EAST POINT
COLLEGE OF ENGINEERING & TECHNOLOGY

JnanaPrabha Campus, Virgonagar Post, Avalahalli,Bangalore-560049
Accreditated by National Board Of Accreditation CSE,ECE & ISE

Department of
Electronics & Communication Engineering

NGIEC -2023

**National Conference on Next Generation Intelligence in
Electronics & Communication Engineering
16th June, 2023**

GENERAL CHAIR

DR YOGESH G S
HOD & PRINCIPAL,EPCET

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NGIEC 2023

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National Conference
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Next Generation Intelligence in Electronics and
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Bengaluru| Karnataka | India

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**Dedicated to our
Beloved
Honorable
Founder Chairman**

**Late Dr. S.M. Venkatpathi
Hon. Founder Chairman ,EPGI
Bengaluru (1955-2017)**

EAST POINT COLLEGE OF ENGINEERING & TECHNOLOGY

Smt.B.L Ramadevi Venkatpathi

Chairperson,
East Point Group of Institutions, Bengaluru,
Karnataka, India

It is indeed our pleasure and privilege to host the National Conference on "Next Generation Intelligence in Electronics and Communication Engineering" (NGIEC) on 16th June 2023 at EPCET, Bangalore.

This conference provides a platform which brings Academicians and Research Scholars from across the country under one platform to discuss about their latest research ideas, results, potential applications in the areas of Electronics & Communication Engineering, Electrical & Electronics Engineering.

I extend my best wishes to entire organizing team and committee members in bringing out this proceeding on the occasion of the National conference. I extend my greetings and best wishes to all the participants and wish this conference a grand success.

B L Ramadevi Venkatapathi

EAST POINT COLLEGE OF ENGINEERING & TECHNOLOGY

Sri. S. V Pramod Gowda

CEO,
East Point Group of Institutions, Bengaluru, Karnataka, India

It is a great pride to host the National Conference on "Next Generation Intelligence in Electronics and Communication Engineering" (NGIEC) on 16th June 2023 at EPCET, Bengaluru.

The emerging technologies are the key to future socio-economic growth of any developing country and today's challenge is to build cost effective solutions using recent technological developments.

This conference offers a platform for Research scholars, Faculty and Students from across the country to present and discuss their latest research ideas which will go a long way in enriching the knowledge to generate new ideas and solutions for the upcoming challenges.

I wish the participants of this conference to come out with new inventions and innovative ideas which will contribute for the advancement of global technology. I wish all the success to the conference.

S V Pramod Gowda

EAST POINT | COLLEGE OF ENGINEERING & TECHNOLOGY

Sri. S. V Rajiv Gowda

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S V Rajiv Gowda

EAST POINT COLLEGE OF ENGINEERING & TECHNOLOGY

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Senior Vice President,
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The Conference provides an open forum for scientists, Researchers and Engineers to exchange the information on innovations and research advancements in the areas of Electronics and Communication Engineering, I hope that this conference will go a long way in enriching the knowledge and it will generate new ideas among the Researchers.

I appreciate the efforts and dedication of the organizing committee for organizing this Conference and I hope the deliberations would benefit all the students and faculty.

I wish this conference a great success

D R   P R A K A S H   S

EAST POINT COLLEGE OF ENGINEERING & TECHNOLOGY

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Principal & HOD ECE,
East Point College of Engineering & Technology,
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DR YOGESH G S

DEPARTMENT VISION

The Department aspires to be a center of excellence in Electronics and Communication Engineering to develop competent and ethical professionals through holistic development.

DEPARTMENT MISSION

- To impart quality education and provide a conducive environment for innovation and Research.
- To develop skills to meet scientific, technological, and socio- economic needs.
- To inculcate professional ethics, teamwork, leadership qualities, and lifelong learning.

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DISCLAIMERS

SPEED CONTROL OF DC MOTOR USING PID CONTROLLER

Mr. Avinash B C
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Abstract— The paper describes about the concept of DC motor and Speed control separately excited DC motor. Motor speed is controlled with PID controller and first system is checked without controller on loaded and unloaded condition then add PID controller and system is tuned using its existing tuning methods. After it system is further tuned in order to get desired value with less steady state error And then the result is discussed. This paper describes about the basic concepts of Fuzzy Set and Fuzzy Logic, the speed control with the help of Fuzzy controller. Fuzzy controller provides better control strategies than other controllers. Optimization of Fuzzy controller with Simulink model describes in this paper and a new way for faster response and smooth output. The comparison of these two controllers' results is also showed. From the results it is proved that Fuzzy Controller is the best controller. Finally the MATLAB Simulation is discussed.

I.   Introduction

There are many different DC motor types in the market and all with it good and bad attributes. One such bad attribute is the lag of efficiency. In order to overcome this problem a controller is introduced to the system. There are also many types of controllers used in the industry, one such controller is PID controller. PID controller or proportional–integral– derivative controller is a generic control loop feedback mechanism widely used in industrial control systems. A PID controller attempts to correct the error between a measured process variable and a desired set point by calculating and then outputting a corrective action that can adjust the process accordingly. So by integrating the PID controller to the DC
motor we will be able to correct the error made by the DC motor and control the position of the motor to the desired speed or point. Electronic analog controllers can be made from a solid-state or tube amplifier, a capacitor and a resistance. Electronic analog PID control loops were often found within more complex electronic systems. However, nowadays, electronic controllers have largely been replaced by digital controllers implemented with microcontrollers or FPGAs. In this project, PID controller is chosen as the controller for the DC motor. This is because PID controller helps get the output, where we want it in a short time, with minimal overshoot and little error. DC (Direct Current) Motors are two wire (power & ground), continuous rotation motors. When the
supply power is provided, a DC motor will start spinning until that power is removed. Most DC motors run at a high RPM (revolutions per minute), examples being computer cooling fans, or radio controlled car wheels. The speed of DC motors is controlled using pulse width modulation (PWM), a technique of rapidly pulsing the power on and off. The percentage of time spent cycling the on/off ratio determines the speed of the motor, e.g. if the power is cycled at 50% (half on, half off), then the motor will spin at half the speed of 100% (fully on). Each pulse is so rapid that the motor appears to be continuously spinning. A control system is an interconnection of components forming a system configuration that will provide a desired system response. DC Motor will be interfaced with Visual Studio using ATmega 8A Microcontroller. The role of Microcontroller is to pass the set speed to the DC motor using the PWM pins and to get the data (speed) from the motor using the IR sensor through Interrupt.

II.   Block Diagram

The Speed control of a motor is frequently required in industrial applications, robotics, home appliances, etc. In this report, we have implemented a DC motor speed control system. The idea of a speed control system is to maintain the speed of the motor at the desired value under various condition. In practice, the

DC motor is a nonlinear device and its speed varies because of change in load demand, disturbances,etc. We have implemented the PID controller algorithm which is a popular controller in industries. The block diagram of a DC motor speed control system is shown in figure. The motor speed is sensed by an optical switch and converted to feedback voltage. It is compared with the reference signal (i.e. desired speed) by the error detector. The PID controller acts on the error signal and generates appropriate control voltage.
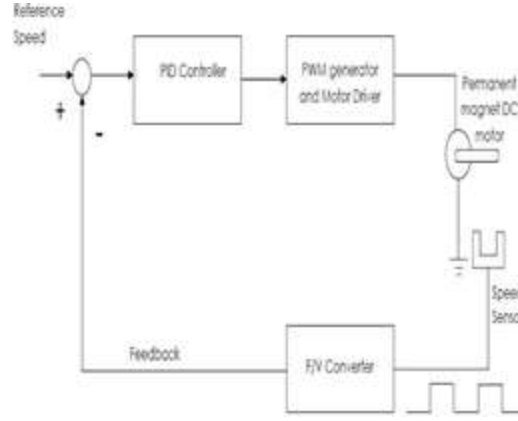

Figure.1. The PWM generator block than

supply power is provided, a DC motor will start spinning until that power is removed. Most DC motors run at a high RPM (revolutions per minute), examples being computer cooling fans, or radio controlled car wheels. The speed of DC motors is controlled using pulse width modulation (PWM), a technique of rapidly pulsing the power on and off. The percentage of time spent cycling the on/off ratio determines the speed of the motor, e.g. if the power is cycled at 50% (half on, half off), then the motor will spin at half the speed of 100% (fully on). Each pulse is so rapid that the motor appears to be continuously spinning. A control system is an interconnection of components forming a system configuration that will provide a desired system response. DC Motor will be interfaced with Visual Studio using ATmega 8A Microcontroller. The role of Microcontroller is to pass the set speed to the DC motor using the PWM pins and to get the data (speed) from the motor using the IR sensor through Interrupt. bvaries the duty cycle of the voltage supplied to the motor to control its speed.

III.   DC MOTOR SPECIFICATIONS

The speed control system was implemented for a Permanent Magnet DC Motor(PMDC). The PMDC consists of rotor or armature and a stator, which is a permanent magnet. There are two ways of speed control for a DC motor, bField Control In this method, the field current or current through stator is varied to control the speed of the motor. vArmature Control In this method, the armature voltage is varied to control the speed of the motor. For the PMDC, a constant field is generated by a permanent magnet and hence we decided to implement Armature control. To control the armature voltage we are generating a Pulse-Width Modulated (PWM) waveform to control the average voltage applied to the motor. The details of the PWM implementation are given in section.

ARDUINO UNO

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your Uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for

the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards

Each of the 14 digital pins and 6 analog pins on the Uno can be used as an input or output, under software control using pinMode, digitalWrite, and digitalRead functions. They operate at 5 volts. Each pin can provide or receive 20 mA as the recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50K ohm. A maximum of 40mA must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5; each provides 10 bits of resolution (i.e. 1024 different values). By default, they measure from ground to 5 volts, though it is possible to change the upper end of the range using the AREF pin and the analog Reference function

L298N MOTOR DRIVE CONTROLLER

The L298N is a dual-channel H-Bridge motor driver capable of driving a pair of DC motors. That means it can individually drive up to two motors making it ideal for building two-wheel robot platformsThe L298N motor driver module is powered through 3-pin 3.5mm-pitch screw terminals. It consists of pins for motor power supply(Vs), ground and 5V logic power supply(Vss).

The module has an on-board 78M05 5V regulator from STMicroelectronics. It can be enabled or disabled through a jumper.When this jumper is in place, the 5V regulator is enabled, supplying logic power supply(Vss) from the motor power supply(Vs). In this case, 5V input terminal acts as an output pin and delivers 5V 0.5A. You can use it to power up the Arduino or other circuitry that requires 5V power supply.When the jumper is removed, the 5V regulator gets disabled and we

have to supply 5 Volts separately through 5 Volt input terminal. The voltage drop of the L298N motor driver is about 2V. This is due to the internal voltage drop in the switching transistors in the H- Bridge circuit. So, if we connect 12V to the motor power supply terminal, the motors will receive voltage around 10V. This means that a 12V DC motor will never spin at its maximum speed The L298N motor driver's output channels for themotor A and B are broken out to the edge of the module with two 3.5mm-pitch screw terminals. You can connect two DC motors having voltages between 5 to 35V to these terminals

MICROSOFT VISUAL STUDIO

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs, as well as websites, web apps, web services and mobile apps. Visual Studio uses Microsoft   software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silverlight. It can produce both native code and managed code.

Visual Studio includes a code editor supporting IntelliSense (the code completion component) as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger. Other built-in tools include a code profiler, designer for   building GUI applications, web designer, class designer, and database schema designer. It accepts plug-ins that expand the functionality at almost every level— including adding support for source control systems (like Subversion and Git) and adding new toolsets like editors and visual designers for domain-specific languages or toolsets for other aspects of the software development lifecycle (like the Azure DevOps client: Team Explorer).

Visual Studio supports 36 different programming languages and allows the code editor and debugger to support (to varying degrees) nearly any programming language, provided a language- specific service exists. Built-in languages include C,C++, C++/CLI, Visual Basic..NET, C#, F#

JavaScript, TypeScript, XML, XSLT, HTML, and CSS. Support for other languages such as Python, Ruby, Node.js, and M among others is available via plug- ins. Java (and J#) were supported in the past.

The most basic edition of Visual Studio, the Community edition, is available free of charge. The slogan for Visual Studio Community edition is "Free, fully-featured IDE for students, open- source and individual

developers".The latest production- ready Visual Studio version is 2019, with older versions such as 2012 and 2013 on Extended Support, and 2015 and 2017 on Mainstream Support

ADVANTAGES

1.Easy to implement.

2.Uses low resources

3.Robust to tuning mismatches.

4.Easy to tune by simple trial and error.

DISADVANTAGES

•Low performance in processes with long deadtime.

•Low performance to handle strong non – linearities.

• Difficulty to handle multiple variables with strong interaction.

FUTURE SCOPE

MATLAB simulation for speed control of DC motor has been done which can be implemented in hardware to observe actual feasibility of the approach applied in this thesis. This technique can be extended to other types of motors. The parameters of PID controller can also be tuned by using genetic algorithm (GA).

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IOT & AI BASED CROP PROTECTION SYSTEM

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Abstract- This paper describes an Internet of Things (IoT) application for crop protection that aims to prevent animal intrusions and optimize water usage in agriculture. The system uses microcontrollers and sensors to monitor the moisture content, temperature, and humidity of the soil, and alerts the farmer when an unauthorized entry is detected using PIR sensors. The IoT technology enables remote monitoring from anywhere in the world and helps to reduce manpower, physical monitoring, and increase crop yield. Additionally, the IoT application for crop protection includes an AI algorithm that can differentiate between animal and human intruders using image recognition technology. When a human is detected, the system sends a higher priority alert to the farmer and authorities, while animal intrusions trigger a lower priority alert. This feature enhances the security of the crop fields and provides farmers with more accurate information to take appropriate actions.

Keywords – IoT, AI, PIR, Remote monitoring, Image Recognition

I. INTRODUCTION

IoT (Internet of Things) has revolutionized the way we interact with the physical world around us. One of the areas where IoT has a significant impact is agriculture, where it can be used to monitor and protect crops, increase yield, and improve overall productivity. Smart crop protection systems based on IoT technology have the potential to significantly reduce losses due to pests, diseases, and other factors.

In addition to crop protection, IoT-based systems can also be used for fire detection and suppression in agricultural areas. These systems can be equipped with sensors to detect smoke, heat, and other indicators of a fire. They can then trigger a water sprinkler system to control the spread of the fire.

The combination of smart crop protection and fire detection with a water sprinkler system can provide farmers with a comprehensive solution for protective their crops and property. By utilizing IoT technology, these system can be monitored and controlled remotely, allowing farmers to

make real-time decisions and take appropriate action to protect their crops and property from any potential threats.

ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is a broad branch of computer science that is focused on a machine's capability to produce rational behavior from external inputs.

Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition and machine vision. The technologies which are AI-based help to improve efficiency in all the fields and also manage the challenges faced by various industries including the various fields in the agricultural sector like the crop yield, irrigation, soil content sensing, crop.

II. LITERATURE SURVERY

[1]. Nirit Datta and Souvik Sarkar explains the methodology to overcome the problem of human and animal injury and mortality due to the straying of wild animals out of the national parks and wildlife sanctuaries by the use of automatic tracking and alert system. Automatic tracking and alert system has been implemented by incorporating GSM and GPS technology in the form of a device that would be attached to the body of an animal and would be continuously monitoring the position of the animal with respect to the GPS defined boundaries set up inside a wildlife sanctuary or national park.

[2]. Sachin umesh sharma and dharmesh j. Shah explains a simple and a low-cost approach for automatic animal detection on highways for preventing animal-vehicle collision using computer vision techniques are proposed. A method for finding the distance of the animal in real- world units from the camera mounted vehicle is also proposed. The proposed system is trained on more than 2200 images consisting of positive and negatives images and tested on various video clips of animals on highways with varying vehicle speed.

[3]. IoT-Based Smart Irrigation and Crop Protection System Using ZigBee Wireless Sensor Network" by S. S. Wagh and S. D. Jadhav. This paper proposes an IoT-based smart irrigation and crop protection system that uses a ZigBee wireless sensor network to monitor soil moisture, temperature, and humidity. The system includes a water sprinkler system that can be controlled remotely through a mobile application, as well as a fire detection module that triggers the water sprinkler system when a fire is detected.

[4]. IoT-Based Smart Irrigation and Crop Protection System with Fire Detection and Alerting" by S. S. Wagh and S. D. Jadhav. This paper presents an IoT-based smart irrigation and crop protection system that includes a fire detection and alerting module. The system uses a wireless sensor network to monitor soil moisture, temperature, and humidity, and includes a water sprinkler system that can be activated remotely through a mobile application. The fire detection and alerting module uses a flame sensor to detect fires and sends an alert to the user's mobile phone.

[5]. Dr. P. Venkateswara Rao etc all, "Smart Crop Protection
System from Wild Animals Using IoT," the purpose of this system is to build a system to detect movement of animal and produce sound. Camera and microcontroller are used to detect the animal. The system includes sensors to monitor temperature, humidity, soil moisture, and light intensity, as well as a water sprinkler system that can be activated remotely through a mobile application. The system also includes a fire detection module that triggers the water sprinkler system when a fire is detected.

III**. PROPOSED METHDOLOGY**

In the proposed system, Crop monitoring is done where sensors are used to collect information in the agricultural field. In our proposed work, PIR, Smoke sensor and Node MCU is used. When animals come near to the PIR sensor and it detects the animal movement. After getting that initial input signal, it is passed for further processing. Then it will be given to the microcontroller. Our system will be activated, immediately buzzer will be on, at the same time it sends an SMS and makes call to the owner. Microcontroller Block is used for reading the inputs from PIR and Smoke sensor. Whole process is controlled by microcontroller. The wifi module is used for sending SMS and making call to farmer when movement or smoke is detected. It also turns ON the motor, when smoke is detected. It alerts the farmer that some animals try to enter into the farm. Our LCD data will be display for SMS sending.

➢ Identify the requirements and objectives of the system: The first step is to define the purpose of the system, the crops that need protection, the size of the farm, and the type of fire detection and water sprinkler system required.

➢ Select the hardware components: The hardware components include sensors for detecting temperature, humidity, and smoke, a microcontroller or single-board computer to process sensor data, a Wi-Fi module to connect to the internet, and a water sprinkler system.

➢ Develop the software: The software includes firmware for the microcontroller, a cloud-based server application to receive and store sensor data, and a user interface for monitoring the system and setting thresholds for triggering the water sprinkler.

➢ Install the system: The system should be installed in a strategic location where it can detect fires and monitor the crops. The sensors should be placed at a suitable height and orientation for accurate readings.

➢ Test the system: The system should be tested for its effectiveness in detecting fires and triggering the water sprinkler. The user interface should be tested for ease of use and functionality.

➢ Maintenance and updates: The system should be maintained regularly to ensure proper functioning. Updates to the software and firmware may be required to add new features or fix bugs.

Overall, an IoT-based smart crop protection and fire detection system with a water sprinkler can help farmers protect their crops and prevent potential losses due to fires. It is an effective solution that can provide real-time monitoring and automatic response, ensuring a quick response time and reducing the risk of crop damage.
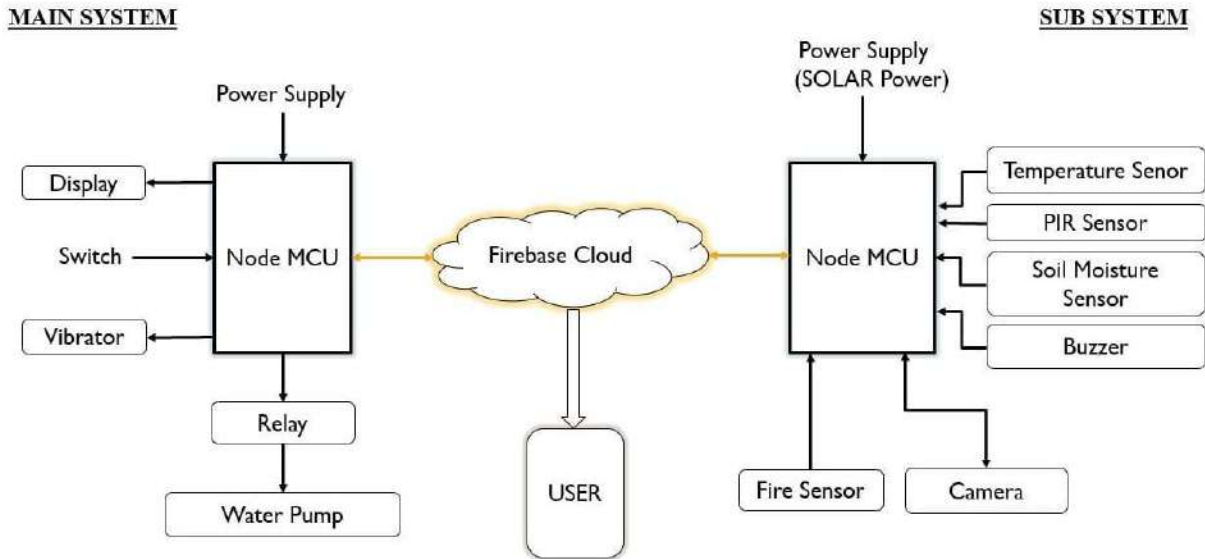

Fig.1. Block Diagram Integration of main system and sub system

From the figure it represents the Sensors and camera are interfaced to the puppet. As soon as the PIR sensors go High on detecting motion within a range of 10 meters, the camera will be turned ON which first captures an image and then starts recording the video for about five to six minutes, which will be stored on board as well as cloud, simultaneously a message will be generated automatically to the registered number using a module to inform about the intrusion along with the details of the temperature and Humidity obtained by interfacing dht11 temperature and humidity sensor. If the motion detection is due to an authorized person who is mostly a farm worker.

We use Passive Infrared Sensors (PIR) to detect any motion of human body, once the employed PIR sensors detect motion the cameras capture an image and start recording the video as well as the owner of the farmland gets notified about the intrusion. This information along with the captured video is stored onto cloud from where the person in charge can access it once he receives the message. We use bash scripting for uploading the video to Dropbox. If found to be an animal, the system then checks for the number of PIR sensors that have gone HIGH, if fewer number of sensors are high it denotes a smaller animal and all or more than half the sensors that turn high denoted it is a bigger animal and hence necessary action is employed to keep them away from destroying the crops. In order to automate the animal ward off system discussed, we take a decision based on the number of sensors that have gone high. The basic working principle is, if fewer numbers of sensors are able to detect the motion then it denotes an animal smaller in height

such as a wild boar, deer etc., and we immediately turn on the buzzer, which helps to keep away the pigs. Similarly if more than half or all of the employed PIR sensors have gone high it is naturally because of a huge animal such as the elephant which is another major threat to such farm lands the loud noise which in turn helps to ward off the bigger animals.

IV. HARDWARE COMPONENTS

• NODE MCU

The Node MCU is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Express if Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds. However as a chip, the ESP8266 is also hard to access and use. You must solder wires, with the appropriate analog voltage, to its pins for the simplest tasks such as powering it on or sending a keystroke to the "computer" on the chip. You also have to program it in low-level machine instructions that can be interpreted by the chip hardware. This level of integration is not a problem using the ESP8266 as an embedded controller chip in mass-produced electronics. It is a huge burden for hobbyists, hackers, or students who want to experiment with it in their own IoT projects.

TEMPERATURE SENSOR A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. There are many different types of

temperature sensors. Some temperature sensors require direct contact with the physical object that is being monitored (contact temperature sensors) while others indirectly measure the temperature of an object (non-contact temperature sensors). Non-contact temperature sensors are usually infrared (IR) sensors. They remotely detect the IR energy emitted by an object and send a signal to a calibrated electronic circuit that determines the object's temperature.

