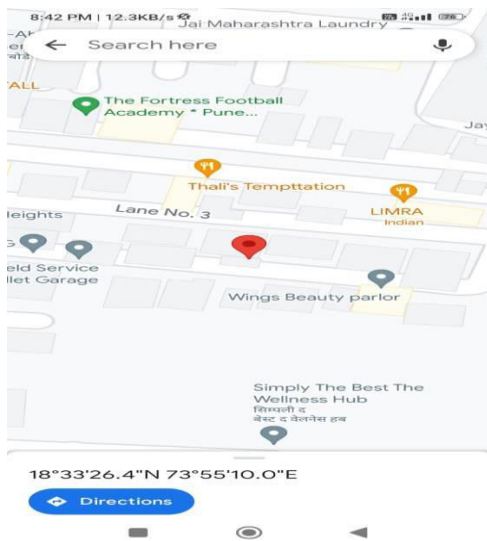


Fig. 2 Location Received from Message



Fig. 3 Call received by Father

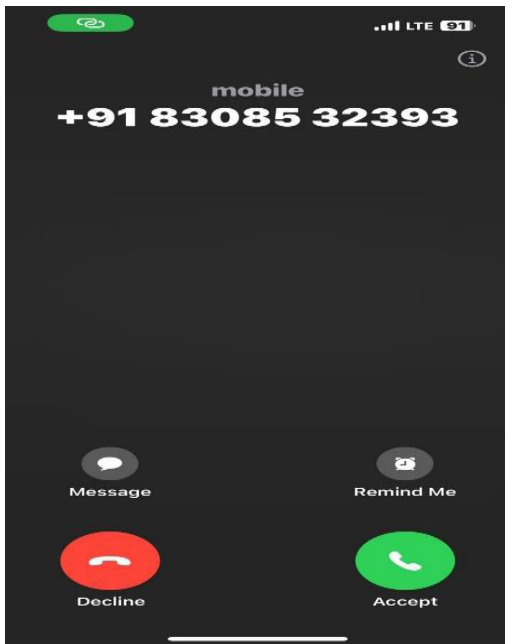


Fig .4 Call received by police

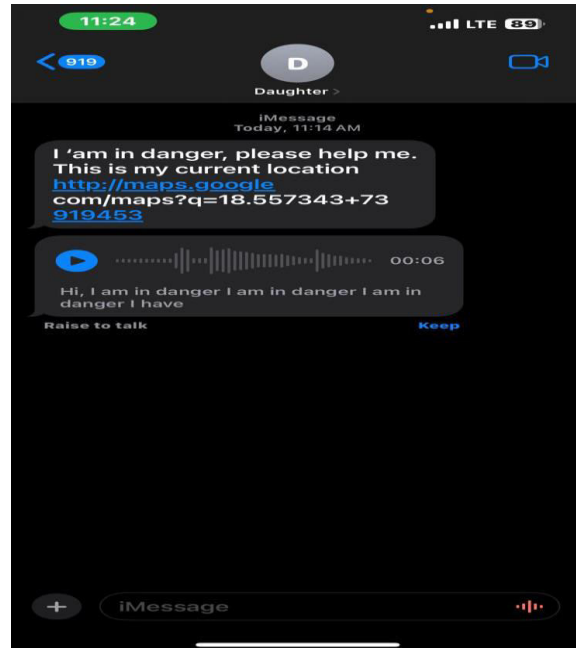


Fig .5 Audio Recording received by father

## VI. CONCLUSION

In conclusion, the Smart Safety Device for Women using IoT stands as a valuable solution to address the critical issue of women's safety. Its multifaceted features empower women with heightened security, allowing them to navigate their lives with confidence and peace of mind. While challenges exist, the benefits of enhanced safety, privacy measures, and user-friendliness make this device a significant step toward a safer world for women, proving the potential of IoT technology in addressing pressing societal concerns.

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# A Comprehensive Survey of Plant Disease Detection Using Machine Learning and Deep Learning

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**ABSTRACT:** In the realm of agriculture, the advent of advanced technologies has sparked a paradigm shift in crop management strategies. Among these innovations stands the "AI-Based Plant Disease Classification System," a pioneering tool harnessing the prowess of deep learning and artificial intelligence. This system heralds a new era in agricultural practices by enabling automatic identification and categorization of plant diseases with unprecedented accuracy and efficiency.