▪ PIR SENSOR A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications. PIR sensors detect general movement, but do not give information on who or what moved. For that purpose, from an imaging IR sensor is required. PIR sensors are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector". The term passive refers to the fact that PIR devices do not radiate energy for detection purposes. They work entirely by detecting infrared radiation (radiant heat) emitted by or reflected from objects.

▪ SOIL MOISTURE SENSOR

Soil moisture sensors measure or estimate the amount of water in the soil. These sensors can be stationary or portables such as handheld probes. Stationary sensors are placed at the predetermined locations and depths in the field, from whereas portable soil moisture probes can measure soil moisture at several locations.

▪ LCD Display (16x2)

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.16×2 LCD is one kind of electronic device used to display the message and data. The term LCD full form is Liquid Crystal Display. The display is named 16×2 LCD because it has 16 Columns and 2 Rows. it can be displayed (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots. These displays are mainly based on multi-segment light-emitting diodes. There are a lot of combinations of display available in the market like 8×1, 8×2, 10×2, 16×1, etc

▪ FIRE SENSOR

A flame detector is a type of sensor that detect and respond to the presence of a flame. These detectors have the ability to identify smokeless liquid and smoke that can create open fire. For example, from fig 4.6 in boiler furnaces flame detectors are widely used, as a flame detector can detect heat, smoke, and fire. A

smoke sensor is a device that senses smoke, typically as an indicator of fire. Commercial and residential security devices issue a signal to a fire alarm control panel as part of a fire alarm system, while household detectors, known as smoke alarms, generally issue a local audible or visual alarm from the detector itself.

▪ CAMERA camera, in photography, device for recording an image of an object on a light-sensitive surface, it is essentially a light-tight box with an aperture to admit light focused onto a sensitized film or plate. A brief treatment of cameras follows. For full treatment, from to see photography, technology of: Cameras and lenses.

▪ BUZZER

The buzzer is a sounding device that can convert signals into sound signals. An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. It is widely used in alarms, computers, printers and other electronic products as sound device. The main function of this is to convert the signal from audio to sound. From generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

▪ RELAY The relay is the device that open or closes the contacts to cause the operation of the other electric control. According to the it detects the intolerable or undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area. Thus protects the system from damage.

▪ WATER PUMP A water pump is an electromechanical machine used to increase the pressure of water to move it from one point to another.It represents, Modern water pumps are used throughout the world to supply water for municipal, industrial, agricultural, and residential uses.

V. SOFTWARE TOOL ➢ Arduino IDE The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. According to the figure, the console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displ ays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.
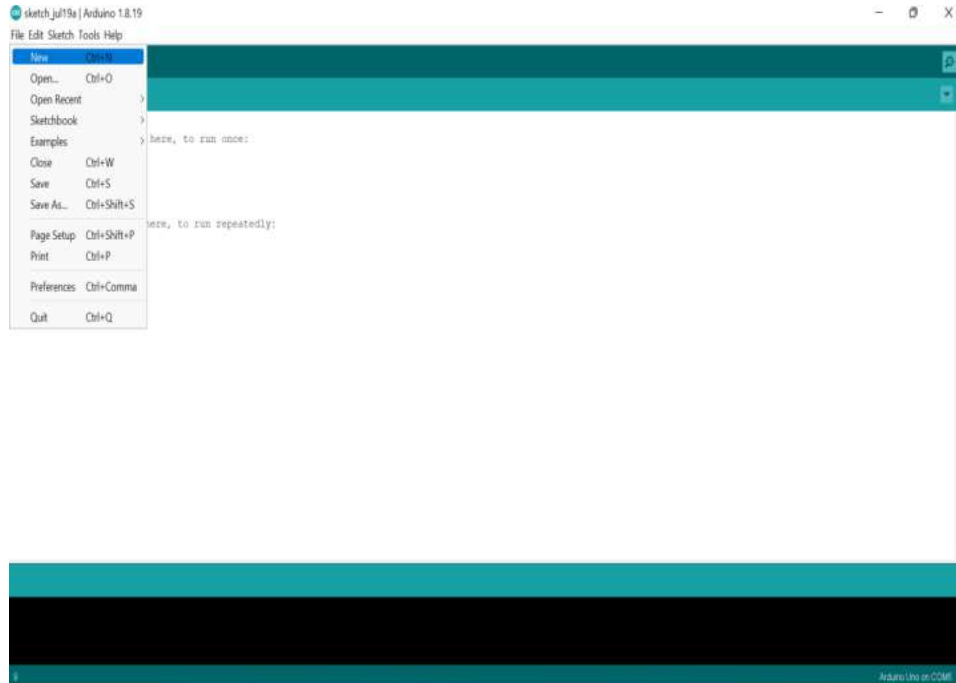
Fig.2. Arduino IDE

➢ MIT App Inventor MIT App Inventor is an intuitive, visual programming environment that allows everyone – even children – to build fully functional apps for Android phones, iPhones, and Android/iOS tablets. Those new to MIT App Inventor can have a simple first app up and running in less than 30 minutes. And what's more, our blocks-based tool facilitates the creation of complex, high-impact apps in significantly less time than traditional programming environments. The MIT App Inventor project seeks to democratize software development by empowering all people, especially young people, to move from technology consumption to technology creation.

➢ Google Firebase

Google Firebase is a Google-backed application development software that enables developers to develop iOS, Android and Web apps. The figure represents, firebase provides tools for tracking analytics, reporting and fixing app crashes, creating marketing and product experiment.

VI.CONCLUSION

This project is used to identify animals or illegal tress passers entering into agriculture fields. This also help in providing efficient protection in a most cheap way and eventually reduce losses incurred by farmers due to loss of crop. At present it is done manually which consumes more time and also in the coming future, we review the application of the animal detection technology in the agriculture field and it can promote for detecting tress passers and animals entering into agriculture fields with good accuracy. In the field of agriculture there are more chance to develop or convert this project in many ways. Thus, this project has an efficient scope in coming future where manual predicting can be converted to computerized production in a cheap way.

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ARDUINO BASED SPEED CONTROLLER FOR DC MOTOR

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Abstract - Agriculture is one of the oldest activities practiced by man. Due to its importance in our daily life and reliance on it, many technologists try to update a new development based on agricultural robots that perform well in a strict, efficient, and timely manner due to the tremendous development in the field of robotics, The main problems faced in the agricultural field such as random sowing which cost more seeds that is costly, consumption more water and quantity of fertilization. This project develop a robot that can solve such problem measure the distance between seeds that lead to save wastage of water, determined the plants needs of fertilization by using soil PH sensor. The motion of the robot controlled by Android Bluetooth connected to HC- 05 Bluetooth module, servo for seed sowing actuators, ESP8266, Ph sensors, moisture sensors, temperature sensors, relays boards, dc motors and ESP 32cam for video Streaming. This model for seed sowing, water spraying, and Fertigation operations in farmland that can calculate the distance between the seeds and quantity of fertilization, considering the need of plants. The most common application of robots in agriculture today is fertilization, Seed Sowing, Water Spraying, and Monitoring, soil analysis and temperature and humidity. The robot will control via android mobile using Bluetooth.

Keywords - Agriculture robot, seeds sowing, Water spray, Fertilizer, PH, Humidity, Temperature.

I.   INTRODUCTION

The earliest agricultural robots were developed in the early 1920s, when agricultural research into the integration of autonomous vehicle steering emerged. Most countries in recent times lack sufficient skilled manpower, notably in the agriculture industry, it has a detrimental impact the growth of developing countries. The primary goal of automation in our country is to reduce manpower; the Keyword in all industrial businesses generally refers to electrical, electronic

And mechanical components. Automation eliminates a lot of time consuming manual labour and speeds up production. As a result, it is the moment to automate the sector in order to solve the problem in India, 70% of population is reliant on agriculture. Farmers are increasingly turning to technology to address a number of pressing problems in the agriculture industry, Such as the growing global shortage of food and windling agricultural workforce. Agricultural robots automate Slow, repetitive, and dull tasks for farmers, allowing them to focus on improving production yields, while increasing Farm efficiency as well as reducing the labour requirements and overall operating costs. Agricultural robots also enable precision agriculture, in which resources are distributed more efficiently, leading to significant savings in resource use. Currently, advanced robotic systems are utilised in crop harvesting and picking Process, weed control, mowing, seeding, as well as sorting and packing agriculture produce. Application by workers with knapsack sprayers is methods of the past which are not only highly inefficient and time-Consuming, but also result in high labour requirements and costs to cover large agriculture fields. Seed sowing, Fertigation and water spraying robots can carry large storage reservoirs, be operated safely and even autonomously, and be deployed at a fraction of the cost compared to the traditional methods. In fact, it is estimated That seed sowing, Fertigation and water spraying by agricultural robots can reduce labour requirements by up to five times Compared to human workers. Several agricultural robots that can carry out some of these operations are already available, while many others will hit the market soon. Today, however, agricultural robots are far too complicated, slow, and costly to be made publicly available to everyone. This research work aims

development an Agriculture robot for Seed sowing, Water spray and Fertigation. The agricultural robot developed for this research work focuses on three applications, namely seed sowing, water spraying and Fertigation.

II.   SCOPE OF STUDY

The scope of this study is to design and improvement a robot that used for multipurpose the benefit of this robot is saving time and effort of farmers, less cost and water wasting, easy to use by unskilled farmer, the plants organize in specific distance and role. The objective of research is to Design an Agriculture robot for Seed sowing, water spray and Fertigation, which performers following tasks:

- Soil moisture measurement
- Ph value of soil.
- Fertigation.
- Sowing seeds.
- Water spray.
- Measuring temperature and humidity.

III.   LITRATURE REVIEW

Different research paper had been conducted in this filed, various outcome has been generated we discussed the latest paper techniques and results therefore all the paper applied different methods and techniques to get better result.

Manik Rakhra, Arun Singh, Taha Fadhaeel, Ahmed Al Ahdal, Nitin Pandey [1], has proposed research work to develop an Design, Fabrication, and Implementation of an Agriculture robot (2022).

Arun Malik, Gayatri Vaidya, Vishal Jagota, Sathyapriya Eswaran, Akash Sirohi, Isha Batra [2], Design and Evaluation of a Hybrid Technique for Detecting Sunflower Leaf Disease Using Deep Learning Approach (2022)

M. Rakhra et al [3], An Analytical Study of the Types of Implements used by Farmers in Mechanized Agriculture (2022).

A.M. Kassim, M. F. N. M. Termezai, A. K. R. A. Jaya, A. H. Azahar, S Sivarao, F. A. Jafar, H.I Jaafar, M. S. M. Aras [4] With the advancement of technology in the twenty-first century, a variety of robots have been utilized in agricultural activities, ranging from the cultivation process to the production process. The design of an insecticide spraying robot has been explored by the author. The system is made up of a spraying motor that is powered by a battery. The Arduino board, which also processes inputs from ultrasonic sensors, controls the spring activity. The robot control flowchart is shown, as well as the experimental results.

P. Rajesh Kanna and R. Vikram, Vinay Chamola, Vikas Hassija [5], has proposed A Comprehensive Review of the COVID- 19 Pandemic and the Role of IoT, Drones, AI, Blockchain, and 5G in Managing Its Impact to implement the Usage of drone during the pandemic for Crowd surveillance, public announcement, spraying disinfectant.

Ratnmala Nivrutti Bhimanpallewar et al 2020 [7]. Enabling farmers to achieve precision farming, this analysis has led to the production of an independent seeding and fertilizing micro-dosing robot. The direct seeding and micro dosing fertilizer robot device is designed to plant a variety of seeds, but it is particularly well suited to planting seeds with micro- dosing fertilizers. A current platform restricted the amount of seeds and determines the amount of fertilizer to be dropped at each location. It may also change the distance between each falling point.

Mohapatra, B. N. et al 2020 [8]. This research assessed some of the most recent robotic successes in the agriculture industry. Because agriculture is the primary source of income for the vast majority of Indians, it is critical to protect the environment. Create some advanced robots that require the elimination of various difficulties. As it is now, Automation, as is well known, enhances profit, posing concerns and issues. With

the deployment of new technology, the problems related with agricultural robots can be solved. In the future, current technology will be combined with a mechanism, an improved algorithm, and modern technology. With the assistance of this robot industry, based on things revolutionary robot engine, can take this out of the workshop. In some respects, the agricultural economy resembles an ocean.

IV. PROBLEM STATEMENT AND SOLUTIONS

Agriculture is a very important sector in Indian economy. Most of the livelihood in India depends on agriculture. As the knowledge based farm labours are less, the requirement for them is high and their wages are increasing. Traditionally farming is done by human being with the help of bullock carts, tractors and tillers etc. The main problem in agricultural field include lack of labour availability, lack of knowledge regarding soil testing, increase in labour wages, wastage of seeds and more wastage in water. The below figure shows the manual working in field.

Fig.1. Manually working in field

The idea of applying robotics technology in the field of agriculture is very new. In agriculture, the opportunity for robot-enhanced productivity is more and the robots are appearing on farms in various guises and in increasing numbers. In recent years there are many agricultural robots which can perform only single or dual tasks. We are improving the robot by designing an agricultural robot for spraying water, sowing seed, fertigation operation. More than 42% of the total population in the world has chosen agriculture as their primary occupation. In recent years, the development of autonomous vehicles in agriculture rational and adaptable vehicles. In the field of agricultural autonomous vehicles, a concept is being developed to investigate if multiple small autonomous machines are more efficient than traditional large tractors and human force. These vehicles should be capable of working round the clock all year round, in most weather conditions and have the intelligence embedded within them to behave sensibly in a semi-natural environment over long periods of time, unattended, while carrying out the useful task. There are a number of field operations that can be executed by autonomous vehicles, giving more benefits than conventional machines. The below figure shows the usage of modernized technology in fields.

Fig.2. Modernized technology

V.   METHODOLOGY

The methodological procedure, block diagram are included in this section. The development of the agricultural robot consists of the integration of hardware techniques and software tools. The following framework configuration is done based on the requirements. Below Figure shows the block diagram of agricultural robot, which includes sensors for measuring humidity and temperature detecting PH value for fertilizer selection, and the water spray for planting. The robot and the control segment are the two main regions of this framework, and they are interconnected using or aided by web communication technologies. Temperature sensor, ph values, humidity sensor, seed allocator, seed capacity,

Fertiliser storage, fertiliser dispenser, water spray container, water spray capacity mechanical framework with motor, microcontroller, and power supply are all included in the control area. The robot movement controlled by Android Bluetooth. LCD used for reading and monitoring the value of each operations, solenoid valve working like switch control the quantities needed for all functions mention above that available on the tanks, in Figure 1 it shows the connection diagram of all components used in this robot. A pH sensor, a temperature sensor, and a soil dampness sensor are used to detect the pH, temperature, and soil wetness separately.

An Arduino microcontroller receives this measured value, and based on the ph value, the farmer will decide which fertilizer and the quantity of water to use for planting

Seeds level sensor and liquid sensors are used for determined the number of seeds, water and fertilizer available on the tanks.

Existing System:

Existing System has many protocol formats available for commercially available IoT sensors. Different vendors/solution providers use different protocols to communicate. Therefore, it is difficult to achieve interoperability. Robot fertigation system costs are too high even for implementing in small farms. Then manually farmer fertigation the minerals (like that NPK) for the soil and only seed sowing system are present but this operation take more time.

Proposed System:

In order to controlling and monitoring system is designed and implemented robot concept. The system consists of which includes all sensors, PCB, controller with communication hardware, and low-level protocols. Arduino, Esp 32 cam, Bluetooth, servo motors, different sensors used in this framework with their controllers, actuators, etc. The robot can control via android mobile using Bluetooth which is the control element in the system which gets the current value. The system will behave as a feedback control scheme where the user will be requested to specify the desired pH value. If the value of the pH is changed, due to an external disturbance, pumps will give solution as needed. The quantity added will be based on

the readings of the sensor to fix the value. The user can control actuators via Bluetooth. The ESP 32cam also collects data for monitoring the process and check plants growth.

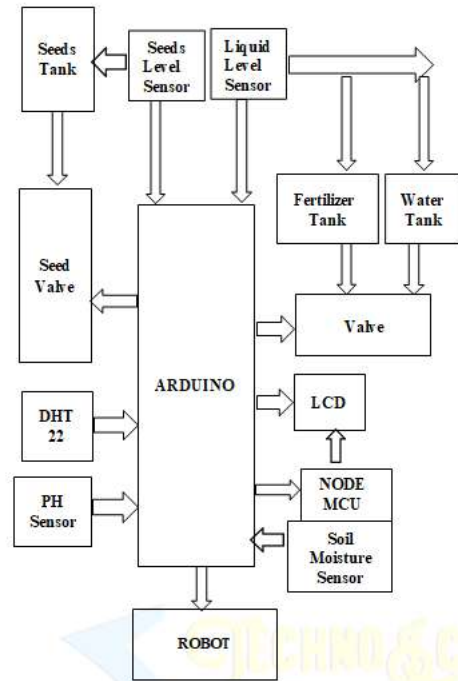The Block Diagram of an Agriculture Robot is shown in the Below Figure.

Fig.3. Block Diagram of Agriculture Robot for Seed sowing, Water Spray and Fertigation

APPLICATIONS
- Seed sowing devices plays a wide role in Agriculture field.
- Cost management, waste reduction

ADVANTAGES

Most of seed sowing equipment's Machines mentioned require only one person to operate. Hence it reduces labour cost.
- Saving Time due to automation.
- Robots can work 24/7/365 days.
- Reduced Sound pollution compared to tractors.
- With the help of innovative seed sowing equipment the seed can feed into the soil continuously without any restriction while in flowing of seed.
- Overall Cost for seed sowing process will be reduced by using this seed sowing equipment's.
- These equipment's can also be used for sowing different types of seeds.
- It is helpful for small and medium scale farmers.

DISADVANTAGES

It needs maintenance to keep them running
- Farmers can lose their job
- Lack of access to poor farmers
- Cost is high

RESULTS

Table 1: Temperature and Humidity Sensors

Humidity (%)	Temperature (deg C)
20	0
27	5
34	10
41	15
48	20
55	25
62	30

Table 2 is the result or Status of Soil moisture and Pump.

Soil moisture (in %)	Pump status
99	0
80	100
60	100
40	100
20	100
0	100
-20	10

Table 3 is the result of PH value

PH value	Nature
14	Alkaline soil
12.6	Alkaline soil
11.2	Alkaline soil
9.8	Alkaline soil
8.4	Alkaline soil
7	Neutral
5.6	Acidic
4.2	Acidic
2.8	Acidic
1.4	Acidic
0	Acidic

CONCLUSION

The aim of this work is to design and development of agriculture robot for seeds sowing, water spray and fertigation this robot expected to perform several functions such as spraying water and fertilizer, sowing seeds on the ground. In each complete rolling of crawler, the seeds fall from the seed drum, and seed plantation process taken place smoothly without wastage of seeds. pH values measure the materials of the soil and determine the need of the ground for fertilization then the robot spray the fertilizers according to The data received from pH sensor. Soil moisture sensor senses the amount of water needed by the ground then spray the water without wasting. The proposed system is battery operated and controlled by Bluetooth device. Using this robot, farmer can carry out other secondary activity along with operating the robot. By carrying out multiple activities at the same time, farmer can increase his income which results in development of Indian economy. The proposed robotic machine for Agriculture is an Automated Seed

sowing machine which has the ability to increase productivity. All the data in Robot is collected in Android application and saved for future process.

Robotics in Agriculture plays a very important role for the increase in production and economy development of the country. The scientists in agricultural research are mostly focusing on replacement of labourers completely by robots. In India very few areas are covered with robotic implementation in the future there is a lot of scope for the complete automating in farming. Many Agricultural robots designed are based on GPS but it may have signal issue and may not give accurate results. But in this proposed project Bluetooth is used and hence it may give precise results.

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DENSITY BASED TRAFFIC SIGNAL SYSTEM WITH MOVABLE ROAD DIVIDERS

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Abstract- The proposed project paper is an innovative solution that aims to optimize the flow of vehicles in urban areas. This system employs real-time data from various sensors to monitor the density of vehicles at different intersections. Using this information, intelligent algorithms dynamically adjust the timing of traffic signals to prioritize areas with higher vehicle density, thereby reducing congestion and improving overall efficiency. Furthermore, the system incorporates road dividers that can be moved and adjusted according to traffic conditions. This feature enables the creation of additional lanes or redirection of traffic, adding flexibility and adaptability to the road network. By combining density-based signal control and movable road dividers, this system presents a promising approach to effectively manage traffic congestion in urban environments.

Index Terms – Proximity sensors, Traffic Lights, Smart Dividers, Traffic Density.

I.   INTRODUCTION

The density-based traffic signal system with movable road dividers is an innovative approach to address the challenges of urban traffic management. As cities continue to face increasing traffic congestion, traditional fixed-time traffic signal systems are proving to be insufficient in adapting to dynamic traffic conditions. The density-based system leverages real-time data from sensors to monitor the density of vehicles at different intersections, allowing for intelligent signal control. By prioritizing areas with higher traffic density, the system aims to reduce congestion and improve overall traffic flow efficiency. Additionally, the integration

of movable road dividers offers enhanced flexibility and adaptability to the road network. These dividers can be adjusted to create additional lanes or redirect traffic based on current conditions, further optimizing the utilization of existing infrastructure.

The density-based traffic signal system with movable road dividers also has the potential to improve safety on the roads. By effectively managing traffic flow and reducing congestion, the system helps to alleviate driver frustration and aggressive driving behaviours often associated with heavy traffic. Moreover, the flexibility of the movable road dividers allows for the creation of dedicated lanes for specific modes of transportation, such as buses or bicycles, promoting sustainable and efficient urban mobility.

Together, the density-based traffic signal system with movable road dividers presents a promising solution for effective traffic management in urban areas, ultimately leading to improved mobility and reduced travel times for commuters.

II.   LITERATURE SURVERY

[1]. "Density-Based Traffic Control System with Road Divider Management" by Gupta et al. (2021): This research paper proposes a density-based traffic control system that integrates road divider management to optimize traffic flow in urban areas. The system utilizes real-time traffic data from sensors to adjust traffic signals based on traffic density. Additionally, movable road dividers are used to create additional lanes or redirect traffic, improving the flexibility and adaptability of the road network. Simulation results show that the proposed system can reduce the average travel time and improve overall efficiency of the road network. [2]. "Adaptive Traffic Control Using Deep Reinforcement Learning" by Chen et al. (2021): This research paper proposes an adaptive traffic control system based on deep reinforcement learning (DRL). The system utilizes real- time traffic data to optimize the timing of traffic signals in an adaptive manner.

The DRL-based approach is shown to outperform traditional fixed-time signal control methods, leading to a reduction in travel time and improved traffic flow efficiency. The proposed system has the potential to be applied to large-scale traffic networks.

[3]. "Real-Time Traffic Signal Control Using Adaptive Fuzzy Logic and Particle Swarm Optimization" by Mousavi et al. (2020): This research paper proposes a real-time traffic signal control system that combines adaptive fuzzy logic and particle swarm optimization (PSO). The system utilizes real-time traffic data to adaptively adjust traffic signal timings based on traffic density. The combination of adaptive fuzzy logic and PSO optimization leads to improved traffic flow efficiency and reduced travel time compared to traditional fixed-time signal control methods. Simulation results demonstrate the effectiveness of the proposed system under different traffic scenarios.\

[4]. "Smart Traffic Management using IoT and Machine Learning Techniques" by Khan et al. (2022): This research paper presents a comprehensive survey of smart traffic management systems that utilize IoT (Internet of Things) and machine learning techniques. The survey covers various aspects such as traffic monitoring, signal control, congestion detection, and predictive modeling. It highlights the benefits of integrating real-time data from IoT sensors with machine learning algorithms to optimize traffic flow, reduce congestion, and enhance overall traffic management efficiency. The paper provides insights into the latest advancements, challenges, and future directions in this rapidly evolving field.

III.   PROPOSED METHDOLOGY

In the proposed system, LED traffic lights and an ultrasonic sensor are used. These components are connected to a Microcontroller via physical wires, which acts as the traffic light controller. The Microcontroller receives sensor data and manages the traffic lights by switching between green, yellow, and red signals. It calculates the number of cars at the intersection based on distances measured by the ultrasonic sensor and the timing between measurements. This data is then sent every minute to the local server via the Microcontroller's serial port. The micro-controller utilizes an equation that takes the received car count data as input to determine the optimal time interval for the LEDs to ensure smooth traffic flow. By comparing this calculated time with the current LED timing, the controller makes a decision. If the current green time is less than the calculated time, the decision is to increase the green time; otherwise, it is to decrease the green time.
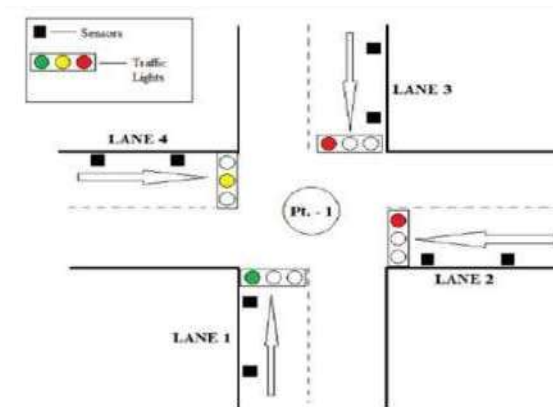

Fig.1. Layout of Project

In the given scenario, at Point - 1, LANE 1 is currently open with a green signal, while LANE 4 is preparing with a yellow signal. However, LANE 2 and LANE 3 are obstructed, preventing vehicles from proceeding. At Point - 2, it is observed that the vehicle count in LANE 3 has already surpassed the

threshold value. Consequently, the road leading to LANE 2 at Point - 1 is blocked in advance at Point - 2 itself. As a result, vehicles are redirected through alternate lanes to reach their destination.
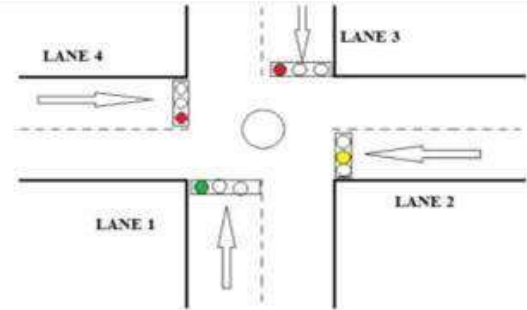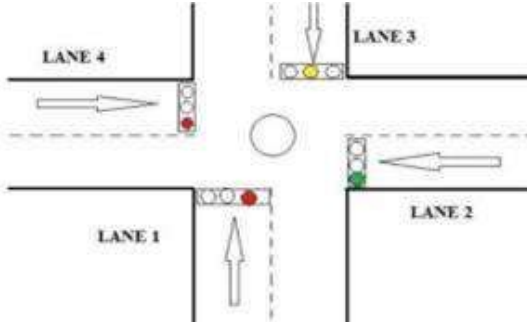

Fig.1. Signal at lane 1
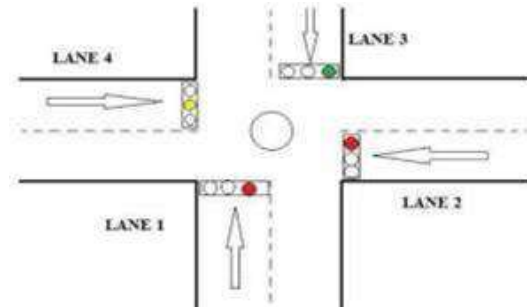
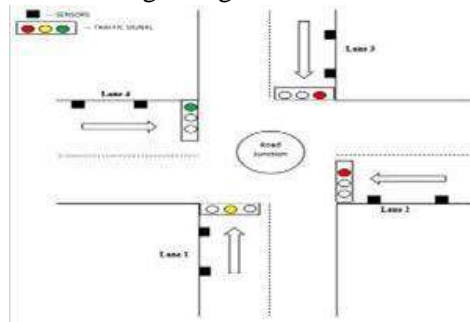

Fig.2 Signal at lane 2

Fig.3. Signal at lane 3

Fig.4 Signal at lane 4

In the above figures is the lane with high density traffic is open with green signal and other lanes are closed with red signal and after that the next will get the green signal automatically.

•**Moveable Road Dividers**

Based on the Traffic density condition, The first step is to check the density of the roads using IR sensor. Then the obtained value is compared with each other. Here the threshold is set to be 50 that mean if in any road, IR sensor reading is above 50 the divider and signal actions are required. After this if there are any vehicle near the divider, alarming is provided. Then the divider is moved creating more lanes for the denser side. After the vehicles are passed the divider and signal comes back to its original arrangement.
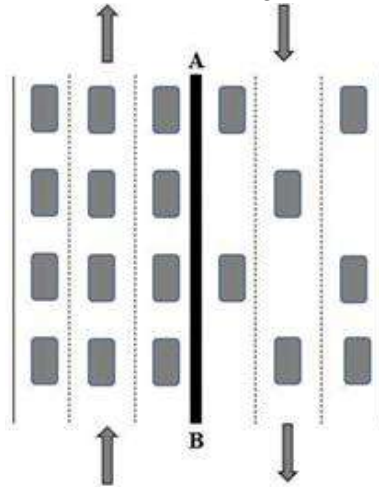
Fig.5 High traffic density on left side of road

The above figures show the scenario in which the left side of the road is having more traffic density than right side of the road. Whereas the left side comprise lesser traffic density. The road divider is moved towards the side of less density i.e., towards right creating more space on the left side.
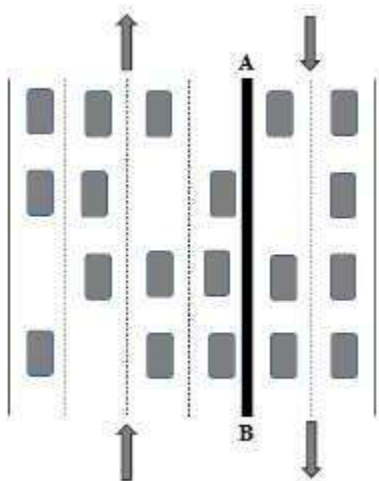
Fig.6 High traffic density on right side of road

Road divider moved towards right side of the road The above figures show the same mechanism for the right side of the road

IV.   **HARDWARE COMPONENTS**
- Arduino mega 2560

The Arduino Mega is a versatile microcontroller board that stands out for its advanced features and expanded capabilities. Powered by the ATmega2560 chipset, it offers a vast array of digital input/output pins, providing extensive flexibility for connecting various sensors, actuators, and peripheral devices. With its abundant analog inputs, the Arduino Mega enables precise measurement and control of analog signals. The board boasts a generous amount of memory, including ample Flash memory for storing code
and substantial SRAM for data manipulation. Its enhanced processing power and abundant resources make the Arduino Mega an ideal choice for demanding projects, such as robotics, home automation, and complex embedded systems. Whether you need numerous I/O pins, ample memory, or robust processing capabilities, the Arduino Mega is a reliable and powerful microcontroller board for tackling advanced projects.

- **IR Sensor**

An IR (Infrared) sensor is a highly versatile electronic device that utilizes infrared radiation for object detection and sensing. It consists of an IR emitter and receiver, which work together to detect and measure the infrared energy emitted or reflected by objects in their proximity. The emitted infrared light bounces off objects and is captured by the receiver, allowing the sensor to determine the presence, distance, or movement of the objects.

- **Ultrasonic Sensor**

An ultrasonic sensor is a device that uses high- frequency sound waves to detect and measure distances to objects. It consists of a transmitter and receiver, which emit and receive ultrasonic waves respectively. These waves bounce off objects and are captured by the receiver, allowing the sensor to calculate the distance based on the time it takes for the waves to return. Ultrasonic sensors are widely applied in robotics, automation, and obstacle detection systems. Their non-contact operation, accurate distance measurement, and suitability for various environments make them invaluable for numerous applications requiring object detection and proximity sensing.

- **L298N Motor Driver**

The L298N Motor Driver is a versatile integrated circuit widely used for controlling and driving DC motors. It offers bidirectional control, enabling motors to move in both forward and reverse directions. With its high current and voltage handling capabilities, the L298N is suitable for a variety of motor applications. The motor driver utilizes a dual H-bridge configuration, allowing independent control of two motors or a single motor with higher power requirements. It can be easily interfaced with microcontrollers or Arduino boards, making it a popular choice in robotics and automation projects. The L298N Motor Driver provides reliable performance, robust design, and simple integration, making it an efficient solution for driving DC motors.

- **9V Battery**

The 9V battery is a widely used power source in compact electronic devices. With its rectangular shape and 9-volt voltage rating, it provides portable and convenient power. Typically composed of six smaller cells connected in series, the 9V battery finds applications in smoke detectors, remote controls, handheld radios, and small toys. While its capacity may be lower than larger batteries, the 9V battery remains a reliable choice for powering low to moderate power consumption devices. Its replaceable nature ensures easy maintenance and accessibility. Overall, the 9V battery offers a practical and versatile power solution for various portable electronics.

- **Traffic Light Module**

A traffic light module is a compact electronic device designed to replicate or control traffic lights. It features LEDs in red, yellow, and green colors, arranged vertically or horizontally to simulate the familiar traffic signal configuration. This module finds utility in educational projects, model railways, and small-scale traffic control systems. It allows users to emulate traffic light sequences for teaching purposes or to enhance the realism of miniature environments. In more advanced applications, the module can be

integrated with microcontrollers or programmable logic controllers (PLCs) to automate traffic light control based on real-time data or pre-defined timing patterns. With its versatility and visual representation of traffic signals, the traffic light module serves as a valuable component in various applications related to traffic management and simulation.

- **BUZZER**

A buzzer is a compact and versatile electronic device that generates sound when an electrical signal is received. It employs a piezoelectric element or an electromagnetic coil to create vibrations and produce audible alerts. Buzzers are commonly used in alarm systems, electronic circuits, and communication devices to provide auditory notifications and warnings. They serve as indicators for events like button presses, low battery warnings, or alarm activations.

- **Bluetooth**

A Bluetooth module is a compact wireless device that facilitates communication between devices using Bluetooth technology. It acts as a link, enabling data exchange and connectivity over short distances. The module includes a Bluetooth chip, antenna, and supporting circuitry, providing a convenient solution for wireless communication. Bluetooth modules find applications in wireless audio streaming, data transfer, and remote control systems. They are easily integrated into electronic projects, offering a reliable and standardized wireless interface. With their small size and low power consumption, Bluetooth modules are widely used in consumer electronics, industrial automation, and IoT applications to enable seamless wireless connectivity.

V. SOFTWARE TOOL

- **Arduino IDE**

The Arduino IDE supports the languages C & C++ using special rules of code structuring. In the Fig 5.2 shows Arduino IDE supplies a software library from the wiring project, which provides many common input and output procedures which provide many common input and output procedures.

Fig 5.2: Arduino Tool

VI.   RESULT

This project yields significant improvements in traffic management and intersection performance. By employing dynamic signal timing adjustments based on real-time traffic conditions, the system effectively reduced vehicle waiting times, alleviated congestion, and enhanced overall traffic flow efficiency.

The integration of movable road dividers proved instrumental in optimizing traffic lane allocation. The system intelligently reconfigured lanes in response to varying traffic volumes, maximizing road space utilization and minimizing bottlenecks at intersections. This adaptive lane management approach ensured smoother traffic distribution and improved overall intersection functionality.

Furthermore, the project demonstrated the system's ability to adapt to changing traffic patterns throughout the day. By continuously monitoring traffic density and adjusting signal timings accordingly, the system effectively accommodated fluctuations in traffic volume, resulting in optimized traffic throughput and reduced delays.

One notable outcome of the project was the system's positive impact on intersection safety. By efficiently managing conflicting traffic movements, the system mitigated the risk of accidents and contributed to overall intersection safety improvement.

The comprehensive findings from the project underscored the effectiveness of the density-based traffic signal system with movable road dividers in enhancing traffic management, reducing congestion, optimizing lane utilization, and promoting intersection safety. These results provide valuable insights for future advancements in traffic control systems and serve as a foundation for further research in the field.
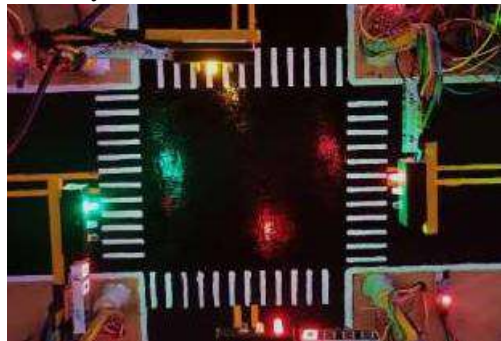

Fig 6. Traffic Signal based on density of traffic.

VII. Conclusion

In conclusion, the project on density-based traffic signal system with movable road dividers has yielded compelling results and demonstrated its effectiveness in improving traffic management and intersection performance. By adopting a dynamic approach based on real-time traffic density, the system successfully reduced waiting times for vehicles and effectively mitigated traffic congestion at intersections

The integration of movable road dividers played a crucial role in optimizing lane allocation and accommodating varying traffic volumes. The ability to reconfigure lanes based on demand allowed for the efficient utilization of road space, ensuring smoother traffic flow and minimizing bottlenecks. This dynamic lane management strategy proved to be highly effective in enhancing intersection capacity and overall traffic efficiency.

Moreover, the project highlighted the system's adaptability to changing traffic patterns throughout the day. By continuously monitoring traffic density and adjusting signal timings accordingly, the system responded in real-time to fluctuations in traffic volume. This adaptability resulted in improved traffic throughput, reduced delays, and enhanced overall transportation efficiency. Another significant finding of the project was the positive impact on intersection safety. The density-based traffic signal system effectively managed

conflicting traffic movements, reducing the potential for accidents and creating a safer environment for both drivers and pedestrians. The project's comprehensive results provide valuable insights into the potential of density-based traffic signal systems with movable road dividers in revolutionizing traffic management. The successful implementation and notable outcomes of the project lay the foundation for future advancements in intelligent transportation systems. Further research and development in this area can lead to even more sophisticated algorithms, improved system accuracy, and seamless integration with emerging technologies such as vehicle-to-infrastructure communication and autonomous vehicles. Overall, the project's findings underscore the significance of adopting innovative approaches to traffic management. The density-based traffic signal system with movable road dividers offers a promising solution for optimizing traffic flow, reducing congestion, enhancing intersection safety, and ultimately improving the overall efficiency of transportation networks.

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Self-driving car using Raspberry pi (Deep Learning and Image Processing)

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Abstract- The objective of the project is to represent an Autonomous car prototype which uses Raspberry Pi as the core functioning chip and our system use Open CV and Machine learning technology. The car will move automatically without any human help to the destination by itself. The car uses the core processing system as Raspberry Pi, which is interfaced with the Pi camera module, will stream the video to the Monitor as the local host. Based on which the detection like pedestrians, vehicles or road sign and signals are done and corresponding commands are sent to the Arduino serially to operate the car. The Raspberry Pi has functionalities like, traffic signal detection, vehicle detection, pedestrian detection, road sign detection, which aids the proposed system in arriving the proposed or specified place cautiously and timely. Every process is completed using the Raspberry Pi with C++ programming. The methods used for achieving autonomous movement of car are Gaussian Blur, CED and Region of Interest.

Index Terms – Smart Car , Raspberry pi , openCV , Arduino Uno , pi camera , raspbian OS.

I. INTRODUCTION

A self-driving car, also known as an autonomous vehicle (AV), is a vehicle that can navigate and operate without human input. Self-driving cars use a combination of sensors, software, and complex algorithms to perceive their surroundings, make decisions, and safely operate the vehicle.

The technology behind self-driving cars can be broken down into several key components:

- Sensors: Self-driving cars use a variety of sensors, such as lidar (light detection and ranging), radar, and cameras, to perceive the world around them. These sensors provide the car with real-time information about its surroundings, including the location of other vehicles, pedestrians, and obstacles.

- Mapping and Localization: Self-driving cars use high-resolution maps to navigate and locate themselves within their environment. These maps provide the car with a detailed understanding of the road ahead, including the location of traffic signals, stop signs, and lane markings.

- Artificial Intelligence (AI) and Machine Learning: Self-driving cars use AI and machine learning algorithms to analyze sensor data and make decisions in real-time. These algorithms are designed to identify and react to complex situations on the road, such as changing weather conditions, construction zones, and unexpected obstacles.

II. LITERATURE SURVERY

[1].This project proposes a self-driving car system that uses a Raspberry Pi 2 board as the brain of the vehicle. The system utilizes a combination of ultrasonic and infrared sensors to detect obstacles and a camera to capture images of the road. The Raspberry Pi runs a Python code to process the sensor data and control the car's movements. The authors also implemented an object detection algorithm based on Tenser Flow to detect and avoid obstacles In [2].This project proposes a self-driving RC car system using a Raspberry Pi 3 board and a camera module. The system uses a neural network model based on Keras to control the car's movements. The camera captures images of the road, which are then processed by the neural network to determine the car's movements. The authors also implemented a PID controller to improve the car's stability and speed control. In [3]. This project proposes a self-driving car system that uses a Raspberry Pi 3 board and a camera module. The system uses a convolutional neural network (CNN) to detect and classify objects on the road, and a machine learning algorithm to control the car's movements.

The authors trained the CNN using the Keras library and used TensorFlow to control the car's movements. In [4]. This project proposes a self-driving car system that uses a Raspberry Pi 2 board and a camera module. The system uses a deep learning model based on TensorFlow to detect and classify objects on the road, and a PID controller to control the car's movements. The authors trained the deep learning model using the TensorFlow library and used a Python code to implement the PID controller.

In [5]. This project proposes a self-driving car system that uses a Raspberry Pi 3 board, a camera module, and an Adafruit motor shield. The system uses a convolutional neural network (CNN) to detect and classify objects on the road, and a PID controller to control the car's movements. The authors trained the CNN using the TensorFlow library and used a Python code to implement the PID controller.

III. PROPOSED METHDOLOGY

Assemble robot body by assembling the chassis and wheels of robot car, solder the motors and fix them in the chassis, fix raspberry pi, Arduino Uno, motor driver and make the circuit connections as per circuit diagram. Prepare the sample track for the robot to run. Bundle operating system to raspberry pi along with the Raspbian OS and it to a 16GB Micro SD card and put it to the raspberry pi. Using ethernet cable connect the raspberry pi to the computer and enable Wi-Fi function of pi so that it can connect and access the Pi using Wi-Fi and VNC viewer which is installed on pi OS. Install open CV library in raspberry pi and access the pi using your pc and Wi-Fi and use the commands in the command terminal of raspberry pi to install Open CV library. Link the open cv library to Geaney editor (C++ compiler software of Raspberry Pi). Setup Raspberry pi camera and now adjust the camera position for best view and fix it on the robot car. Building a self-driving car using Raspberry Pi involves a complex set of tasks and requires expertise in programming, electronics, and mechanics. However, here is a general methodology that can help you get started with your project:

Choose the appropriate components: The first step in building a self-driving car is to select the right components. First need a Raspberry Pi board, a camera module, a motor driver board, motors, wheels, sensors, and other accessories.

- Assemble the hardware: After assembling the necessary components, need to assemble them into a car chassis. This step requires knowledge of mechanics and electronics.
- Connect the Raspberry Pi: To connect the Raspberry Pi to the motor driver board, sensors, and camera module. This step requires knowledge of electronics.
- Install the software: To enable the car to drive itself, you need to install the appropriate software on the Raspberry Pi. You can use programming languages such as C++ and libraries like OpenCV and TensorFlow to develop the software.
- Train the machine learning model: To train the machine learning model that the car will use to recognize obstacles and navigate itself. This step requires knowledge of machine learning and computer vision.
- Test the car: After assembled the hardware, installed the software, and trained the machine learning model, ready to test the car. use a remote control to drive the car manually or let the car drive itself.
- Refine the model: Based on the results of the testing, refine the machine learning model to improve the car's performance.
- Deploy the car: Once satisfied with the car's performance, deploy it and use it for various applications such as surveillance, navigation, and transportation.

The Raspberry-pi is the main core controller which will be attached on the vehicle. The module of pi-camera will be attached on the top of the prototype. The LN298 IC is used for the movement of the prototype. Computer Vision is utilized to find object in front of the prototype and take necessary movements. When there is any object in front of the prototype and is in a measurable distance from the prototype. The raspberry-pi gives instructions to the Arduino UNO and it gives orders to the L298N

Integrated Circuits to halt giving power to the tyres and therefor halts the movement of the prototype contingent on the nearness of the object. The displacement calculated is also showed on the output window of the program. The following process is finding of lanes and road traffic signs.
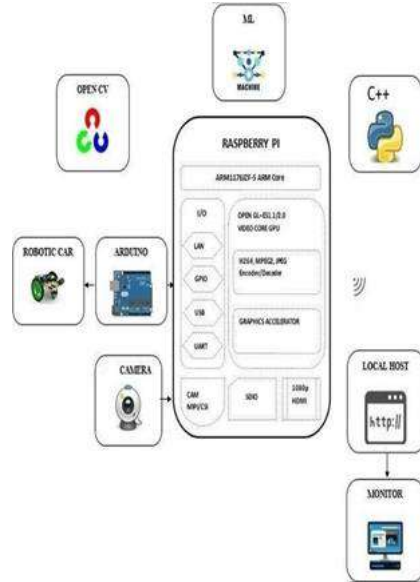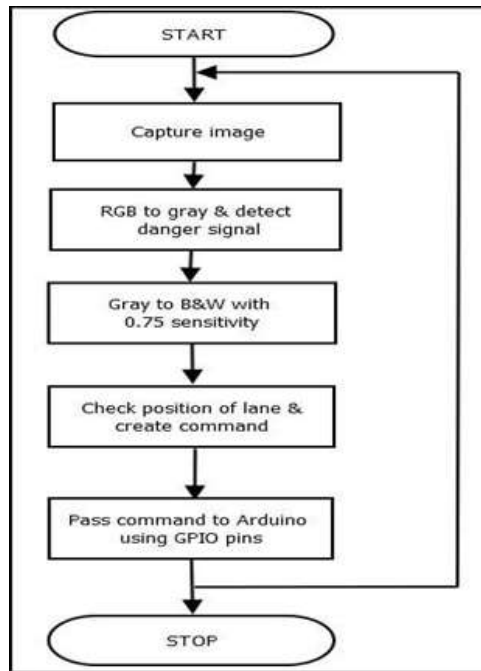
Fig 3.1: Block Diagram

Fig.2. Flow Chart

IV. HARDWARE COMPONENTS
- Raspberry Pi 3 B+

The processor used in the proposed system is the Raspberry Pi 3 B+ model with a 1.4 Giga hertz 64-bit quad- core processor. Raspberry Pi 3 B+ has 1 Giga Byte of Random Access Memory and has 40 pin General purpose Input /Output header. It consists of four Universal serial bus ports and a power input port

of 5V of 2.5A. It is applied in the proposed system as the core central processor to synchronize the functionalities, take suitable inputs and then take actions accordingly. Popularly called low value single board pc. we have a tendency to square measure mistreatment raspberry pi 3B+ version for image process. With the assistance of Open CV code, a machine learning algorithmic rule is enforced and also the pictures square measure trained in numerous lighting conditions mistreatment neural network technology. more the choices taken by the raspberry pi square measure sent as commands to Arduino.