Through its sophisticated algorithms and vast datasets, this technology transcends traditional methods, offering farmers and agronomists a powerful means to diagnose and mitigate crop ailments promptly. By leveraging machine learning models, the system not only detects diseases but also predicts their spread, providing invaluable insights for preemptive measures.

Moreover, the AI-based approach obviates the need for extensive manual labor and subjective assessments, thereby streamlining agricultural operations and reducing human error. Its scalability and adaptability empower farmers worldwide, irrespective of their technological acumen, to adopt sustainable farming practices and optimize crop yields. This paper explores the multifaceted implications of integrating AI into plant disease classification, delving into its potential to revolutionize agricultural landscapes. By facilitating early disease detection and precise intervention, the system holds the promise of bolstering food security, minimizing resource wastage, and fostering environmentally sustainable farming practices.

Furthermore, the societal implications of such technological advancements are profound, as they pave the way for inclusive agricultural development and empowerment of rural communities. However, challenges such as data privacy, model robustness, and equitable access must be addressed to realize the full potential of this transformative tool.

**KEYWORDS:** Disease Classification, Revolutionize agriculture, OpenCv, Model Robustness, crop ailment.

## I. INTRODUCTION

The backbone of human civilization, agriculture, faces a constant battle against a multitude of threats. One of the most significant *challenges* lies in the early and accurate detection of plant diseases. Traditionally, this burden has fallen on the shoulders of farmers and agricultural experts who rely on visual inspection. While this method boasts a rich history, it suffers from inherent limitations. Time-consuming subjective, and susceptible to human error, visual inspection can lead to missed diagnoses, delayed treatment, and ultimately, devastating consequences for crop yields and global food security.

The dawn of artificial intelligence (AI) and deep learning ushers in a new era for agriculture, offering a revolutionary solution to this longstanding challenge. This research paper delves into the development of an "AI-Based Plant Disease Classification System." This cutting-edge tool leverages the power of deep learning algorithms to automatically identify and categorize plant diseases with exceptional accuracy. Imagine a future where farmers, armed with this innovative technology, can instantly analyze their crops, receive precise diagnoses, and implement targeted treatment strategies – all within a matter of seconds.

This paradigm shift has the potential to revolutionize agricultural practices. By empowering farmers with the ability to rapidly detect and address crop health concerns, this AI-based system promises significant benefits. Early and accurate disease identification translates to timely intervention, minimizing crop damage and maximizing yields. Furthermore, by facilitating targeted treatments, this technology reduces reliance on broad-spectrum pesticides, promoting sustainable agricultural practices and safeguarding the environment.



The ramifications of this research extend far beyond individual farms. In a world facing a growing population and a changing climate, ensuring food security has never been more critical. By contributing to higher crop yields and promoting sustainable agricultural methods, this AI-based system plays a vital role in ensuring a stable and secure food supply for future generations.

## II. LITERATURE REVIEW

A growing body of research explores deep learning techniques for plant disease classification using image analysis. Ferentinos et al. [2018] compared various Convolutional Neural Network (CNN) architectures like VGG, ResNet, and Inception for disease detection and diagnosis [1].