- Aurdino Uno

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used a s PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller. Simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

- Pi-Camera Module

Pi camera module is used for the real world streaming of the feed ahead of the car and to take picture of the traffic signs and traffic signals on which processing is done by the Raspberry-Pi later. It uses a 8-mp sensor. It is mounted to the Raspberry-Pi 3 B+ via a fifteen cm height. Pi camera supports videos of 1080 pixel per 30 frames, 720 pixel per 60 frames and VGA 90 modes.

- LN298 Motor Driver IC

L298N motor driver Integrated Circuit is a dual full bridge driver Integrated Circuit which may manage 2 motors at the same time with separate inputs. The basic minimum supply voltage is 5V but the acceptable reserve energy are high as 45 volts and the highest output current per channel is at most 2 Ampere. It is needed to operate different types loads like 2 DC motors with directional and speed control. There are 4 input pins and output pins available. This circuits requires 12V input from DC power supply. This motor driver controls car speed and direction according to raspberry pi's instruction.

- Battery Pack

Building a self-driving car using Raspberry Pi requires a lot of hardware components and a reliable power supply. The Raspberry Pi can be powered by a 5V micro USB power supply or a 5V power bank. However, for a self- driving car project, a more powerful power supply is recommended. One option is to use a DC-DC converter that can step up the voltage from a 12V battery or a LiPo battery to provide stable 5V power for the Raspberry Pi and other components.

- LED

LED indicators square measure placed at the rear of chassis. Stop and overtake it by giving correct turning indications. Whereas taking U flip or if it detects Associate in Nursing. Obstacle indicator can have lit up to allow correct indications. Its programming are drop in IC 74LS164 and can be controlled through Arduino command.

V.SOFTWARE TOOL

- Raspbian OS

Of all the operating systems Arch, Risc OS, Plan 9 or Raspbian available for Raspberry Pi is shown in Fig 5.1, Raspbian comes out on top as being the most user-friendly, best-looking, has the best range of default software's and optimized for the Raspberry Pi hardware. Raspbian is a free operating system based on Debian (LINUX), which is available for free from the Raspberry Pi website.

Fig 5.1: Raspbian OS

- Arduino IDE

The Arduino IDE supports the languages C & C++ using special rules of code structuring. In the Fig 5.2 shows Arduino IDE supplies a software library from the wiring project, which provides many common input and output procedures which provide many common input and output procedures.

Fig 5.2: Arduino Tool

- OPEN CV

OPEN CV is the abbreviation for open computer-vision and is a library and is helpful for real-time optimized applications. It provides both, a trainer and a detector. Both, positive and negative results are feeding to obtain appropriate real-time detection of the traffic signs and pedestrians. It (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision. It has over 2500 optimized algorithms, including both a set of classical algorithms and the state of the art algorithms in Computer Vision, which can be used for image processing, detection and face recognition, object identification, classification actions, traces, and other functions.

VI.RESULT

Most of the experiments done are focussed on the task of detecting the variety of roads in different conditions. In order to do this, different tests were run on different images of the roads.
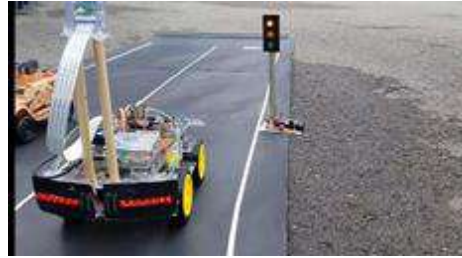
Fig 6: Result

In Fig 6the Lanes are detected successfully, obstacles are detected successfully and traffic signals are detected and according actions are taken. Key changes from base paper are Ultrasonic sensor is being replaced by open cv. The major demerits are their shorter range because of the disturbance of sounds in air, and their weak response time due to the weak propagation velocity. They are also majorly high flown by aerial variations, mainly by disturbances from air and car movement. LN293 Motor Driver IC is replaced by L298 Motor Driver IC. Arduino UNO is used to tackle Time delay while processing.
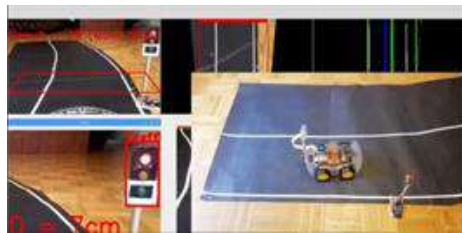

Fig 7. Detecting Traffic Signal

The first step in building a self-driving car using Raspberry Pi would be to assemble the necessary hardware components, including a Raspberry Pi board, a camera module, and other sensors such as ultrasonic sensors, infrared sensors, and so on. The camera module is crucial as it captures real-time video of the road ahead, which is then processed by the deep learning models.Next, a deep learning model would need to be trained to recognize different road signs, traffic signals, lane markings, and other objects on the road are shown in Fig 6.2. This can be done using a variety of deep learning frameworks such as TensorFlow, which can be installed on the Raspberry Pi board.

Once the deep learning model is trained, it can be deployed on the Raspberry Pi board to process the live video feed from the camera module in real-time. The output of the deep learning model can then be used to control the movement of the car, such as steering, braking, and acceleration.

Fig 6.3: Final Output

VII.   CONCLUSION

Driverless car revolution which aims at the development of autonomous vehicles for easy transportation without a driver. For the economy, society and individual business this autonomous technology has brought many broad implications. In this paper, a method is determined for marked road edges are

explained in detail relying upon OpenCV. Cars that drive themselves will improve road safety, fuel efficiency, increase productivity and accessibility. The driverless car technology helps to minimize loss of control by improving vehicle's stability as they are designed to minimize accidents by addressing one of the main causes of collisions: Driving error, distraction and drowsiness. The algorithm mention in this project has been successfully implemented in prototype of Autonomous car. The self-driving car project using Raspberry Pi is a promising development in the field of autonomous vehicles.

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AI AND ML BASED CHATBOT DEVELOPMENT FOR SMART DIGITAL MARKETING

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Abstract - In this growing technological era, there are many online Artificial Intelligence (AI) systems or Chat-bots which are in existence that helps the people to solve the problems. So, we are going to implement a Chat-bot that can solve any college related queries. Chat-bot is a computer application which may speak / text to human beings naturally, the way we interact with one another. Chat-bot has information stored in its database to identify the sentences and making a decision itself as response to answer a given question. In our proposed system, the user can get the information about the college fee structure, K-CET cut-off rank, scholarships, Exams, Hostel facility, Transport facility, branches offering and about the placements. It also stores the information (i.e. contact number & name) of a person who enquires. This helps the college to follow up them. Our chat- bot will be built using Python algorithm (Chatterbot, Flask & Chatterbot corpus) that analyses queries and understand user's message.

Keywords: Raspberry Pi 4, Artificial Intelligence Chatbot,Python Algorithm,Flask,Chatterbot Corpus.

I . INRODUCTION

Artificial Intelligence (AI) will become an integral part of every commercial entity across the globe inthe long term. The new trends in AI-driven automation reflect substantial changes in the AI landscape. It is evident in the form of reconfigured ideas, interests, and investments in the field of AI adoption by the enterprise. This technology is sophisticated enough to recognise faces and objects, which has enormous implications for various business applications. For security purposes, facial recognition can distinguish individuals; On the other hand, object detection can be used to distinguish and analyse images. AI treats human images like cookies, allowing for more personalised services based on customers preferences AI is primarily concerned with user retention and lead conversion in digital marketing. It can guide a user in the direction that aligns with the business's goals by using intuitive AI chat bots, intelligent email marketing, interactive web design, and other digital marketing services. Several factors determine the impact of AI on digital marketing. ML, a subset of AI, is concerned with computer programmes that accessdata and use it to learn independently... AI then uses the information to produce and deliver content relevant to the audience. AI software enables in-depth online analysis of restaurants and their customers. By implementing AI into marketing strategy, businesses can use the available data better and reach out to potential customers with attractive commercials at more convenient times.

Digital marketing gives a visibly pleasant experience for clients with AI for advertising across social media and digital platforms such as Facebook and Instagram... AI also assists marketers in identifying and forecasting trends. It prevents the company from overspending on digital advertising and ensures that the money is well spent. The ability of a computer to recognise objects, scenes, and activities in images is referred to as computer vision. Medical imaging analysis, face recognition, public security, and security monitoring are a few uses. If computer vision and AI are properly coupled, robots can predict what will happen in the future and act accordingly based on potential changes.

Chat-bot is an automated software program that interacts with humans. A chat-bot is merely a computer program that fundamentally simulates human conversations. This functions through IOT and python application. Chat-bots are programs that can do talk like human conversations very easily. For example, Facebook has a machine learning chat-bot

that creates a platform for companies to interact with their consumers through the Facebook Messenger application. According to research, nowadays chat- bots are used to solve a number of business tasks across many industries like E- Commerce, Insurance, Banking, Healthcare, Finance, Legal, Telecom, Logistics, Retail, Auto, Leisure, Travel, Sports, Entertainment, Media and many others. Thus, that was the moment to look at the chat-bots as a new technology in the communication field. Nowadays various companies are using chat bots to answer quickly and efficiently some frequented asking questions from their own customers. Chat-bot is a computer application which may speak / text to human beings naturally, the way we interact with one another. It can replace a persons for several tasks of answering queries. Chat-bot is an agent that interacts with users using simple language. Several applications of chat-bots like Customer Service, call centers etc. uses AI terminology to talk with user.

II.LITERATURE SURVEY

A literature survey is a comprehensive summary of previous research on a topic. The literature review surveys scholarly articles, books, and other sources relevant to a particular area of research. It should give a theoretical base for the research and help you (the author) determine the nature of your research. Prof. Ram Manoj Sharma [2] proposed a college enquiry chat-bot system which has been built by using Artificial Intelligence algorithms. The bot analyses user's query and understands user messages. The system has modules like Online chat- bot, Online Noticeboards etc.. P.Nikhila, G.Jyothi, K.Mounika, Mr. C Kishor Kumar Reddy and Dr. B V Ramana Murthy[3], they have designed using AIML (Artificial Intelligence Mark-up Language) to make response to queries. AIML is employed to make or customize alice-bot that could be a chat-bot application supported ALICE free code.Harsh Pawar, Pranav Prabhu, Ajay Yadav, Vincent Mendonca , Joyce Lemos[6] , a chat- bot is designed by them using knowledge in database. The proposed system has Online Enquiry and Online Chat-bot System. The development is done using various programming languages by creating a user friendly graphical interface to send and receive response. The main purpose is it uses SQL (Structured Query Language) for pattern matching which is been stored in program. Nitesh Thakur, Akshay Hiwrale, Sourabh Selote, Abhijeet Shinde and Prof. Namrata Mahakalkar [10], proposed an artificial chat-bot using NLP (Natural Language Processing) which can be done in two ways the first via written text and the second is via verbal or voice communication. Written communication is much easier than the verbal communication. This paper introduces an interest in some emerging capabilities for evolving speed understanding and processing in virtual human dialogue system .

III. PROBLEM STATEMENT

- Usually student enquire about colleges/university Before joining.
- On the other-side receptionist also can't convey all the details for the people who enquire.
- To overcome this problem, we are proposing a system which can provide all the necessary information for people.
- Students can get the information about the colleges either through website or receptionist of respective college.

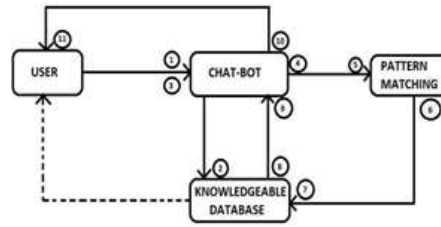Fig.1. Chatbot

IV.PROPOSED METHODOLOGY

Fig.2. System architecture of Chat-bot

Fig.3. Functional flow Chart

If a student wants to enquire about the college for admission or any competition held in the college can query using chat-bot. Given below is the system architecture of this chat- bot: The basic algorithm that will be implemented for working of this proposed system is as follows:

Step 1 : In the beginning ,the home screen of a college website is as shown below. Mainly consistsof two buttons namely

(i)Visitor

(ii)Administrator

Step 2: If a student wants to enquire about the college , they have to click on "Visitor"button to enquire. If clicked on "Visitor" button , user has to fill their details (Name , Contact number, Email ID , Gender & Branch interested .

Step 3: After filling and submission, the entered details will store in cloud database (FirebaseDB) and AI enabled chat-bot screen will enable.

Step 4: Get the input query from the user. The query is pre-processed. It will match the fetched keywords with the keywords in Knowledge base and provide an appropriate response. Further the Database module is used to call proper services to find respective response of the query. It returns the query response to the bot. Chat-bot packages the data into proper response for display to the User. If the user enters other than the pre- processed queries , it will give response as "I am sorry, but I do not understand" and it will notifies the admin. Step 5: The Admin can use this facility by clicking on "Administrator" button in the Home Screen of a College Website. It will ask for admin   login credentials (Username and Password).

Step 6: If Login credentials (Username and Password) are correct, then it display the Visitor's details (N a m e , Contact number, Email ID, Gender & Branch interested). In the form of table. So that Admin can access this and it helps the college to follow up them regardingadmission.

Step 7: The Admin   can view the New Queries which is not pre-processed by clicking on a button labelled as "New Queries" , so that Admin can update the respective response to the New Queries entered by the Visitors.

V.HARDWARE COMPONENTS

Raspberry Pi 4

Raspberry Pi 4 Model B is a single-board computer developed by the Raspberry Pi Foundation. It was released in June 2019 and is the latest addition to the Raspberry Pi family of devices. The Raspberry Pi 4 Model B features significant hardware improvements over its predecessor, the Raspberry Pi 3 Model B+, including a faster CPU, more RAM, and improved connectivity options. RAM: 1GB, 2GB, or 4GB LPDDR4-3200 SDRAM (depending on model)

Connectivity: Gigabit Ethernet, dual-band 802.11ac wireless, Bluetooth 5.0, BLE

Ports: 2 USB 3.0 ports, 2 USB 2.0 ports, 2 micro- HDMI ports (up to 4Kp60 supported), 3.5mm audio jack, 2 CSI camera ports, 2 DSI display ports, microSD card slot for loading operating system and data **storage Power**: 5V DC via USB-C connector (minimum 3A), or GPIO header (minimum 3A) Operating system: Raspberry Pi OS (formerly known as Raspbian), as well as a variety of other operating systems including Ubuntu, Kali Linux, and more. that can be used for a wide range of projects, including home automation, media centers, gaming.

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.
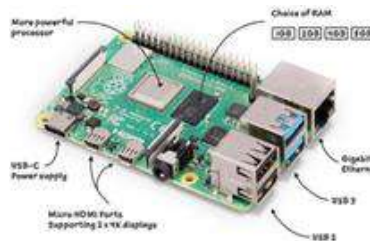

Fig.4. Raspberry Pi 4

Buzzer: An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.. The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal The multi resonator of this mainly includes ICs and transistors. Once the supply is given to this resonator, it will oscillate and generates an audio signal with 1.5 to 2.kHz. The impedance matcher will force the piezoelectric plate to produce sound.

Fig.5 LCD Display VI Software Requirements

Raspberry Pi Operating System: Python Programming is done in Raspberry Pi OS. Raspberry Pi OS (previously called Raspbian) is an officially supported operating system for RPIS. It is a 32-bit Linux (Debian) base OS that has been optimized to run on Pi systems and has been around since 2012. Raspberry Pi OS is free for download. On this site, you will notice that there are actually many different images that can be used with RPIS.

Fig.6 Raspberry Pi Operating System

MIT App Inverter

Fig.7. MPP App Inverter

LCD Display
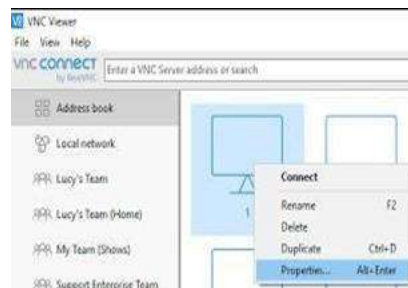
Fig.8. LCD Display

MIT App Inventor is an intuitive, visual programming environment that allows everyone – even children – to build fully functional apps for Android phones, iPhones, and Android/iOS tablets. Those new to MIT App Inventor can have a simple first app up and running in less than 30 minutes. A viewer, on the other hand, is a program that renders the contents of a digital file on screen. VNC Viewer is used for local computers and mobile devices you want to control. A device such as a computer, tablet, or smart phone with VNC Viewer software installed can access and take control of a computer in another location.

Advanced IP Scanner is a network scanner available for download on devices running Windows OS. Itis easy- to-use and can locate all computers on your local area network (LAN) within seconds. The free and reliable software comes integrated with Radmin and is designed to find both wired and wireless devices. You can also use the network scanner to access shared folders and to control computers remotely. Advance IP Scanner download also offers support for protocols such as HTTPS, HTTP, and FTP Using the software, you can scan for the name and group of NETBIOS. This function, as well assending remote commands to PCs, is only limited for devices running Windows.
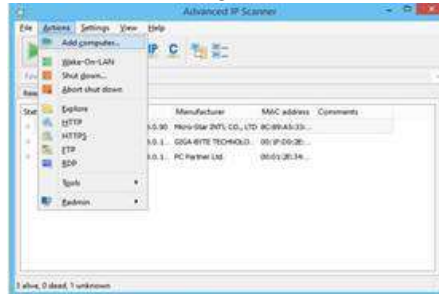

Fig.8 Advance IP Scanner Google Firebase

Google Firebase is a cloud data. It stores the queries and responses of customer. Firebase is a set of hosting services for any type of application (Android, iOS, Javascript, Node.js, Java, Unity, PHP, C++...). It offers NoSQL and real-time hosting of databases, content, social authentication (Google, Facebook, Twitter and Github), and notifications, or services, such as a real-time communication server.Firebase is a development platform for mobile and web apps.

VI. ADVANTAGES

- User does not have to go personally to college office for the enquiry.
- Easy to access.
- Chat-bot marketing give boost to admission.
- Time-saving.
- Available 24/7.Multiple user handling

VII. APPLICATION

Customer Service: Chatbot can be used to provide fast and efficient customer service.

Lead Generation: Chatbots can help generate leads by engaging potential customers in conversation and directing them to the appropriate products or services.

Sales Support: Chatbots can assist sales teams by answering product-related questions and providing relevant information to help close deals.

E-commerce: Chatbots can be used to provide a personalized shopping experience for customers.

Social Media Marketing: Chatbots can be integrated with social media platforms to provide a seamless experience for customers

VIII.FUTURE SCOPE

- In the future enhancement of our project, we can include speech based questions and responses.
- The users just need to provide voice-based input and the developed bot will provide the text based output.

IX. CONCLUSION

We have created a chat-bot in python through the ChatterBot library using the flask framework.

- The goal of our proposed system is to enquire and gather necessary information about the college in a simple way and stores the details of the user which may help the college to follow up them.
- We have developed a Chat-bot which will make a conversation between human and machine and will satisfy the questions raised by the user.

- The main motive of this project is to reduce the work load on the college's office staff and reduce the response time to a user's query

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Design and development of smart hot and cold-water dispenser using Node MCU

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Abstract: Technology is a never-ending process. The proposed system is to design a product using the current technology that will be beneficial to society. The water dispenser is a system which can be used to dispense drinking water at various work, public and commercial places. As per the health conscious, based on the people's requirement whether they need hot and cold water depend on this the system is designed. The system is developed in two ways as one is based on voice command through mobile and the another one is based on the manual way; this manual method is for the people who don't have the smartphone those people will give input through keypad. According to the above- mentioned methods, the dispenser will dispense the hot or cold water, and this system also avoids the wastage of water.

Keywords: Node MCU, Firebase, dispenser, Coin sensor, LCD display.

1.Introduction

Nowadays, we have remote controls for our television sets and other electronic systems, which have made our lives easy. Have you ever wondered about home automation which would give the facility of controlling tube lights, fans and other electrical appliances at home using a remote control. Wastage of water is the biggest problem in today's world. Water scarcity is one of the major problems which we are facing today. To overcome this problem, so a new system is designed called design and development of smart hot and cold-water dispenser using NodeMCU. The system is super cost effective and can give the user, the ability to control any electronic device without even spending for a remote control. The project helps the user to control hot or cold-water dispenser using his/her voice commands to smartphone. Time is a very valuable thing. Everybody wants to save time as much as they can. New technologies are being introduced to save our time. To save people's time we are introducing hot cold-water dispenser system. The system is fully based on voice commands sends from mobile to microcontroller and also the manual method. This water dispenser system also uses ultrasonic sensor, coin sensor, a relay, a pump, a keypad, LCD display, a rain sensor, solenoid valve, jars for storing water and a QR scanner.

In the proposed system we are using coin sensor for payment or QR scanner for the payment. If the payment is done through coin sensor then they should give input through keypad manually. If payment is done through QR scanner then the input is given using google mic in smartphone. The system uses ultrasonic sensor to detect the presence of glass then the sensor sends the signal to microcontroller and based on the voice it dispenses cold or hot water. The microcontroller processes the information to the ultrasonic sensor to determine where the glass is placed or not, an ultrasonic sensor sends the signal to the microcontroller about the presence of the glass. Once the glass/bottle is detected according to the input it will dispense hot or cold water. If person need a glass, he/she should pay for it. If there is an overflow of water then the rain sensor detects and stops the overflow of water. Rain sensor is used to detect the overflow of water and to reduce the wastage of water. This system can be used at home, offices etc. to get hot or cold water by just giving voice command.

II. Literature survey

Several papers have been referred to, for the development of the prototype described in this project. This section provides the description of the work done and presented by the author, that we have referred for this project. Although several references have been made, we have described five works that contributed greatly in development of this project. We have also described a similar piece of work to that of ours, and

how our system if far more superior than the former. Yudi Kristyawan et.al [1], "Automatic water dispenser based on hand gesture detection using Arduino", explains the methodology to overcome the problem of blind people to access the water dispenser. This system is based on hand gesture detection to choose hot water or cold water. The APDS-9960 gesture sensor is used to detect hand movements to select hot or cold water, and then a servo motor is used to open the water faucet. One of the water dispensers in the Indonesian market today is a dispenser with two faucets for hot and cold water. The water will flow after the user presses the faucet according to the desired type of water. This water dispenser with a manual faucet is considered impractical, especially during a pandemic, because users still have to press the water faucet on the dispenser so that it is prone to disease transmission. Therefore, it is necessary to do automation to prevent disease transmission through this dispenser faucet. The system is cost effective, easy to maintain, easy to implement, and this design can prevent disease transmission during the pandemic. Chootichai Hommalee et.al [2], "Development of cold hot water dispenser with thermoelectric module systems", this paper presents the cold hot water dispenser with a thermoelectric modulsystem (TMS). Here, for the cold-hot water dispenser with TMS in the test room temperature of 24°C (with air conditioning system), experiments were performed on the cooling capacity of the cold-hot water dispenser with TMS by considering the cold and hot water temperature variations with various cold-water consumption conditions (500, 1000, and 1500 mL). The cold and hot water temperatures obtained from the TMS as compared with those from the conventional CRS. it can be found that the cooling and heating capacities of the thermoelectric module are approximately 400 mL within a 5minute period time. Compared with the conventional electrical power generators, thermoelectric module offers many advantages, such as environment friendliness, reliability, and absence of moving parts. The Design and development of smart hot and cold-water dispenser using NodeMCU cold and hot sides of thermoelectric modules are developed and utilized, especially, to enhance cooling capacity in electronic components. On the other hand, the power input is a function of the cold and hot sides of thermoelectric modules, and the power consumption of these modules is high.

Almas quazi et.al [4], "ATM system for cold and hot drinking water and mobile charging" in this system the author explains the vending machine meth. It utilizes a holistic approach that overcomes many of the shortcomings of previously developed models and standards while building on the significant contributions previously made. It is based on microcontroller. The inputs to the microcontroller are coin and output in the form of water. When we put the coin in coin box camera catch the coin image camper to database using mat lab and give signal to ARM7. Microcontroller switched on relay and motor is on, when put the glass under the valve IR sensor is activate gives output in the form of water. After paying, the paid product becomes available by the time the machine releases it at the bottom of the vending machine. Example for the service vending machine is the Automated Teller Machine. The model described in this project provides a methodology that will help the person to easily fetch the water from the system, this model can be used in public places and it can be accessible by a common people no need of instructor. Ratna Aisuwarya et.al [5], "Implementation of Ziegler-Nichols PID Tuning Method on Stabilizing Temperature of Hot-water Dispenser" in this paper authors explains the PID tuning method. The low-cost dispenser has disadvantages such as unable to maintain the water temperature to remain stable. To brew hot drinks such as coffee and tea require a specific range of temperature of 90 - 96 °C. There are still some drawbacks when controlling the temperature stability in the dispenser. For this purpose, they proposed a dispenser that can maintain the stability of hot water temperature. This dispenser will make it easier for users to brew coffee and tea with the ideal water temperature and produce a stable temperature that produces a good quality drink. The designed system uses water resistant temperature sensor. Voltage control is applied to the heating element using the Ziegler-Nichols PID Tuning Method in order to control the temperature stability. Experimental results show that the system can maintain the temperature of hot water in the dispenser to keep it stable with a range from 92.31 °C to 92.62 °C, while the system without controller

unable to maintain the stability of hot water temperature because the hot water temperature reaches a maximum temperature of 95.62 °C exceeding the set point of 92 °C. The system is flexible, easy to implement, it is beneficial to maintain the temperature of hot water to be stable and that provides a good quality drink.

III. Methodology

The proposed system consists of NodeMCU as microcontroller, ultrasonic sensor, coin sensor, rain drop sensor, a relay, solenoid valves, heating coil, LCD display, QR scanner, power supply. Using these components, the system is designed as shown in Fig.1.
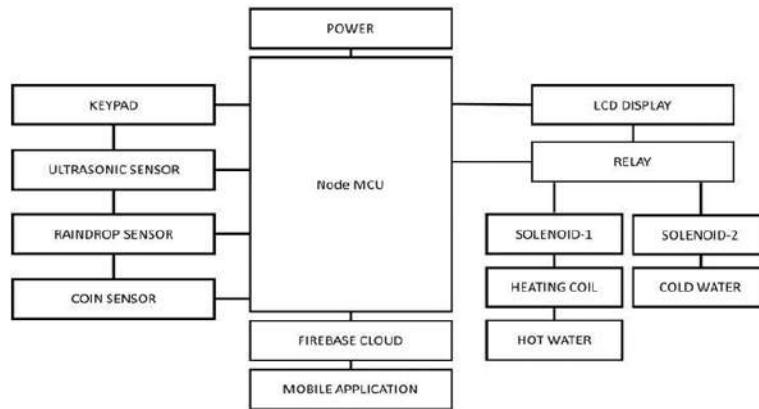
Fig.1: Block diagram of proposed system

In the proposed system NodeMCU is the microcontroller all other components are interfaced with it. The keypad is to give manual input. The ultrasonic sensor is to detect whether the glass or bottle is placed or not. Rain drop sensor to send the signal whenever water spills out. Coin sensor to insert the coin to dispense water. LCD to display the input message. Relay acts as the switch in which the solenoid valve should open according to the input. QR scanner to do online payments. Firebase stores the data of online payment details.
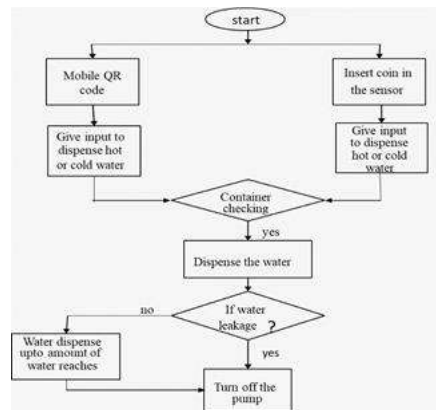

Fig.2. Flow chart

In the proposed system we are using coin sensor for payment or QR scanner for the payment as shown in Fig 3.2. If payment is done through coin they should give input through keypad manually. If payment is done through QR scanner then the input is given using google mic. The system uses ultrasonic sensor to detect the presence of glass, then the sensor sends the signal to microcontroller and based on the voice it dispenses cold or hot water. The microcontroller processes the information to the ultrasonic sensor to determine whether the glass is placed or not, an ultrasonic sensor sends the signal to the microcontroller

about the presence of the glass. Once the glass or bottle is detected according to the input it will dispense hot or cold water. If person needs a glass, he or she should pay for it. If there is an overflow of water then the raindrop sensor detects and stops the overflow of water. Rain drop sensor is used to detect the overflow of water and to reduce the wastage of water.

IV. Results

The people who can access the dispenser through smartphone user can access it by paying the amount through QR scanner and can give voice command through the user's smartphone then user can place the bottle, so that the water will be dispensed based on user input. The people who can access dispenser through manual mode user can access it by paying the amount through coin sensor and can give input through the keypad then user can place the bottle or glass so that the water will be dispensed based on the user input.

Fig.3. Prototype model

V. Conclusion

The implementation of this proposed system overall is successful. The motive of making the project is user-friendly, to avoid the wastage of water is considered and achieved. The proposed system is created with the use of different sensors like coin sensor, rain drop sensor, ultrasonic sensor, Nodemcu esp32 as a controller, keypad to get input from user and an app to get voice command from user smartphone. The system implementation is based on the Nodemcu Esp32 microcontroller, which has been programmed to control hot and cold-water dispenser valves based on sensor signals and on direct commands by the user.

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POWER STATION MONITORING USING PLC

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Abstract: The efficiency of power systems is largely determined by the effectiveness of the inbuilt power equipment. Monitoring transmission parameters for faults and quick isolation of the system from faults helps to improve the efficiency of the power system's reliability. Current conventional method has its limitations due to the reliance on the technical team to carry out a visual inspection in order to identify any fault. In this project we use plc and Arduino interface technology, to provide a reliable monitoring and fault detection system. Appropriate designed specific sensors are used to monitor the changes in transmission parameters such as voltage, and current. With this system, power transmission faults can be detected and isolated in the shortest possible time.

Keywords: PLC along with avr mc, transmission, current sensors

I. Introduction

Electrical equipment is prone to disturbances which are faults imposed on the system such as overloading and short circuit. This in turn causes damage to the power equipment in the powersystem and also at the consumer's end. The impact can bring about a short or long-term loss of electric power in an area. Continuous attention to power transmission faults is very vital in power systems, avoiding harm and instability to the system. Whenever the power in the transmission line reaches above the expected level/safety level, the system trips of the load from the transmission line and check for the circuit until the short is been rectified or not. If the short is rectified the load will get attached to the transmission line, or else the system check the transmission line for a few more time say, repeats the process for 5 times until the short is been rectified. If in case the short is not been rectified the system shutdown automatically. Where it can turned on manually after the rectification of the short that is present in the circuit. Where it can turned on manually after the rectification of the short that is present in the circuit.In the proposed system we will be using voltage and current sensors for the analyses of the power. So when the power raises above the safety level maximum power flows through the circuit, when the power in the circuit is lesser than the safety level means that the power in the transmission line is minimum ie,.. zero current flows through the circuit. This systems can be used in home, industrial sector, public sectors etc.

II. Literature survey

Several papers have been referred to, for the development of the prototype described in this project. This section provides the description of the work done and presented by the author, that we have referred for this project. Although several references have been made, we have described five works that contributedgreatly in development of this project. We have also described asimilar piece of work to that of ours, and how our system if far more superior than the former. Fatima Mumtazhas[1] has proposed on project named "Real-Time, PLC based, Energy Monitoring System" where the system correctly fetches data from the three-phase supply network through Ethernet and Modbus TCP communication. The system logs the measured and calculated electrical data in a relational database, creating a record of the data for analysis.

The SCADA developed allows the operator to view the logged data in a graphical form. It also allows data to be viewed in tabular form and to search data between two data's. The data logged can be viewed and analysed to take measures to save power and minimize its wastage. The logged data also gives an idea of the load distribution in the three phases of the supply. Any sudden changes in power values at any point in time, is also recorded. Advantage: observing the parameter change is made easy with the help of SCADA.

Goran H. Ismail, Bilal A. Mubdir, Asso R. Majeed, Asaad M. Jassim Al-Hindawi[2] has proposed a project on "Monitoring and Controlling Electric Power Stations Using GSM Network" where the system which helps in monitor of voltage, current, and temperature changes at the mainstation and the substation if there is any fault detected (with the help of PLC) it will send the message via the GSM to the authoritative person to take immediate action for the fault.

Advantage: observing the parameter change is made easy with the help of SCADA. P.Thamarai, and R.Amudhevalli [3] has done project on "Energy Monitoring System using PLC & SCADAS" This project helps in the monitoring of data or power station monitoring by developing a web based control and remote monitoring system where people can monitor power station parameters at there convenient places.

Advantage: monitoring of power station at a distant place is possible.

III. Methodology

The circuit diagram of the proposed system is shown below in Fig.1
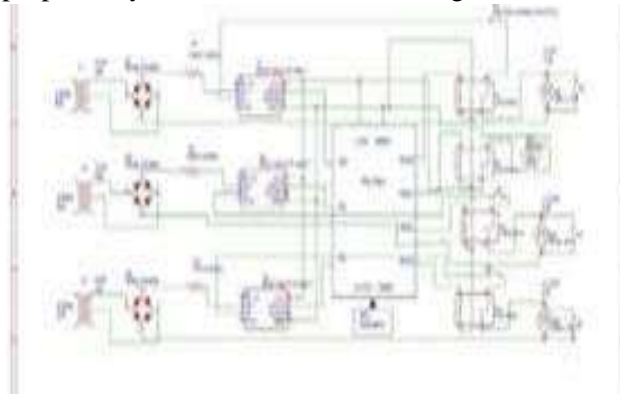
Fig.1 circuit diagram of the proposed system

The proposed system consists of PLC along with the AVR microprocessor, relays, DC load (motor),Current and voltage sensors. In this system PLC along with the AVR is the main microcontroller whereas the other components are been interfaced with it. The flow diagram of the process is shown below.
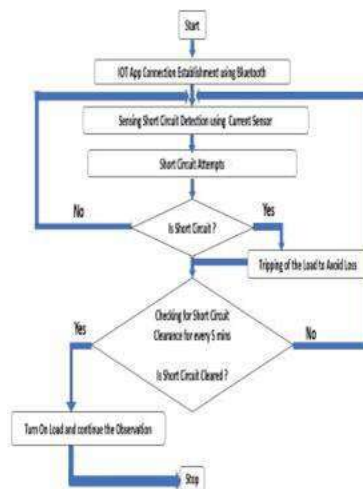

Fig.2 flow diagram of the proposed system

- The sensors will continuously observe the changes in the parameters such as current and voltage from the power station. These changes are been monitored by the PLC along with AVR microcontroller. If there is a change in these parameter the plc which is used as a controller controls the power station by shutting down the — can alert the authoritative person using buzzer and lights/bulb or motor

- High voltage transmission lines are the major part of the electrical distribution system, as they provide the path to transfer power between generation and load.
- Transmission lines operate at voltages levels from 69kV to 765kV, and are ideally tightly interconnected for a most reliable operation.
- This system ie, a transmission protection system is designed to identify the faults and isolates the faulted section with the help of PLC These transmission faults are detected with the help of current and voltage sensors.
- If any short circuit occurred in transmission lines the current rating will automatically be increased.
- The high current rating will be sensed by the sensor and gives the input to the PLC.As per the PLC logic program of the PLC. The system gives an output signal.

IV. Results

By using this proposed system we can monitor the amount of current or power that is been passed into the load and control the damage that occurs during the current transmission in the high voltage transmission line whenever the short occurs during the transmission.

V. Conclusion

Using this system we can detect the of the fault that occurred during the overhead HV power transmission line by PLC. To provide an uninterrupted power supply and short circuit protection in transmission lines. Thus by this system, we serve the power efficiently to the people.

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[1]. Fatima Mumtaz has done a project on "Real- Time, PLC based, Energy Monitoring System" which was published at the 2015 Annual IEEE India Conference (INDICON) in Delhi.

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[3].P.Thamarai, R.Amudhevalli has done a project on "Energy Monitoring System using PLC & SCADAS" which was published in the International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering.

EV BMS WITH CHARGE MONITOR AND FIRE PROTECTION

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Abstract- The Main objective of this project is to detect the any abnormal fault in the lithium-ion battery. The purpose of our research is to use ATmega328P and sensors like smoke sensor, temperature sensor to monitor the parameters like temperature, leak gases in surrounding of Lithium-ion battery of Electric vehicle. And protect it from unwanted situations occur during charging and discharging also with the help of the system makes use of a li ion Battery, Battery charging and monitor system, Push Buttons, LCD Display, current sensor, voltage sensor, temperature sensor to develop this system. The system monitors as well as protects an EV battery at all times. We here develop the system as per a 3S li ion battery. The system we design will not only monitor the battery and charge it safely but also protect it to avoid accidents from occurring. The system when turned on uses its charging and monitoring circuitry that allows user to safety charge the 3S battery.

Index Terms – PCB Board, Heat, LCD (Liquid Cristal Display), cable Fault, sensors, Digital Data, Solenoid valve and Lithium-ion battery

I. INTRODUCTION

The safety of lithium-ion batteries in vehicles could be a priority of the automotive industry. The main focus of the event activities are the reduction of the risks and also the improvement of the protection ideas and systems. Constant observance of battery parameters like temperature, gas level, and voltage, current can alert the system for any abnormal or worse condition of emergency.

As these conditions could lead into battery hearth or battery explosion early indication of such activates become terribly important.

If in sensible case fire or any accidental impact on the battery may cause the interior tangency of the battery which leads into excessive warming of the battery that leads into explosion and fire.

Our good sensor-based network can keep batteries incessantly monitoring. This method are going to be very helpful for saving the precious lifetime of the motive force.

Electric vehicles (EV) are playing a key role because of its zero-emission of harmful gases and use of efficient energy. Electric vehicles are equipped by a large number of battery cells which require a effective battery management system (BMS) while they are providing necessary power.

The battery installed in a electric vehicle should not only provide long lasting energy but also provide high power. Lead-acid, Lithium-ion, -metal hydride are the most commonly used traction batteries, of all these traction batteries lithium-ion is most commonly used because of its advantages and its performance.

The battery capacity range for a electric vehicle is about 30 to 100 KWH or more. Battery management system (BMS) makes decisions based on the battery charging and discharging rates, state of charge estimation, state of health estimation, cell voltage, temperature, current etc.

II. LITERATURE SURVERY

[1]. The idea of dedicated planned model of Battery protection system of work unit came from the incident once we watch countless news on catching fireplace in EVs. As transport is a elementary demand of contemporary life, however the normal combustion engine is quickly changing into outdated. hydrocarbon or diesel vehicles are extremely polluting and are being quickly replaced by totally electric vehicles. [2]. Totally electric vehicles (EV) have zero pipe emissions and are far better for the environment. the electrical vehicle revolution is here. thus, safety of EVs is most important. and therefore, the combination of electrical and electronic information will do this terribly effectively. Growing population and demand of safe travel is necessity of any person. As we have a tendency to all recognize that India is a developing

country and therefore the weather of India is heat most of time. These factors produce a problem on EVs. thus, for the demand and problem, we review count. To scale back the thermal runaway, the potency of gas fire extinguisher ought to be sensible on suppressing lithium-ion battery fireplace. the current work is to mix a gas fire ending agent (C6F12O) with the water mist system for LIB fire suppression, such the battery flame is initial controlled by the extinguisher and therefore the water mist is then applied for effective cooling of the battery

In [4]. This project proposes Battery operational in higher temperature have an adverse impact on the performance as well as fast capability fade and aging. Similarly, the decline of battery performance results from reduction of the activity of conductor material and lithium-ion diffusion rate within the solution and therefore the conductor material. Temperature distribution non uniformity throughout the one battery or pack is additionally a crucial operational index which can cause chemical science imbalance over time, and accelerate the capability loss and premature aging.

In [5]. This project proposes aa whole power management system IC with full integration, high-precision and high- reliability for battery pack which might monitor and defend the system is demonstrated, achieving lower application costs. The IC protects the battery from over-voltage, over- current and overtemperature once charging and discharging with 0.5 mV discrimination accuracy.

In [6]. The outline of previous battery abuse experiments with overheating, overcharging and nail penetration all indicated the presence of dioxide within the vent-gas. At identical time, CO, H2 and VOCs were found in several batteries abuse experiments, however lacked consistency across completely different testing conditions. Considering the early presence in first emanation, sensible consistency, ability to notice cell outflow and detector feasibility, CO2 was hand-picked because the indicator for gas venting events.

The system makes use of a li ion Battery, Battery charging and monitor system, Push Buttons, LCD Display, current sensor, voltage sensor, temperature sensor to develop this system. The system monitors as well as protects an EV battery at all times..We here develop the system as per a 3S li ion battery. The system we design will not only monitor the battery and charge it safely but also protect it to avoid accidents from occurring. The system when turned on uses its charging and monitoring circuitry that allows user to safety charge the 3S battery.

The temperature sensor is used to monitor temperature of battery while charging as well as discharging. If the battery temperature is observed to deviate from standard values, the system automatically cuts off input as well as output supply and displays the temperature as well as a buzzer alert on

III. PROPOSED METHDOLOGY

Electric vehicles surely are the future of transportation, but ev technology has not been fully developed with respect to efficiency and safety as of 2022. We come across electric vehicle battery fire and similar incidents as the EV market expands. Most electric vehicle fire incidents occur due to battery blast or fire.

So here we attempt to solve the problem by using some sensors and battery pack based system powered by an STM32 controller. bThe system is designed to protect batteries from various parameters that may incite a fire. The system is designed to constantly monitor battery voltage current temperature and instantly cut off the input or output from battery as soon as any unusual behaviour is detected. This System provides the following advantages:- Battery Status Monitoring and Display • Charging of Battery as per required input parameters • Temperature monitoring with auto cut-off the voltage, whereas the output is the switches, analog voltage signal, a current signal, or an audible signal. Sensors are devices that can sense or identify and react to certain types of electrical or optical signals. The implementation of a voltage sensor and current sensor techniques have become an excellent choice for the conventional current and voltage measurement methods.
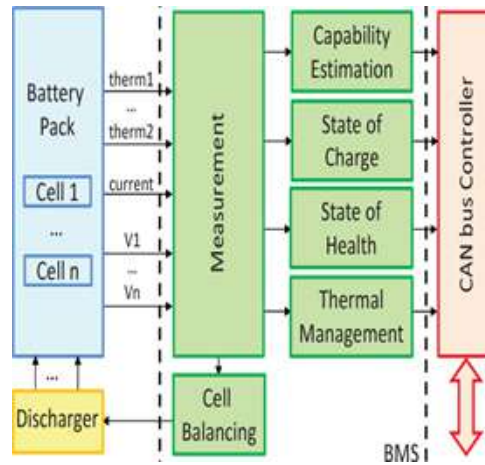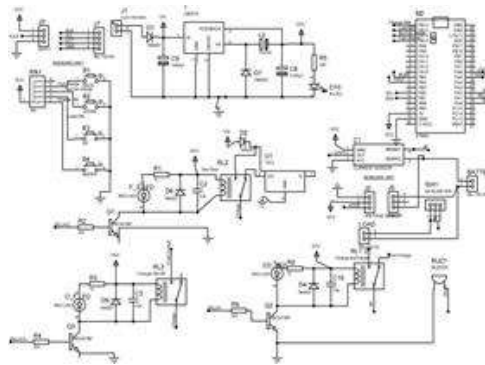
Fig.1. Block Diagram

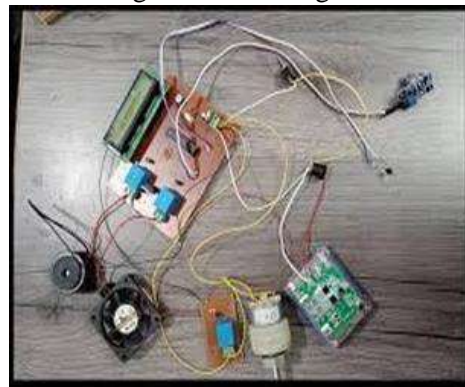## IV. INTERNAL CIRCUIT

Fig.2. Circuit Diagram

Fig.3. ACTUAL MODEL OF EV BMS CHARGE MONITOR

V. HARDWARE COMPONENTS

STM32 Controller

The STM32 family of 32-bit microcontrollers based on the Arm Cortex®-M processor is designed to offer new degrees of freedom to MCU users. It offers products combining very high performance, real-time capabilities, digital signal processing, low-power / low-voltage operation, and connectivity, while maintaining full integration and ease of development. The unparalleled range of STM32 microcontrollers, based on an industry-standard core, comes with a vast choice of tools and software to

support project development, making this family of products ideal for both small projects and end-to-end platforms. Read more about the benefits of the 32-bit Arm Cortex-M7 processor for MCUs.

Temperature Sensor

Temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. There are many different types of temperature sensors. Some temperature sensors require direct contact with the physical object that is being monitored (contact temperature sensors), while others indirectly measure the temperature of an object

Voltage Sensor

A voltage sensor is a sensor used to calculate and monitor the amount of voltage in an object. Voltage sensors can determine the AC voltage or DC voltage level. The input of this sensor is the voltage, whereas the output is the switches, analog voltage signal, a current signal, or an audible signal. Sensors are devices that can sense or identify and react to certain types of electrical or optical signals. The implementation of a voltage sensor and current sensor techniques have become an excellent choice for the conventional current and voltage measurement methods.

Current Sensor

A current sensor is a device that detects and converts current to an easily measurable output voltage, which is proportional to the current through the measured path. There are a wide variety of sensors, and each sensor is suitable for a specific current range and environmental condition. Among these sensors, a current sensing resistor is the most commonly used. It can be considered a current-to-voltage converter, where inserting a resistor into the current path, the current is converted to voltage in a linear way. The technology used by the current sensor

LCD Display

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

LCDs were a big leap in terms of the technology they replaced, which include light-emitting diode (LED) and gas-plasma displays. LCDs allowed displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. Where an LED emits light, the liquid crystals in an LCD produces an image using a backlight. As LCDs have replaced older display technologies, LCDs have begun being replaced by new display technologies

Li ion Battery

Lithium-ion batteries are currently pervasive across portable electronics and electric vehicles, and are on the ascent for emergent technology segments including grid storage, long- haul/heavy-duty transportation, and electric aviation. This is, however, predicated upon safe operation of lithium-ion batteries under operational extremes including extreme fast charge and untoward abuse scenarios that may lead to thermal runaway catastrophes. In this regard, it is imperative to understand the mechanistic implications of underlying thermo- electrochemical interactions at hierarchy of scales in the resulting thermal safety consequences. This presentation will provide an overview of mechanism-driven safety physics and analytics for delineating thermal stability signatures in lithium-ion battery chemistry and beyond.