This paper shows minimal effort shading sensors for checking plant development in a research facility. A mechanized framework for estimating plant leaf shading is created to check plant wellbeing status [2] by introducing minimal effort shading sensors for checking plant development in a research center. A computerized framework for estimating plant leaf shading is created to check plant wellbeing status [3]. This paper have exhibited novel calculation for division and programmed distinguishing proof of vermin on plants utilizing picture handling. The proposed system includes decreased computational intricacy and goes for irritation recognition in a nursery domain as well as in a ranch situation too. The whitefly, a bio-assailant which represents a danger to a huge number of yields, was picked as the nuisance of enthusiasm for this paper. The calculation was tried for a few whiteflies influencing various leaves and a precision of 96% of whitefly identification was accomplished. We have exhibited irritation control in rural ranches utilizing picture preparing strategies in MATLAB. Pictures are then exposed to pre-handling, change and bunching [4]. This paper has exhibited IoT Implementation for remote checking of agrarian parameters. Remote framework is created to screen natural conditions in horticulture field like temperature, soil pH, soil wet level and stickiness adjacent to leaf sicknesses discovery [5]. We have introduced small scale controller based auto-water system and nuisance recognition utilizing picture handling. A technique for picture examination can widely connected to farming learning for stretch most extreme security of plants which can at last lead to all the more likely yield the executives and generation [6]. Plant diseases and creepy crawly vermin have transformed difficulty by way of which foundation substantial decrease of equally superiority and amount for crop items [7]. In this research we have introduced plan and advancement of vermin observing framework for actualizing exactness agribusiness utilizing IoT. Pakistan the greater part of the rancher develop sugarcane yet did not get yielding because of bugs and hatchlings in sugarcane. In this proposed structure framework utilized arduino for checking the clamor and temperature [8]. This paper has exhibited arduino based vermin control utilizing constant ecological observing sensors. This paper endeavors to build up a robot fit for performing task of apportioning nuisance control specialists, deterrent shirking for self-direction on the field with no client impedance and make a sterile situation for the ideal development of the harvests in a continuous checked shut condition [9]. This paper has displayed a genuine nature sensor and reasonable assessment calculation for plant acknowledgment. The framework created depends on free and programmable real nature sensors for constant acknowledgment and distinguishing proof of individual weed and harvest plants utilizing numerical calculations and choice models [10]. This research has introduced apple leaf sickness distinguishing proof utilizing hereditary calculation and connection based element determination strategy. A shading change construction of information RGB picture remained planned right off the bat and after that RGB structure has been changed over to HSI. YUV as well as dim structure. Foundation has evacuated and afterward the illness spot picture was sectioned with district developing calculation (RGA). At last, the sicknesses were perceived by SVM classifier [11]. The brisk progression of new advances and the changing scene of the online world. Web of Things (IoT), Internet of All, cloud-based plans) give a novel opportunity to making modernized and mechanical.

## III. METHODOLOGY

This section outlines the technical approach undertaken to develop the AI-based plant disease classification system. Here, we detail the sequential steps involved in:

- Preprocessing the image dataset
- Designing and training the Convolutional Neural Network (CNN) model
- Deploying the trained model for real-time inference

### Data Preprocessing

The methodology commences with data preprocessing. The dataset, containing approximately 61,000 images of plant leaves, is prepared for training the CNN model. This process involves:

1. Resizing: Images are resized to a standard resolution, typically 256x256 pixels, ensuring uniformity for model processing.

2.Data Augmentation: To enhance the model's ability to generalize to unseen data, data augmentation techniques are employed. This might involve operations like shearing, zooming, and horizontal flipping, introducing slight variations to the original images.

3.Dataset Splitting: The preprocessed dataset is then divided into two sets: a training set used to train the model and a validation set used to evaluate its performance on unseen data.

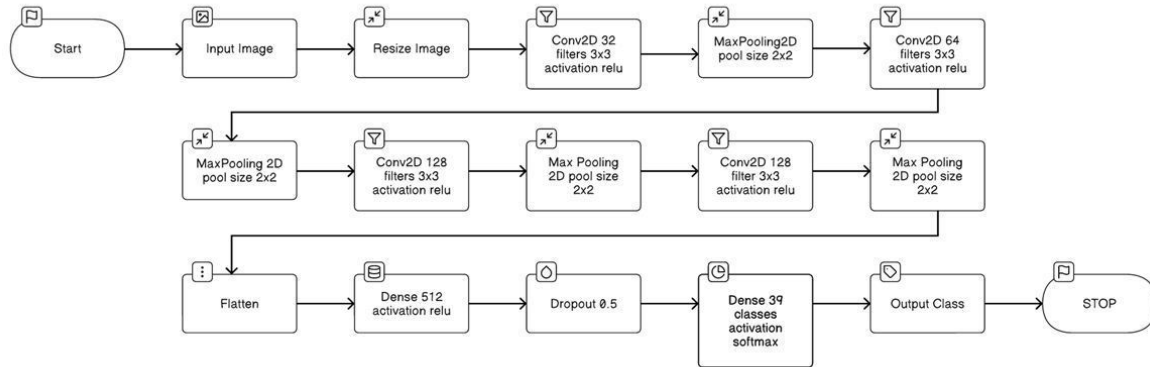


Fig 1: Flow Chart The model flowchart illustrates the sequential steps involved in preprocessing the dataset, designing and training the convolutional neural network (CNN) model, and deploying the model for inference.