LED

LED indicators square measure placed at the rear of chassis. Stop and overtake it by giving correct turning indications. Whereas taking U flip or if it detects Associate in Nursing. Obstacle indicator can have lit up to allow correct indications. Its programming are drop in IC 74LS164 and can be controlled through Arduino command.

VI. SOFTWARE TOOL

XILINK ISE SOFTWARE

Xilinx ISE (Integrated Synthesis Environment) is a discontinued software tool from Xilinx for synthesis and analysis of HDL designs, which primarily targets development of embedded firmware for Xilinx FPGA and CPLD integrated circuit (IC) product families. It was succeeded by Xilinx Vivid. Use of the last released edition from October 2013 continues for in-system programming of legacy hardware designs containing older FPGAs and CPLDs otherwise orphaned by the replacement design tool, Vivid Design Suite.

ISE enables the developer to synthesize ("compile") their designs, perform timing analysis, examine RTL diagrams, simulate a design's reaction to different stimuli, and configure the target device with the programmer. Other components shipped with the Xilinx ISE include the Embedded Development Kit (EDK), a Software Development Kit (SDK) and Chip Scope Pro.

The Xilinx ISE is primarily used for circuit synthesis and design, while ISIM or the Model Sim logic simulator is used for system-level testing. As commonly practiced in the commercial electronic design automation sector, Xilinx ISE is tightly-coupled to the architecture of Xilinx's own chips (the internals of which are highly proprietary) and cannot be used with FPGA products from other vendors. Given the highly proprietary nature of the Xilinx hardware product lines, it is rarely possible to use open source alternatives to tooling provided directly from Xilinx, although as of 2020, some exploratory attempts are being made.
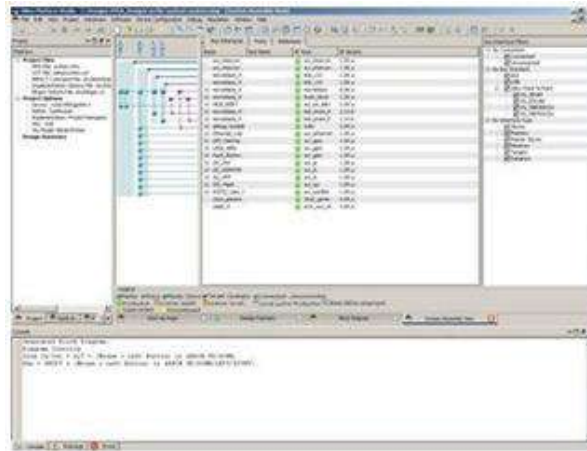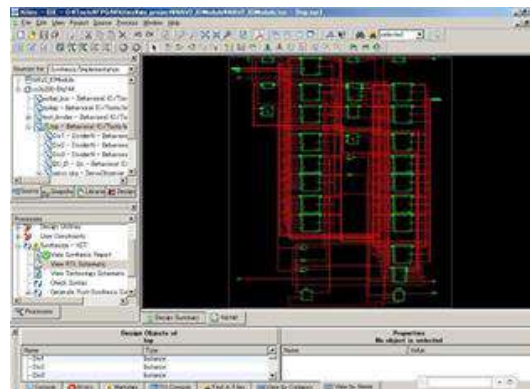

Fig.4. XILINK SOFTWARE

Fig.5. XILINK Tool

VII. CONCLUSION

The final approach for making this hardware modules is to give a easy way of protection. We tried to fulfil almost all the missing requirement for these types of platforms make this hardware modules as much as:

- Flexible
- User friendly
- User interactive

Latest use of technology After all this feature there is lot, more scope left in this platform so the development will continue.

The global electric vehicle market is expected to reach $1,299.3 billion by 2030, representing a 2020-2030 CAGR of 19.8%. The Indian electric vehicle ecosystem market provides detailed market information for segmentation such as batteries, propulsion type, charger type, separator, and region. The purposeof this market analysis is to examine the electric vehicle ecosystem market outlook in terms of factors driving the market, trends, technological developments, and competitive benchmarking, among others.

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Design and Simulation of PID controller based on the Q-Learning algorithm for a BLDC motor

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Abstract- The objective of the project is to represent reinforcement learning (RL) is an extensively applied control method for the purpose of designing intelligent control systems to achieve high accuracy as well as better performance. In the present article, the PID controller is considered as the main control strategy for brushless DC (BLDC) motor speed control. For better performance, the fuzzy Q-learning (FQL) method as a reinforcement learning approach is proposed to adjust the PID coefficients. A comparison with the adaptive PID (APID) controller is also performed for the superiority of the proposed method, and the findings demonstrate the reduction of the error of the proposed method and elimination of the overshoot for controlling the motor speed. MATLAB/SIMULINK has been used for modeling, simulation, and control design of the BLDC motor.

Index Terms – Fuzzy logic ,BLDC motor, Reinforcement learning, Q-learning;

I. INTRODUCTION

A BLDC motors have many advantages, including high efficiency, higher torque-waited ratio, high dynamic response, and long operating life. Hence the BLDC motor was employed in many industrial applications, including electric automotive and robotics. PID controller is a popular used controller in various industries because of no need for an in-depth understanding of the system dynamics and its simple structure. On the other hand, it suffers from the inadequate adjustment of gains. During the use of the PID controller, determining the appropriate PID coefficients is probably challenging in the case of the existence of various nonlinearities and uncertainties, including hysteresis, friction, payload variations, etc.

The parameters of the controller have been automatically tuned in auto-tuning PID and APID control according to the alterations of process parameters. The desired speed tracking and control system performance could be affected by all these factors. This issue can be addressed through applying intelligent control approaches, including fuzzy control, adaptive control, and neural networks. s. Many tuning approaches and discussions were presented in. Moreover, it is possible to discover countless research articles focusing on auto-tuning PID control, APID control, auto- tuning PID-type fuzzy control, etc. in the existing literature. This article combines conventional PID control and fuzzy Q- learning to achieve the self-tuning. PID-type fuzzy Q-learning control strategy which is utilized to the BLDC motor device and has the same benefits of an ordinary PID structure and are easy to omit the system error and overshoot as well as possesses excellent robustness to parameter interference and alteration.

II. LITERATURE SURVERY

In [1].This project proposes they presented a comparative evaluation of the proportional integral, sliding mode and fuzzy logic controllers for applications to power converters.

Logic controller and sliding mode controller. Logic controller and sliding mode controller. Sensitivity of these controllers to supply voltage disturbances and load disturbances is studied and results are presented. This paper explores the potential and feasibility of FLC control for power electronic circuits.

In [2].This project proposes an advanced pitch angle control start. For limiting the aerodynamic power captured by the wind turbine based on the fuzzy logic is proposed for the variable speed wind bine at the high-wind speed regions, several pitch angle control turbine systems, in which the generator output power and speed methods have been suggested.

In [3]. This project proposes the proportional integral (PI) are used as control input variables for the fuzzy logic controller (FLC). The pitch angle reference is produced by the FLC, which can compensate for the

nonlinear characteristic of the pitch controllers have been often used for the power regulation. The PID family of controllers failed to perform satisfactorily under parameter variation, nonlinearity, and load disturbance.

In[4]. This project proposes a proposed various aspects of digital fuzzy logic controller (FLC) design and implementation are discussed. Classic and improved models of the single-input single- output (SISO) multiple-input single-output (MISO) and multiple input multiple-output (MIMO) FLC'S are analysed in terms of hardware cost and performance. In [5]. This project proposes a rule-based fuzzy logic controller to control the output power of a pulse width modulated (PWM) inverter used in a stand-alone wind energy conversion scheme (SAWECS). The self-excited induction generator used in SAWECS has the inherent problem of fluctuations in the magnitude and frequency of its terminal voltage with changes in wind velocity and load. The paper presents modelling, simulation, and experimental results of the standalone wind energy conversion scheme.

III. PROPOSED METHDOLOGY

The merits of the BLDC motor, when compared to the DC motor, have higher reliability, lower electromagnetic interference (EMI) and lower maintenance costs The various fields of applications of BLDC Motor are aerospace applications, domestic applications, industrial automation sector, medical, textile industry and digital control machine tools. Generally, the BLDC Motor consists of three stator windings and permanent magnets on the rotor. BLDC Motor is stated as the trapezoidal back EMF permanent magnet synchronous motor. The line-to-line voltage equation is expressed in Eq. (1).

$$\begin{bmatrix} V_a \\ V_b \\ V_c \end{bmatrix} = \begin{bmatrix} R & 0 & 0 \\ 0 & R & 0 \\ 0 & 0 & R \end{bmatrix} \begin{bmatrix} i_a \\ i_b \\ i_c \end{bmatrix} + \begin{bmatrix} L-M & 0 & 0 \\ 0 & L-M & 0 \\ 0 & 0 & L-M \end{bmatrix} \begin{bmatrix} \frac{di_a}{dt} \\ \frac{di_b}{dt} \\ \frac{di_c}{dt} \end{bmatrix} + \begin{bmatrix} e_a \\ e_b \\ e_c \end{bmatrix} \qquad (1)$$

Where Va, Vb, Vc represents the phase voltages of BLDC Motor in Volts

R represents the resistance of stator Windings in ohms,

ia, ib, ic represents phase currents of the motor in amperes, L represents the Self Inductance in Henry,

M represents the mutual inductance.

ea, eb,ec denotes the trapezoidal back EMF of each phase in volts

The Fig.1 shows the Simulink diagram for speed control of BLDC Motor.
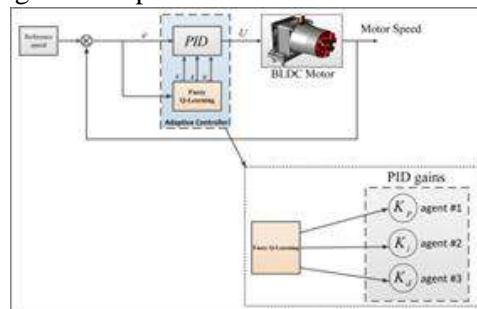

Fig 1.The structure of the self-tuning PID-type fuzzy Q-learning adaptive controller.

IV. SOFTWARE TOOL MATLAB

We use MATLAB in our project. MATLAB is a high-

performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment whereproblems and solutions are expressed in familiar mathematical notation. In MATLAB, you can design and tune a PID controller using the built-in Control System Toolbox.

What can you do with MATLAB?
- Analise data
- Develop algorithms
- Create models and applications

The language, apps, and built-in math functions enable you to quickly explore multiple approaches to arrive at a solution. MATLAB lets you take your ideas from research to production by deploying to enterprise applications and embedded devices, as well as integrating with Simulink® and Model-Based Design.

- It is easier to use than other languages.
- Inbuilt keywords, therefore, easier statements.
- Inbuilt libraries.
- Memory/data type allocation is not needed.
- Debugging of errors is easier.
- Display tools (outputs are easily understandable)

MATLAB SIMULINK

Simulink is a MATLAB-based graphical programming environment for modeling,simulating and analyzing multidomain dynamical systems. Its primary interface is a graphical block diagramming tool and a customizable set of block libraries. It offers tightintegration with the rest of the MATLAB environment and can either drive MATLAB orbe scripted from it. Simulink is widely used in automatic control and digital signal processing for multidomain simulation and model-based design.

V. RESULT

Designed the optimal PID Controller for Control speed in BLDC Motor. The proposed Controller is compared with Existing methods like PI Controller, PID Controller. The results of the proposed controller are promising in terms of quick settling time, zero peak overshoot and zero steady state error. Analyze the performance of speed in BLDC Motor.
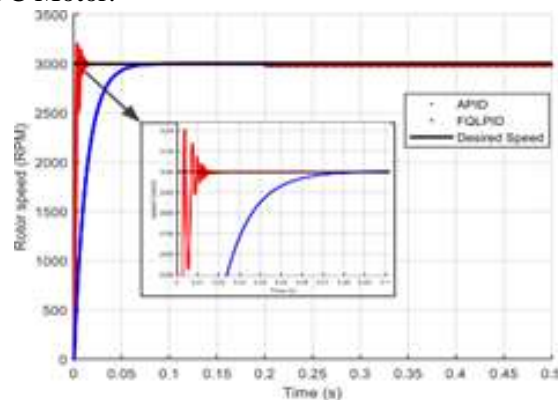

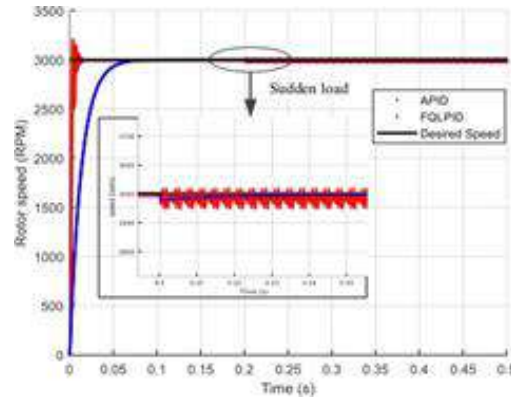Fig 2. Speed responses of controllers

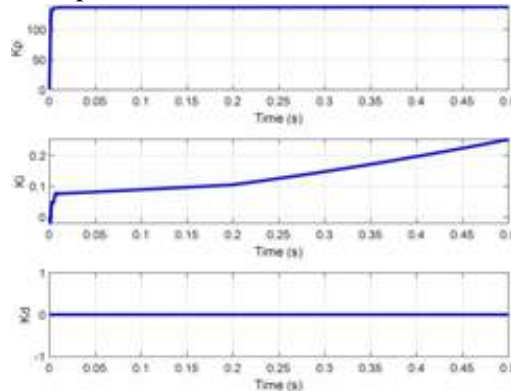Fig 3. speed response of controllers with sudden load for case 2

Fig 4. PID gain and adaptive PID controller for case 1

VI. CONCLUSION

The numerical simulation of the BLDC motor has been realized to the desired reference speed. The simulation of the system applying the adaptive PID (APID) as well as the self-tuning PID-type fuzzy Q-learning adaptive controller (FQLPID) was performed by MATLAB/SIMULINK software. The resulted figures illustrate the best performance of the self-tuning PID-type fuzzy Q-learning adaptive controller among the conventional adaptive PID with regard to both the amplitude of the oscillations and steady-state error. The proposed controller results in the desired system without the overshoot. It can be inferred from the obtained results that the proposed controller is more effective than others.

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Wearable Device for Child and Women Safety using IOT for Heterogeneous Environment

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Abstract- Women and children today deal with a variety of problems, including sexual attacks. Such brutality will undoubtedly have a significant impact on the victims' life. In order to secure the security and safety of women and children, we have therefore intended to suggest a gadget in this project. In order to send notifications and the current location of women and children to different cell-phone numbers in their contact list, a microcontroller, GPS module, and several sensors are interfaced. Additionally, this project will serve as a safety measure that will briefly stun the opposition. When a child is in danger and an attacker taps the touch screen, the device detects changes in body temperature, heart rate, and other bodily functions. You must be aware of the victim's movements. When the sensor exceeds the threshold, the device activates, uses the GPS module to track the victim's location, and sends the information to the contacts that have been stored for emergencies. She must defend herself because the law alone won't always keep her safe. A self-defense tool is required for it.

Index Terms – Wearable Device, Arduino Uno, Blynk App , Sensors , IOT .

I.INTRODUCTION

The main concerns in this project are enhancing child wellbeing and ensuring their safety. Gatekeepers and carers typically have the responsibility of protecting children, therefore it is on to them to become informed with the security risks in and around their homes and neighbourhoods. Once you are aware of the dangers, you may organise security measures. They can take their kids with friends to the park, playground, or school. This encourages children to rely less on their parents while they are going out or to school even when they are younger. They can enjoy playing in the park and on the ground with their friends and neighbours. Therefore, when the child is lost or taken into custody, this mechanism will aid the parents. The parent can send a substance with particular catchphrases, for occurrence region, temperature, buzz an wearable gadgets will answer back with a substance containing the reliable cautious zone of the youth which after will give applications. Furthermore, Suraksha, it portrays that the contraption can be prompted by two diverse ways in specific, switch and notifications.

The centralization of our paper is to have an notification substance locked in correspondence medium between the kids and women wearable and the parent helpful that correspondence is displayed all over all through the place. A heterogeneous environment refers to a computing environment where different hardware, software, and networking technologies are used to support different applications or services. In such an environment, various devices and systems may have different operating systems, programming languages, and hardware configurations, making integration and interoperability more challenging.

There might be three instances:

- Accident
- Illness
- Kidnapping

If the victim meets an accident the values of the tilt sensor and vibration sensor will alter. If the victim get kidnap the victim can press the panic Button to make the near by people aware that something wrong is happening with the victim. If some disbalance is happening in her body it will be reflected in the heart sensor reading as well as in Temperature sensor reading.

II. LITERATURE SURVEY

In [1].Bannuru Ranjeeth, "Smart child safety wearable Device". The author explains that Child security is the foremost common issue emerging around the world. There are numerous issues to youngster security and this work primarily manages kid security from the dangers like missing, abducts. The Technical point of this task is to have an ordinary correspondence between the kid and parent through the gadget which helps in finding the area,pulse and temperature of the kid utilizing the gadget empowered with the pulse sensor, temperature sensor and GPS tracker. In [2]. V. Lavanya, have proposed "Child Safety Wearable Device". The author explains that this project is to safeguard the child from threads. Thus the violence against children increasing day by day. Not only kids even women are also abused both physically and mentally their project mainly focus on sensing the children's Temperature and Heartbeat. In [3]. P Nandhini K, have proposed "A research on Child Safety Wearable Device".The author explains that child and women are less secure and have many issues regarding their security purpose. They have to undergo among various difficult situations and have to prove themselves every time in all critical conditions. So, for their security and safety purpose government has provided security through rules and regulation to the society. Although there are many existing systems for security purpose need of advanced smart security system is increased. In order to overcome such problems smart security system for child and women is implemented. In [4] Anandjatti , have proposed "Design and Devolopment of an IOT based Wearabledevice for safety and security of women and girl children" .The author explains that the safetyand protection of women and girls. The objective of their project is achieved by the analysis ofphysiological signals in conjunction with body position. Real-time monitoring of data is achieved by wirelessly sending sensor datato an open source Cloud Platform. Analysis of the data is done on MATLAB simultaneously. In [5] Sunil K Punjabi, have proposed "Smart Intelligent and System For Women and child Security" .The author explains that the security system for women and children which allows immediate responses in any harassment in public places, societies etc.

III. PROPOSED METHDOLOGY

- When the Arduino is powered on it first initializes the GPS with alerting commands.
- Once the Wi-fi module is initialized with the controller checks for GPS and it then initializesall sensors.
- All the sensor readings are taken. If any false behavior is detected, message alert along with the GPS location is sent to the mobile app.
- This same steps follows when panic button is pressed instead of only sensor alerts.
- If there is no problem with the child and women then a "SAFE" message is displayed in the Blynk app in the contacts mobile app.

The methodology for developing a wearable device for children and women safety can be broken down into the following steps as been shown in the FIG 1.

- Identify the target audience: Identify the target audience for the wearable device. In this case, the device is designed for children and women safety.
- Define the problem: Define the problem that the wearable device is designed to solve. In this case, the device is designed to ensure the safety of children and women.
- Determine the features: Determine the features of the wearable device that will help to solve the problem. For example, features such as GPS tracking, emergency button, and alerts can be included.
- Develop the hardware: Develop the hardware of the wearable device. This includes designing the physical device, determining the components required, and developing the electronics.

- Develop the software: Develop the software for the wearable device. This includes developing the user interface, programming the features, and testing the software.
- Test and refine: Test the wearable device to ensure that it functions correctly and is user- friendly. Refine the device based on user feedback.
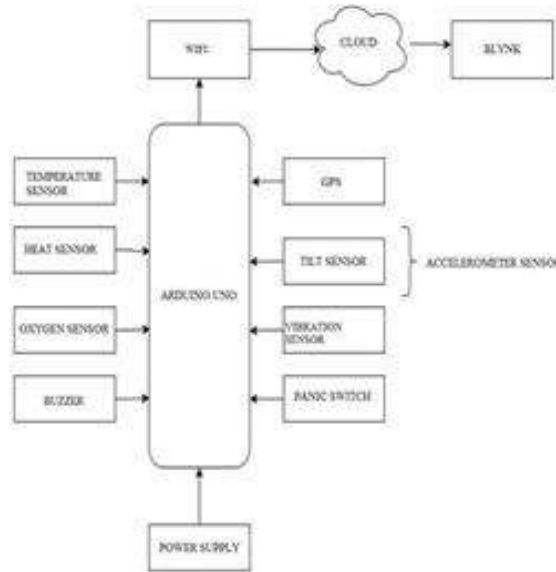

Fig.1. Block Diagram

- GPS and Geofencing: The device could use GPS technology to track the wearer's location and set up geofences around safe areas, such as a home or school. If the wearer goes outside of these areas, the device could send an alert to a parent or guardian.
- Panic Button: The device could include a panic button that, when pressed, sends an alert to a parent or guardian. The alert could include the wearer's location and any additional information, such as the time and date.
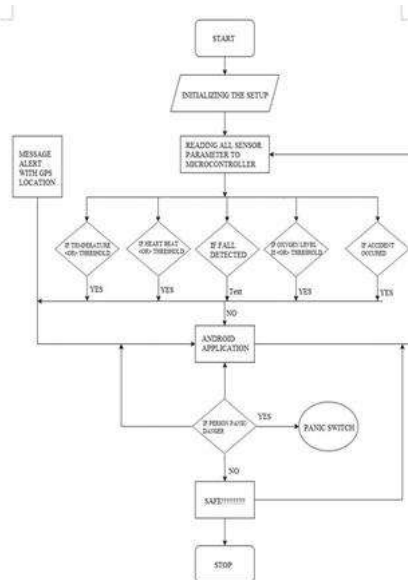
Fig. 2: Flow Chart

To help parents to locate their child in a easy manner. To help women save themselves in case of emergency by sending notification. To reduce the number of cases of rape and kidnapping by making a safety and securitydevice. To make women feel safe when outside in the world of predators by knowing that their loved ones can keep a track of all the activities happening to her. To make child and women get help even when having health issue by the presence of sensors in the device as been explained in the above FIG 2

IV. HARDWARE COMPONENTS

- Arduino UNO: It is our system's brain is the Arduino UNO R3 board. This board is in chargeof the overall operation of the system. As shown in the Fig 4.2 the Arduino Uno is an ATmega328p-based microcontroller board. A 16 MHz crystal oscillator, 14 digital input/outputpins (6 of which are PWM outputs), 6 analogue inputs, a USB port, a power jack, an ICSP header, and a reset button are all included on this board.

- Temperature Sensor: NTC Thermistor temperature sensor module as shown in the Fig 4.3 issmall sized, low cost sensor which is very sensitive to ambient temperature. This sensor helps in sensing the temperature of surrounding environment. The detection range of temperature is between 20 -80 degree Celsius.

- Pulse-rate Sensor: Pulse Sensor is very small sized, low cost, a plug and sense heart rate sensor. This with GPS is used to detect a possible atrocity and notify her friends and family through a message containing her location. Also provide a button on the wearable to manually be able to send a notification if the victim could react. Sensor is compatiblewith Arduino. It helps in getting reliable pulse readings fast. Pulse-rate Sensor is compatible with a 5V or 3V Arduino.

- Oxygen Sensor: Oxygen Sensors is used to measure and monitor the level of oxygen concentration, (i.e) oxygen which is inhaled and exhaled by the patient who is connected to it. Oxygen Sensor incorporated in a respiratory gas monitors (RGM) is used to measure oxygen concentration (or) partial pressure of oxygen in a breathing gas mixture.

- Panic Switch: Panic switch exist to protect people from personal harm. They can provide an instant alert to the monitoring company when the user feels they are in danger and need immediate emergency assistance. Violence can strike any workplace at any time.

- Tilt Sensor: Tilt sensors allow you to detect orientation or inclination. They are small, inexpensive, low-power and easy-to-use. If used properly, they will not wear out. Their simplicitiy makes them popular for toys, gadgets and appliances. Sometimes they are referred to as "mercury switches", "tilt switches" or "rolling ball sensors" for obvious reasons.

- GPS sensors: These are receivers with antennas use a satellite-based navigation system with a network of 24 satellites in orbit around the earth to provide position,velocity, and timing information.

- Buzzer: It is Small PCB Mountable 5V Passive. It is used to add AudioAlert to electronic designs. An audible tone is generated using the coil element and works on 5v supply.

- Vibration Sensor: A vibration sensor is a device,it measures the amountand frequency of vibration in a given system, machine, or piece of equipment. Those measurements can be used to detect imbalances or other issues in the asset and predictfuture breakdowns.

- Power Supply: A 12 V rechargeable Li-ion battery is used to provide the power supply to the controller which in turn feeds the required power to all the sensors and modules connected to it.

V.SOFTWARE TOOL

BLYNK APP

Blynk is an IOT platform for IOS or Android smartphones that is used to control Arduino, Raspberry Pi and Node MCU via the Internet. This application is used to create a graphical interface or human machine

interface (HMI) by compiling and providing the appropriate address on the available widgets. Blynk app works by allowing users to create custom user interfaces, known as "widgets", that can be used to interact with IOT devices. These widgets can be used to control devices, such as turning on and off lights or adjusting temperature settings, or to display data from sensors, such as temperature or humidity readings. As been shown in the below FIG 3.
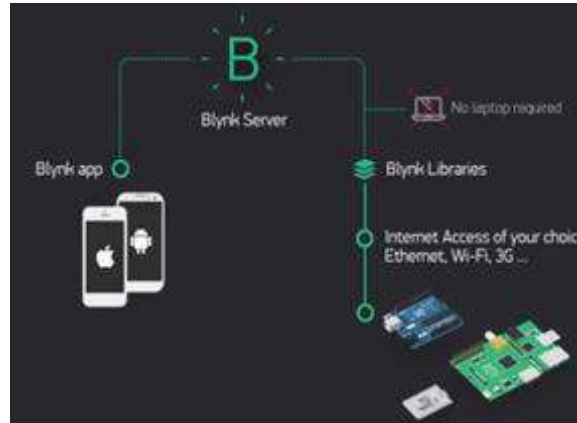

FIG 3: Connection Between Android and Blynk app

Arduino IDE

The Arduino IDE provides a user-friendly interface for programming Arduino boards using a simplified version of C++, with libraries and functions specifically designed for controlling the board's input and output pins. The IDE includes a text editor with syntax highlighting, a compiler, and a serial monitor for debugging and testing as shoon in the FIG 4. One of the advantages of using the Arduino IDE is its large community of developers who have contributed to a vast collection of code libraries, tutorials, and examples that make it easier for beginners to get started with Arduino projects.

FIG 4: Arduino Tool

EMBEDDED C

Embedded C is a variant of the C programming language that is used for programming microcontrollers, embedded systems, and other devices with limited processing power and memory. It is a subset of the standard C language and has been optimized for the unique requirements of embedded systems.

Embedded C is used to control the behavior of electronic devices and systems, such as household appliances, industrial control systems, and automotive components. It is particularly useful in applications where real-time performance, low power consumption, and reliability are critical factors.

VI. RESULT

When the pressure switch is activated, the buzzer turns on and Find the GPS location of victim then it will send a message to the parent/guardian stating "NEED URGENT HELP" as shown in FIG 5
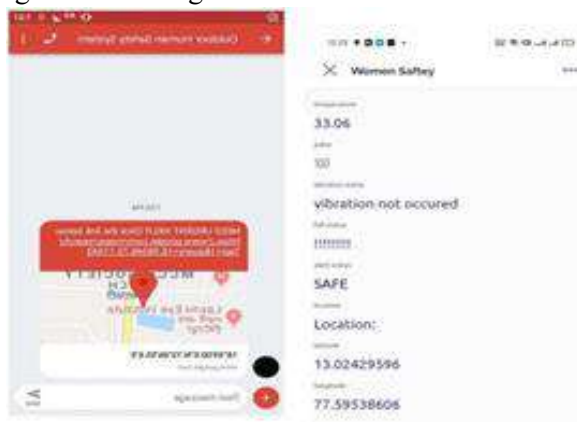

FIG 5: Overview of Information provided by Blynk app

VII.CONCLUSION

In conclusion, the development of a wearable device for children and women safety is an important step towards improving the safety and security of vulnerable populations. By incorporating features such as GPS tracking, emergency buttons, and alerts, these devices can help to prevent incidents of violence or abduction and provide peace of mind for parents and caregivers. The methodology for developing a wearable device for children and women safety involves identifying the target audience, defining the problem, determining the features, developing the hardware and software, testing and refining, manufacturing, launching, and providing ongoing support. Additionally, the Blynk app provides a user-friendly interface for controlling and monitoring Internet of Things (IOT) devices, making it an excellent platform for integrating wearable devices for children and women safety. By using Blynk app, it is possible to create custom user interfaces and widgets that can be used to control and monitor IOT devices from anywhere in the world with an internet connection. Overall, the development of wearable devices for children and women safety has the potential to improve the safety and security of vulnerable populations and provide a valuable tool for parents and caregivers.

VII.FUTURESCOPE

The project undertaking would help in improving the wellbeing and security of children. This will help the authorities to solve the child missing cases easily. It will improve social security as well as parents' insecurities. This project will reduce crime rates in society. This takes low cost while implementing and building so that everyone can afford this. Everyone in this era using smart devices and gadgets which will be helpful for the parents to use IOT based device. This IOT based device brings a revolutionary change in the current problems regarding child safety issues. Child safety is the most common problem in the world. By this project, the child missing and kidnap issues can be brought down and help the society.

The result for the parent in two different ways. The first one is they get an alert message (SMS) for the registered phone number. The next one is they receive an graphical representation which shows the Latitude ,Longitude, MEMS Sensor and Vibration sensor of the child's activities through "Thing Speak". From these notification the parents can find their child in critical state. By this device we can avoid violence against children. This is one step to reduce rape, violence, theft etc. Our Future Scope includes the real time implementation of the proposed system in tiny size with the additional components heartbeat

sensor for monitoring the heartbeat of women and children in every second by measuring variation in blood volume in tissues and analysis of various parameters related to heart beat for individual women and children.

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Mobile Wireless Communication: The 5G Revolution's growth

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Abstract—After the roll-out of 5G technology, the evolution of mobile wireless communication broadly has acquired a purpose in recent years. This progressive journey encompasses numerous generations, commences with 1G, following 2G, 3G, 4G, and the yet-being-researched 5G. The advancement of remote access gadgets will facilitate 5G mobile systems, who require a premium on strengthening client stations anywhere it has stations. The internet of things (IOT) technologies that are scheduled to be invented in the fifth era shall represent an increasingly knowledgeable invention that directions society as a whole. The article examines various kinds of data transmission prices, challenges, techniques, features, and applications hired to present a snapshot of the emergence of mobile generations.

Keywords—IOT; LTE; 4G; 5G; Wireless;

I. Introduction

The discipline of Mobile Wireless Communication Networks (MWCN) continues to be increasing swiftly as of late. Many billions of people now use cellular telephone technology, which became attainable by the invention of several subsequent eras of wireless communication [1], [2]. Multiple types of mobile wireless communication have existed created while the 1G first generation, and that was mainly utilised for voice calls yet formed the starting point forEach cell phone generation [3, 4]. The 2G second generation brought text messaging and a new perform and made digital phone conversation possible. afterwards the arrival of Third generation 3G, which encourages multimedia techniques, the rate of information transmission has increased [5], [6]. As opposed to 3G, the 4G fourth generation is more swift and more reliable, which is an improvement that eliminates 3G's restrictions and additionally improves QoS. The data transfer capacity is boosted with service) [7], [8]. that time 2010 right through to this moment, 4G users and support have grew more common. The Wireless World Wide Web (WWW) has a new generation that is referred to as 5G. given that new features and techniques are supported in every generation. The mobile phone companies and the number of mobile users increase as the consequence of this growing [9], [10]. The remote Businesses has been undergoing explosive development due to of both ranged innovation and its backers [11], [12], and [13]. Particularly since the period's turn, there has been an obvious change in fixed to portable communications [14]. Before the passing of 2010, there were more adaptable cell phone customers than fixed phone lines. Network planning and improvement-related administrations jumped into existence as a consequence of this. the sharp core [15], [2]. The 3G and 4G networks that's presently present are not suited for Internet of Things (IOT) in multiple ways. Since 5G has yet to be publicly in use, it could enhance services such e-commerce, e-transactions, while e-management [19]. The phrase "Internet of Things" (IOT) depicts an online community of gadgets with connectivity that work together to monitor and enhance daily living. The Internet of Things (IOT) is an offer trend and a future direction in technology [8], [9]. Nearly all that was needed. Such gigantic devices need to be able to speak to other machines to be able to connect to the internet through high-speed internet [44], [11]. Future 5G cell phones will be heavily exploited to help with the huge IOT deployment that will include billions of attributed

smart goods and sensors [12], [13]. The significant amount of data has been taken into account when designing 5G. Connectivity to billions of technology and future advances is made possible by the internet of things [14]. wireless and mobileEase of Use Connectivity in communication between the five generations will increase; traffic volume will impact all aspects of daily life and create an all-dimensional atmosphere. which has to adjust to these obstacles by adding fantastic features to boost capacity and enhance energy, spectrum, and cost efficiency [25].

II. Evolution of Mobile Wireless Communication through Five Generations

The article analyses each technology and analyses the mobile wireless communication generations from the initial one to the fifth. It is important to go over past wireless mobile communications generations, and Figure 1 shows the highlights of those generations. With 5G technology still according to study and creation, it could bring about another revolution by responding to fresh technologies with fast data rates.

2.1 First Generation (1G)

The very first mobile network, or 1G, originated as an analogue system built during the 1980s. It hires an analogue radio signal with a frequency of 150 MHz, only does voice transmission and call modulation, like mobile phone systems, and uses a recurrence balance FM system to multiplex radio communication traffic into an FDMA (Frequency Division Multiple Access) recurrence division various access system [6]. It is unreliable for this generation, without security. In any event, 1G innovation has a number of shortcomings. AMPS (Advanced Mobile Phone System) and TACS (Total Access Communications System) are widely used and recently issued. It could be as quickly as 2.4Kbps [2].

2.2 Second Generation (2g)

Through 1991, Finland's 2G mobile network travelled application below the GSM (Global System for Mobile Communication) the mean.Computer chats tend to be clearer and 2G calls could be jumbled. Some of its key features enabled users to share voice and image messages (MMS), text messages (SMS), and image interactions via their phones [8]. As opposed to an analogue signal, it utilised a digital one. It put the CDMA Code Division Multiple Access idea into effect. CDMA supplies everybody with a unique code for indicating the closing of several physical channels. FDMA, TDMA, and CDMA are a few of the access methods that are utilised for communication with a growing amount of customers. After 2G opened in 1995, 2.5G followed, combining voice and data in a process the fact improved GSM Evolution (EDGE)'s data rate. In addition, GPRS (General Packet Radio Service), which featured packet switching and was appropriate for the internet, emerged. The transfer of data at 64 Kbps [9].

2.3 Third Generation (3G)

For it accomplish a data transmission rate of at least 2 Mbps, 3G requires utilises huge trademark wireless networks with enhanced system support abilities. It was first released in 2000 and includes high-speed data transfer and security. The 3GPP (3rd Generation Partnership Project), a company created to aid in the construction of the 3G network, has advanced the project by providing an open design that complies with an IMT 2000 guideline. The Universal Mobile Telecommunication Systems, also known as Universal Terrestrial Mobiles Systems, were known in Europe. that ITU T term of a three-era framework by way of CDMA and transport technology enhanced data GSM environment, which forms part of the ETSI ambitious International Mobile Telecom IMT2000. A 3G digital network is EDGE [33]. raised information transmission powers of 3G, that have numerous times speedier than those of 2G. The abilities have been extended to include speech, video files, finishing IP (like Skype), and bandwidth and data transfer rates. Peak data speeds vary from 100 to 300 Mbps [15].

2.4 Fourth Generation (4G)

An important advance in this generation is the affordability of higher security, larger bandwidth, and a quicker internet access. Long Period Evolution (LTE) is the basis for this generation. The LTE standard was created by the 3G Partnership Project (3GPP) for 4G distant exchange. The 4G will continue to bring steadily enhanced versions of the same innovations promised by 3G (such as improved multimedia,

streaming of videos, global access, and around- the-world getting around through a broad range of gadgets). An array of systems. The International Telecommunication Union (ITU) has chosen 100 Mbps as the permitted speed [43]. implementing a Long Term Evolution (LTE) 4G typical, the 4G began to be communicated in Stockholm before moving to Oslo, Norway when 2009. Therefore, 4G offers quick mobile web browsing (up to one Gb per second for stationary clients), encouraging gaming, regulates HD recordings, and promotes HQ video conferencing for many customers. This was presented all over the world complete high quality streaming of movies [37].

2.5 5G Revolution and Application

The fifth generation of wireless mobile broadband technology is right now ready. Higher speed, less latency, ability of supporting many devices at once, and conservation of energy are a few of the key rewards. Nowadays, projects must support 5G strength in order to fit multiple services due to the obstacles of modern technology. The World Wide Wireless Web (WWW) is a real wireless while 5G development is still underway. 5th Wireless System for Dynamic Operating Mega Communication (WISDOM), an original concept for a new wireless communication, is the cornerstone of the generation communication network [1]. According to communication theory, the 5G has a high speed for data transmission while the short frequency and broad bandwidth are more effective. network. This frequency range, which has been assigned to 5G, enables communication over short distances and with the ability deeper than 1Gbps [13].

The world's mobile communications have become overloaded due to the rise in customer appetite for data and the need to offer new services. Therefore, 5G networks are developed for the challenges of new technology, such as machine communication, and the growing demand for data from industrial users. Furthermore, as the total number of internet-connected devices rises, 5G wireless technologies for consumer devices (such as smart watches, smart metres, technology and sensors utilised by business). When related these devices use Internet of Things (IoT) capabilities. With regard to mobile communications services, which are used between people and objects, the IoT has widened this focus. The explosive growth of IoT applications will be driven by future IoT applications such mobile health, internet devices in autos, connected homes, industrial control, and environmental monitoring. Additionally, the cloud will be used for storage and processing of the big data produced by IoT applications. All industries is going to see a change thanks to the 5G network. Through the year 2020, when there will be an estimated 20 billion linked devices [4]. The future of the Mobile Broadband (MBB) service and Internet of Things (IoT) is represented by the roll out of wireless mobile 5G applications in society's day-to-day activities. Some of the contemporary uses offered by 5 G include charging mobile devices using our own the heartbeat, knowing the precise time of our job in nanoseconds, and real-time video software. Augmented AR and VR services, smart cities, networked buildings, and city services, autopilot applications in education, autonomous vehicles, industrial automation, and health applications are a few instances of emerging technologies [37]. An enormous quantity of gigabit-scale data may be transmitted, and 5G offers private virtual networks. 25Mbps related rates with data capacity more than 1Gb are also offered. 5G has unprecedented upload and download rates [26].
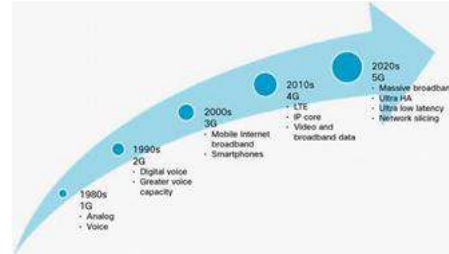
Fig.1. Evaluation of Wireless Mobile Generations.

3. Literature Review

Plenty of research on the growth of mobile communication and the fifth generation trend have been performed by researchers in recent years. Several major research projects conducted in the mobile generations will be studied in this section of the paper: In 2016, Gopal and P. G [7] proposed examining thespeed, frequency range, switching design the basis and forward error correction of 4G and 5G wireless protocols. likewise they discussed about how 5G will soon replace 4G and mentioned some new 5G applications. In 2017, Yadav, M.,et al. [8] looked at the mobile communication generation that has developed thus far and will remain in the future for the next generation. After the advent of 6G technology, which will offer high-speed internet access up to 11 Gbps, there are no hinders to the progress of mobile communication. The 6 G will bring together satellite networks and the 5G wireless mobile system. Furthermore, they discussed about how the 7 G generation is dependent on satellite functions for mobile communication. Satellite-based 7.5 Gbps super high-speed connectivity and top download network methods. In 2017, Pavia, L., et al. [29] released an analysis of the 2G, 3G, and 4G security features. The second (2G), third (3G), and fourth (4G) versions of mobile communications networks employ the Global System for Mobile Communications (GSM), Universal Mobile Telecommunication System (UMTS), and Long Term Evolution (LTE) innovations, accordingly. Furthermore, new security systems that automate and monitor security using artificial intelligence and machine learning algorithms have been introduced for G5 and IOT applications. The Authors arrived to the idea that new avenues need to be established for device attack prevention and protection. In 2018, Alsulami and Akkari

[14] proposed that 5G wireless networks play the primary role in acting and addressing the IoT's high communication requirements. 5G was created for running IoT applications. The authors analysed 3G, 4G, and 5G relationship alternatives for the Internet of Things. Furthermore, several 5G IOT enabling technologies have received consideration, involving D2D, MWT, Relays, WSDN, and NFV. In 2018, Neumann, G., et al. [11] described three strategies for combining industrial Ethernet and 5G mobile networks onto a hybrid design. The first extends the second conduct by a far-flung production site, the second is a virtualized controller, and the third is connected homogenous, which is an island. They employed a mechanism for merging 3GPP 5G with TSN/Industrial Ethernet. Bendale and Prasad [42] suggested a plan in 2018 to boost the security of the 5G mobile network through the addition of new features. This study provided some basic information on 5G wireless networks. the many innovations, notably IOT, MIMO, D2D and SDN, HetNet and IDS, that may be used with 5G wireless. Rashid and Razak [23] touched about the challenges that come with big data analytics in 5G in 2019. A billion devices are anticipated to be connected to 5G, increasing bandwidth interest and data size. They supplied a flow model for 5G that incorporates several machine learning methods to deal with huge and different quantity of data. The flow model demonstrated that big data analytics tools may be used to enhance 5G networks. In Furthermore they came essential for supporting various applications, uch as big data. Botir S., et al. [14]

provided a thorough overview of mobile wireless generations in 2019. They compared alterations happening with generations of mobile wireless communication. They looked examined characteristics of several generations, included bandwidth, core connections, multiplexing, and switching. They came to the conclusion that 5G is more reliable as it transmits large amounts of data quickly. The found that 5G delivers unique characteristics that are consistent with contemporary supported by LAS- CDMA, OFDM, MCCDMA, Network-LMDS, and UWB advances in technology. They expected that five generations will be finished and in support by the year 2020.

In 2019, Manam, V., et al. [35] discussed and outlined the evolution of mobile wireless generations. They compared the pace, technique employed, and specific aspects of electronic devices from all generations. Instead of discussing both the advantages and negatives of the 1, 2, 3, 4, and 5 generations. Abidin, I., et al. [26] described the characteristics of 5G in 2020. The five generations will be addressed with a focus on 5G. They focussed on employing the WISDOM approach in 5G as a justification for quicker data transmission as compared to 4G LTE techniques. In their opinion, 5G is a a 4G and WISDOM approach concoction. The 0G, 1G, 2G, 3G, 4G, and 5G mobile generations were outlined by AHMAD et al. [37] in 2020. Furthermore, the author compared the various features of each of the first through fifth generations. The author mentioned how employing Millimetre Wave (mmWave) methodology in 5G delivers higher frequency that is between 30-300GHz with capability larger than 1Gbps for the quickest data transfer. Pawarand and Deshpande [8] presented their disapproval of the 5G network and fast expansion in 2020. rely on cognitive radio (CR) technology and spectrum sharing (SS) technologies. They recommended employing 5G's capabilities for offering a variety of services, including machine-to-machine communication, Internet of Things (IoT), increasing mobile broadband, and conquering several challenges faced by 5G technology.

4. Discussion and Comparison

Reviewing and analysing some of the major past research concerning the development of mobile wireless communication networks from 1G to 5G has been discussed in the sections before it. What we can infer is that Initially, 1G was only used for voice. Their phones use second generation 2G for phone calls and sending data like SMS and MMS messages. Third-generation 3G enables elevated information exchange features and multimedia services at speeds several times quicker than 2G. Additionally, the growth of new administrations like video conferencing was prompted by 2G. Fourth generation (4G), on the other hand, is the generation currently in use prior to the invention of 5G. Due to this, the fifth generation is not now in widespread availability, but according to the evaluated studies, it could potentially be in frequent use in 2020 with a bandwidth of more than 1 Gbps. Table 1 shows several kinds of investigation, each with a unique methodology that offers an overview of these five generations. So, based on past evaluations of generation type, deployment, system technologies, bandwidth, standards, and services, a comparison of them is produced.

In summary, the development of mobile wireless communication networks has progressed significantly from the initial 1G to the current 4G generation, with the upcoming 5G technology poised to make a significant impact in the near future. Each generation has brought with it advancements in features, speed, and services, from voice- only capabilities to high-speed internet and multimedia services. The comparison of these generations is based on various factors, such as deployment, system technologies, bandwidth, standards, and services. Through analysis of past research, it is clear that each generation has built upon the previous one, and the progression has been significant in terms of technology, infrastructure, and services offered to users.

Table 1: comparison of different mobile technologies of the addressed previous researches

5. Conclusion

After examining a number of investigations, we reached conclude that the development of mobile wireless communication networks from 1G to 3G only involved voice, message, and data communication. Different mobile transmissible types have been outlined, taking consideration how 5G wireless technology has further revolutionised the mobile businesses. Since it can handle the best advancements and supply an irreplaceable receiver to their clientele, 5G technology has a bright future. The 4th and 5th generations methods supply qualified assistance with lightning-fast data transmission and an obvious boost in the communication market. The unified-IP, seamless adoption of broadband implementing LAN/WAN/PAN was covered by 5G technology, none the less. Additionally, a single unified standard technique was dependent on dynamic information access and wearable devices with AI capabilities in addition to the more than 1Gbps of provided bandwidth.

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A Review of Existing Energy-Efficient Routing Protocols in Wireless Sensor Networks

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ABSTRACT Wireless Sensor Networks (WSNs) are collection of randomly distributed minute devices mainly named as nodes which interact with each other and base station to transmit the required information to the controller via Internet. These networks sense or track the phenomenon, occurring at an unattended place. The major constraint of the WSN is limited life of sensor nodes due to loss of energy. Several routing protocols are developed to transfer the information or data among these nodes in an efficient way and to enlarge the lifetime of nodes. A thorough review of different categories of routing protocols has been discussed in the presented paper.