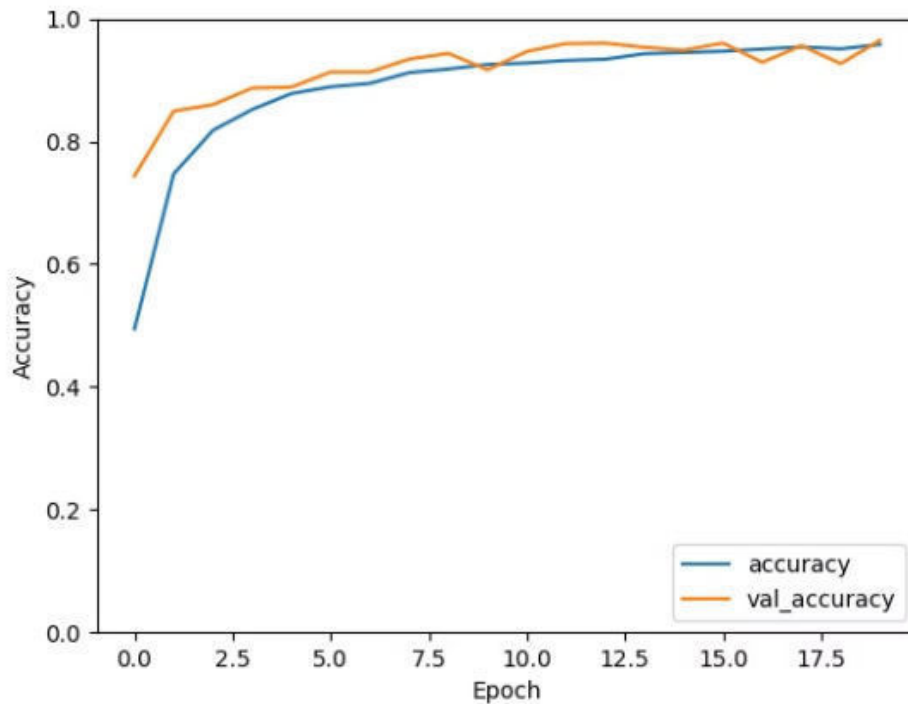
#### IV. RESULTS AND DISCUSSION

The proposed plant disease classification model was implemented successfully, with promising results. The model scored 96.44% accuracy on the validation dataset, demonstrating its ability to effectively diagnose numerous plant diseases. The precision and recall scores across various disease classes revealed the model's ability to distinguish between distinct disease types. Furthermore, the confusion matrix indicated few misclassifications, demonstrating the model's capacity to generalize effectively to new data.

Discussion of the model's performance indicates that the use of Convolutional Neural Networks (CNNs) was critical in extracting detailed information from plant photos, allowing the model to detect minor patterns associated with various diseases. Furthermore, data augmentation approaches used during training reduced overfitting and improved the model's generalizability.

However, during model building, issues such as data imbalance between disease classifications and variability in image quality among datasets arose. Oversampling minority classes and preprocessing approaches to standardize image quality were among the strategies used to solve these difficulties.

Overall, the results demonstrate the efficacy of the developed model in accurately diagnosing plant diseases, laying the foundation for its practical application in agricultural settings. Further refinements and optimizations can potentially enhance the model's performance and applicability in real-world scenarios.



## V. CONCLUSION

The development of this AI-based plant disease categorization system signifies a major leap forward in agricultural technology. Its efficiency, accuracy, and successful implementation highlight its potential to empower farmers, enhance crop yields, and bolster global food security. Beyond immediate benefits, this research lays the groundwork for even more sophisticated disease management tools. Future advancements could integrate real-time field data and broaden the system's scope to encompass a wider range of crops and diseases. Through continued research and collaboration, AI-powered plant disease classification systems hold immense promise for fostering sustainable agricultural practices and mitigating threats to our global food supply.

This document presents a summary of various research works to automate the plant disease classification and identification system using computer vision and machine learning techniques. The efficient and automated system for plant disease detection is highly desired in India to overcome agriculture losses. The survey presents several well-acceptable techniques used for image acquisition, preprocessing module, approaches for lesion segmentation, feature extraction, and finally the classifiers. Various difficulties during feature extraction module have also been summarized. In addition, the limitation of existing systems has also been discussed with a vision to improve efficiency without compromising the present tools. This survey also presents various computer vision techniques highly accepted by several researchers in this domain and provides a demonstration of research in forthcoming time. The following are some points which would help the researchers in enhancing the performance of the state-of-the-art systems.

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