Keywords- Wireless sensor network (WS.N) Low-energy adaptive clustering hierarchy (LEACH) Base station (BS) Power efficient gathering in sensor information system (PEGASIS)

I. Introduction

Wireless Sensor Network (WSN) is a network composed of finite quantity of small and inexpensive devices or nodes that can sense an event, process, and send out the sensed data over a wireless medium. These nodes are densely deployed around the event. The position or arrangement of sensor nodes is not predetermined. This allows random deployment of sensor nodes around the event. Sensor nodes generally drive their energy from attached batteries [1]. Each node consists of mainly a microcontroller, transceiver, memory devices, and power source. The microcontrollers are used for data processing and to do the logical functions. Memory device used for the storage of data while the combination of transmitter and receiver functions is integrated into the transceiver [2]. These sensor devices or nodes make interaction to each other and pass the messages or data to BS which in turn transmits this collected information to the user through Internet [3]. The WSN find its applications in various domains such as agriculture or ecological sensing, tracking of an object, monitoring of wildlife, health care, home automation and security [4–6]. Figure 1 shows the systematic structure of WSN. The different types of topologies used for the transmission of data are Star, Mesh, and Hybrid topologies [7].

A star network is a topology which works on the concept of communication where a single BS can send or accept a message to remote nodes. The remote nodes are capable to transmit or receive a message only from BS. The benefit of this type of network is that the design of topology is uncomplicated and capable to maintain the remote node's power consumption to a least quantity. Further it permits for small latency exchanges among nodes and the base station. Mesh network allows the nodes to interact with each other within its radio transmission range. That make network similar as that of multi-hop communications, in which whenever a node desires to convey information to another node which is not situated in the communications range, it employs a node as an intermediate for the transmission of message to the destination node. A hybrid topology consisting of the star and mesh network offers a dynamic and flexible communication network.

WSNs are also classified on the basis of three different modes of data transference named as Time, Event, and Query-driven type of networks [8]. In Time-driven network, every node transmits data at regular periods, whereas in Event-driven nature of network a node forwards the data or message simply when it senses any occurrence. The final or third class is the network which is based on Query where the sensors transmit the data at the condition only when it receives a query message from the BS. In addition to this, the hybrid networks are also used that combine all the previous three models. These aspects are significant because of the guidelines given by them to design an algorithm or a protocol for WSNs. The

energy difference among the nodes increases with time resulting in deterioration of network performance [9–12]. Main focus while designing WSN protocols should be on power management. A research challenge in WSNs is to cope with little communication of power. In this regard, the routing protocols play an essential role in efficient energy consumption. An appropriate choice of an exact direction to send data from node to BS is necessary which tends to minimize the energy consumption. In the presented paper, section "Routing Protocols" represents classification of routing protocol. Section "Various Design Issues of Wireless Sensor Networks" discusses various design issues in WSN and section "Conclusion" concludes the discussion.
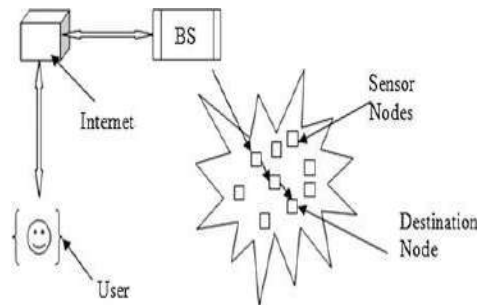

Fig 1. Wireless Structure

II.Routing Protocols

Routing protocols are generally classified on the concept of structure of network and operations of protocol. On the basis of structure of network, the protocols are again categorized as flat routing, hierarchal routing, location-based routing, and chain routing.

III.   FLAT Routing

FLAT routing is basically data-centric routing. Each node is assumed to equally participate into sensing task and is excited through queries generated by BS upon requirement of the user.

(a) SPIN Heinzelman [13] developed a category of protocols known as Sensor Protocols for Information via Negotiation (SPIN). These protocols are resource conscious and adaptive in nature. These are designed to overcome the difficulties arises in older flooding protocols. Each sensor node in the network is recognized as potential member that has enough data that can be accessed by BS through quires. SPIN-1 is developed to minimize the amount of wireless sensor devices within the network. SPIN-2 is developed to reduce the consumption of energy of the nodes. SPIN can be used for mobile application [14].

(b) Direct Diffusion: Directed diffusion is flooding routing protocol. When BS generates some queries or requires some information it sends queries in the network and sets up gradient for data flow from nodes to BS. When BS receives information from the source node, it evaluates and sends it back to network with gradient level (evaluation of received information level with the required information level). Nodes upon receiving the query from BS retrieve their database and evaluate the information with gradient level, if available information is of high level then response is sent back to BS[15, 16].

(c) Rumor Routing:Rumor routing is basically agent-based routing, which is long-lived packet of information. The agent travels the whole network and exchanges the information regarding events occurred in the network with the nodes. When detail of any event is required by a particular node or BS, it can directly interact with the node where event has occurred by retrieving the information exchange by the agent. Using this protocol flooding or roaming the entire network is eliminated [17].

(d) Cougar: It is optimized data-centric routing protocol. It assists the user by providing pro- grams used for various applications consisting of declarative queries of collected or sensed data from the source node. User does not know how the required information is obtained. This approach incorporates a query layer between application and network layer. When a query is generated from gate way node it is well entertained by query proxy service that is linked with sensor nodes [18].

(e) Acquire: Acquire is more optimized technique to respond a query. It is enhanced version of Cougar and it deals with complex queries. The generated queries from the BS are divided into sub queries and are transferred within sensor nodes. When a node receive a query it looks into its database to respond to query, if available data is not sufficient to satisfy the received query it uses its look ahead of d hops for systematically and stepwise forwarding the query to surrounding nodes that can have sufficient data to satisfy the request. It cannot be mixed with directed diffusion because the query is forwarded to limited number of nodes not to entire network. It depends upon factor of Acquire if d becomes equal to network then it behaves as directed diffusion [19].

IV. Hierarchical Routing

Hierarchical routing is the most energy efficient routing technique. It is also known as cluster base routing. Hierarchical routing involves the dividing of the entire network into minute blocks which are mainly named as cluster. The Cluster Head (CH) is then allocated to every cluster. It greatly reduces the traffic towards the BS. The structured way of sensing task is being performed by low energy level clusters and transformation of that data is done by high-level clusters. It greatly reduces the energy utilization and increase the network life.

Low-Energy Adaptive Clustering Hierarchy Low-Energy Adaptive Clustering Hierarchy (LEACH) is the very first protocol of hierarchical routing [20]. LEACH divides the total operation into two segments, setup, and steady state segment. In first segment, the clusters get generated and each cluster is assigned with CH. In steady state, transmission of information takes place from cluster to CH and from CH to BS done. LEACH cannot be used in the area of large vicinity due to its drawbacks [21, 22]. To sustain data aggregation via pro- efficient network association, the nodes get split up into a few numbers of tiny groups known as clusters. Each cluster is then composed of coordinator, called CH, and a few collection member nodes. Clustering works under an efficient hierarchy called two-tier hierarchy where the assigned CHs generates the higher tier and the member nodes give rise to lower tier. Clustering improves the lifetime of a network which results to enhance the performance of sensor network.

a)Two Level Low Energy Adaptive Clustering Hierarchy (TL-LEACH)

Two levels LEACH is an enhanced version of traditional LEACH protocol. It engages the formation of primary and secondary CH. To reduce the consumption of energy and transmission of data in an effective manner, secondary CH interacts with Primary CH and primary interact with BS [23].

b)LEACH-Centralized (LEACH-C)

Wu [24] introduced LEACH-C called LEACH- Centralized. In LEACH protocol, all sensor nodes choose their cluster heads by themselves and the result will be a number of Cluster heads. In LEACH-Centralized, the authors made advancement over traditional LEAH protocol such that throughout the procedure of selection of CH the BS should be conscious regarding the remaining energy of sensor nodes and their locations. Therefore, the BS chooses the most appropriate nodes to act as the role of CH, and split up the rest of the sensor nodes between CH for the formation of clusters. The improvement in energy of LEACH-C protocol is confined by simulation results depends on the foremost dead node as compared to conventional LEACH as well as conventional routing protocols.

c)Heterogeneous Energy-Efficient Distributed Protocol

Sensor nodes within the network are mainly of quasi-stationary form. The location of nodes is uninformed which means to say that they are not equipped with any of GPS proficient antenna. The signal processing and communication abilities of all the nodes are also identical to each other. The position of nodes left unattended after their deployment. The remaining energy of each and every node primarily plays the role of selection of CHs. To manage the ties, the intra- cluster communication expenses are predictable as the less imperative parameter. The meaning of tie is that the node might be felt inside the range of more than one CH. The CH having lower intra- cluster communication cost is preferential under the presence of variety of cluster heads. The less important parameter of clustering, intra-cluster communication expenses, is a (i) purpose of properties of cluster like dimension of cluster and (ii) whether or not random levels of power is acceptable for interactions intra-cluster activities [25].

d)Hierarchical Power-Aware Routing (HPAR) In HPAR, the collections of sensor nodes are created within the network. The collections of wireless sensor nodes in similar geographic regions are grouped collectively

as a region. Each region is then considered as an entity. Each region independently decides how the message received from BS is to travel among the other zones. Message is directed to that path which has high power remaining among the other routes [26].

e)Location-Based Routing

In this routing, the sensor nodes are attended to by their respective locations. The distance among the nodes is sensed by the strength of received signal.

Geographic Adaptive Fidelity (GAF) The protocol is basically designed for MANETs but later used for WSNs because of less energy consumption. GAF greatly reduces the energy consumption by switching off the idle sensors when required information is continuously receiving from the network. In this protocol, the network structure is split up into grid type squares and every node consumes its information of location given by Global Positioning System (GPS) so as to connect itself with a particular grid in which it resides [27, 28].

Geographic and Energy-Aware Routing (GEAR) This protocol is an energy-effective routing protocol which is presented to aim a particular area within a network. Each sensor node is equipped with location aware hardware like GPS and is attentive of their initial and residual energy. They are also aware regarding the energies of their neighboring node. So, data is transmitted through the high energy path. GEAR implements energy-aware scenarios which depend on geographical information to choose sensors for the routing of a packet toward its target region [29].

Geographic Random Forwarding (GeRaF) This protocol was presented by Zorzi and Rao [30], employs the concept of geo- graphic routing. In this process, a sensor which acts as relay is not identified a priori by correspondent. No any assurance is provided regarding the correspondent will be capable of promoting the information in the direction of its final aim which is named as sink node for all time. GeRaF is also called as best-effort forwarding protocol for this reason. GeRaF protocol presumes that all of the sensor nodes have knowledge regarding their physical location and also of sink node. Even though GeRaF combines an algorithm depends on geographical routing and awake-sleep scheduling mechanism, the sensor nodes are not necessitate to keep path of the positions of neighboring nodes and awake-sleep schemes. The sensor node checks the channel first, through which it has to transmit the data to sink node. This avoids the collisions and makes the efficient routing. The source sensor node transmits a message called request to send (RTS) to all of the neighbor nodes under the idle conditions of channel.

Chain Routing

The concept of chain routing is entirely different from the concept of flat, location-based, and hierarchical routing. In chain routing, the formation of cluster head is not necessary like hierarchical routing. In chain routing, the transference of messages or data takes place by the formation of leader in the chain which again makes contact with the other nearest node. Therefore, all the nodes become the leader node according to their turn in the chain so that the data can be transferred. The chain routing is an efficient way to make contact with the other nodes within a network because of no overhead on nodes.

(a) Power-Efficient Gathering in Sensor Information System

for its operation. In PEGASIS a continuous chain of node is formed so as to send out the required information to BS. Nodes that have relevant data interact with its neighbor node which further with its neighbor and so on, resulting continues chain to transfer the data from the source node to sink node. Every node become a leader and pass the information to adjacent node, so continues process of becoming a leader is taken out [31]. The effectiveness of the PEGASIS protocol can be enhanced by using the greedy algorithms [32].

Various Design Issues of Wireless Sensor Networks

Hardware Design

Range of network devices should be high ranging from 1 to 6 km. Establishing the connection between the networks is difficult and depends upon the node. Battery life should be high and power consumption should be low so that life of the sensor node increased [33].

Operating System for Network

It is used to compute, manipulate, and route the data. Various operating systems are used like Tiny OS, Mantis OS, and Nano Q Plus. Operating system must be hardware- independent, application-specific, and easy programmed so that effectively transmit the data to sink from source [34–36].

Deployment

Deployment means to set up the sensor node in the practical environment. The deployment may be deterministic and randomly. Deterministic deployment involves proper positioning of sensor node in a predetermined way. Random deployment involves randomly or by dropping it from plane [39]. Congestion is also result due to deployment because so many nodes transmit the data at the same time [37].

Localization

It is the geographical issue to properly deploy the nodes in network so that there is little effort to trace a source of relevant data that is required. It arises due to improper deployment of the nodes in network. It results in using the localization algorithm to satisfy the various requirements [38].

Quality of Service

QOS is major issue in WSN. QOS must be of high level so that data is of high value is reached at the receiver point. WSNs are used in various application like military, weather, and nuclear points.

Production Costs

WSNs consist of predetermined quantity of small sensor nodes, single node's cost is considerable to justify the total cost of networks and therefore the cost of each sensor node should be kept low.

Conclusion

In the presented paper, we presented a comprehensive study of various techniques of routing in WSNs presented in the literature. Although all above routing techniques put into enhance the lifetime of WSN, but there are still many aspects to be considered in WSNs. We concluded all those confronts and identified guidelines for future research to this regard.

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Multiband Microstrip Antenna Empowering Wireless Applications

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Abstract- In this research article, we introduce a novel multiband microstrip slot antenna tailored specifically for wireless applications. Microstrip antennas have gained popularity due to their remarkable characteristics such as flexibility, robustness, compact size, lightweight construction, narrow radiation beam, and convenient installation andfabrication processes. Leveraging these advantages, we propose an antenna design that utilizes a substrate made of FR-4 material with a permittivity of 4.3. The key component of our antenna is a patch structure featuring four narrow slits, coupled with a ground plane. This configuration enables the generation of a broad range of frequencies, precisely centered at 5.2 GHz, 9.3323 GHz, and 12.038 GHz. The selection of these bands is aligned with the requirements of contemporary wireless applications. To validate the performance of our design, we conducted extensive simulations using the renownedCST MICROWAVE STUDIO software.

Keywords – CST MWS, Microstrip, Multiband, VSWR, ReturnLoss, Radiation Pattern, Gain

I. INTRODUCTION

Microstrip antennas have gained widespread adoption due to their numerous advantageous features, including their low profile, lightweight construction, cost-effectiveness, compatibility with MMIC design [1-3], and compatibility with modern printed circuit technology. These antennas have found utility in various domains such as radar systems, microwave communication, and space communication. A typical microstrip antenna consists of a slender metallic strip, known as a patch, positioned above a ground plane. These two elements are separated by a dielectric substrate, onto which the radiating element and feed lines are photo etched. The shape of the radiating patch can vary, ranging from square and circular to elliptical or rectangular [5-7]. To minimize antenna size, substrates with higher dielectric constants are employed [4]. In our research, we aim to expand the operating bandwidth while simultaneously reducing the antenna's overall size. Our proposed design utilizes a substrate with a height of 1.67mm and a dielectric constant of 4.3. Through comprehensive simulations conducted using CST MICROWAVE STUDIO, we analyze and evaluate the antenna's performance. The demands of wireless communication applications often necessitate the use of antennas that can operate at multiple

frequencies. The compact size, low cost, and lightweight nature of our antenna make it suitable for various applications, including X-band radar communication, Ku-band satellite TV communication, and K-band microwave communication. One of the notable advantages of our proposed antenna is its simplicity. With its straightforward design, it can be easily implemented and fabricated, thereby reducing manufacturing costs and production time. This research signifies a significant step forward in microstrip antennatechnology, facilitating advancements in wireless communication systems.

II.   ANTENNA DESIGN

The antenna structure is comprised of three distinct layers: the patch, the substrate, and the ground. All dimensions are specified in millimeters, ensuring precise engineering and design. The proposed antenna is ingeniously integrated onto a FR-4 lossy dielectric sheet, which serves as the substrate material.

A. Microstrip Patch Antenna

Figure 1 depicts a microstrip patch antenna designed to generate a single resonance frequency. The fundamental formulas utilized to determine the length and width of the patch antennas are presented below [1].
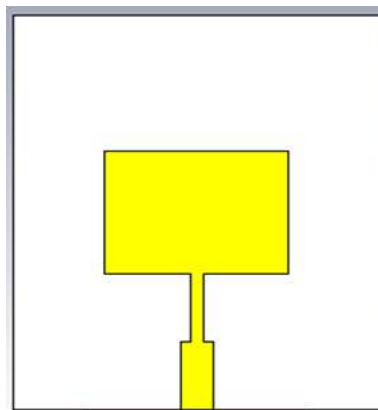
Figure 1: Microstrip rectangular patch antenna

$$L = \frac{c_0}{2 f_r \sqrt{\epsilon_{reff}}} \ldots\ldots\ldots(2)$$

$$\epsilon_{reff} = \frac{\epsilon_r}{2} + \frac{\epsilon_r}{2}\left[1 + \frac{1}{w}\right] \ldots\ldots\ldots(3)$$

$$\frac{\Delta L}{h} = \frac{0.412(\epsilon_{reff} + 0.3)\left(\frac{w}{h} + 0.264\right)}{(\epsilon_{reff} - 0.258)\left(\frac{w}{h} + 0.8\right)} \ldots\ldots\ldots(4)$$

Where
   L_{eff} = Effective length
   c   = Velocity of light in free space
   f_r = Operating resonant frequency
   ϵ_r = Dielectric constant of the sub
   h   = Height of the substrate

This antenna has basic parameters Dielectric Constant, ϵ_r=4.3, Height of the substrate, h = 1.6mm and Resonant Frequency, fr= 5.2GHz. FR-4 lossy is used as the substrate.
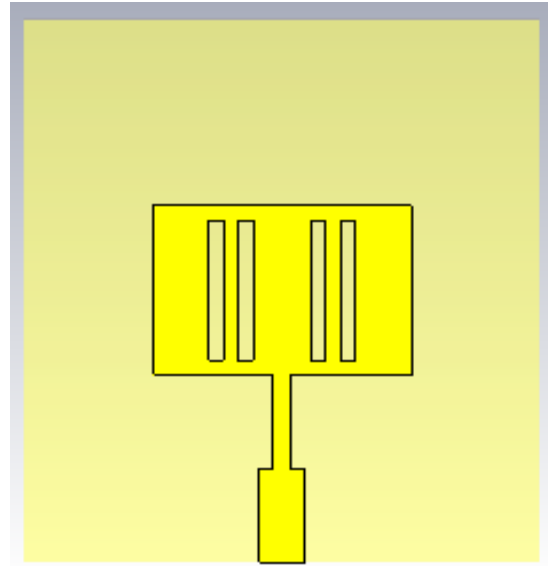
Figure2: Geometry of the antenna with slot

In this particular configuration, each slot measures 1mm in width and 10mm in length. The substrate, with finite dimensions, possesses a length of 35.4402mm, a width of 42.7672mm, and a height of 1.6mm.

TABLE I: DIMENSION OF ANTENNA STRUCTURE

Parameters	Dimensions
Ground	35.7792X 27.0216
Substrate	35.7792X 27.0216
Patch	17.8896X 13.5108
Substrate Height	1.6
Width of quarter wave transformer line	1.2714
Length of quarter wave transformer line	7.4589
Width of feed line	3.1693
Length of feed line	7.4106

III. RESULTS AND DISCUSSION

The proposed antenna design underwent analysis and optimization utilizing the CST MWS software, resulting in the achievement of a tri-band microstrip slot antenna. Notably, the antenna design encompasses three distinct frequency bands. The first band exhibits a resonant frequency of 5.108 GHz, accompanied by a return loss of -17.209 dB and a bandwidth of 0.32933 GHz. Moving on to the second band, its resonant frequency is 9.3323 GHz, complemented by a return loss of -21.903 dB and a bandwidth of 1.0021 GHz. Finally, the third band demonstrates a resonant frequency of 12.038 GHz, coupled with a return loss of -23.053 dB and a bandwidth of 1.2942 GHz. For a visual representation, Figure 3 illustrates the plot of return loss against frequency, showcasing the antenna's performance characteristics across the operating bands.
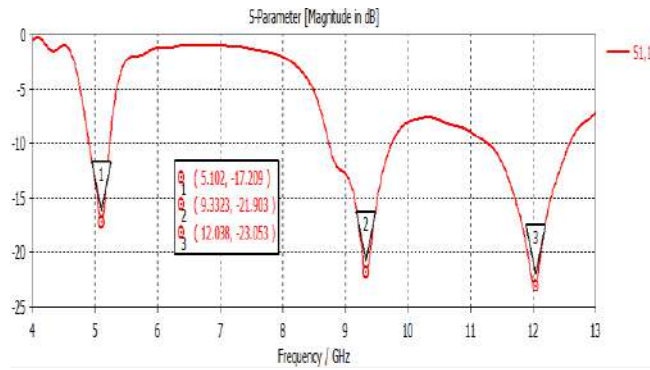
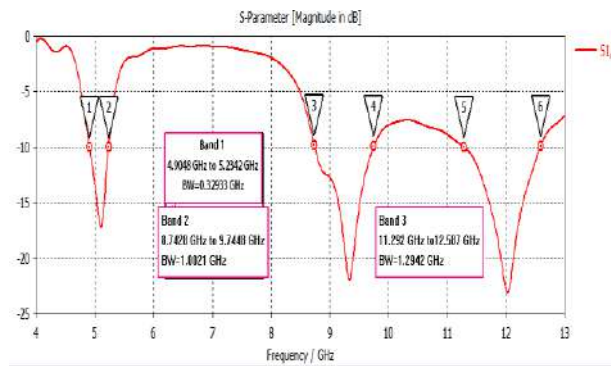**Return Loss**

Figure 3: Return loss plot

Bandwidth

Figure 4: Bandwidth

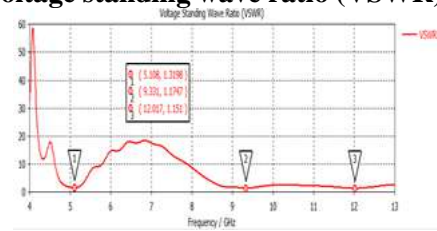**Voltage standing wave ratio (VSWR)**

Figure 5: Voltage standing wave ratio (VSWR)
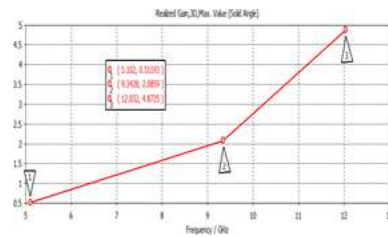
Realized gain

Figure 6: Realized gain

We further examined the radiation patterns of the proposed antenna design. Figure 7, Figure 8, and Figure 9 display the 2D radiation patterns for three distinct frequencies. These figures showcase the simulated total field radiation patterns at 5.108 GHz, 9.3323 GHz, and 12.038 GHz. Notably, these patterns exhibit excellent wideband characteristics at their respective frequencies. For a more comprehensive visualization, Figures 10, 11, and 12 present the 3D radiation patterns corresponding to the resonant frequencies of 5.108 GHz, 9.3323 GHz, and 12.038 GHz, respectively. These 3D patterns provide a more detailed perspective on the antenna's radiation characteristics, highlighting its performance across the selected frequencies.
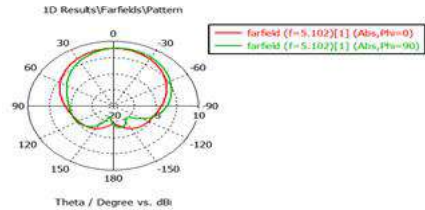
2D Radiation Pattern 1

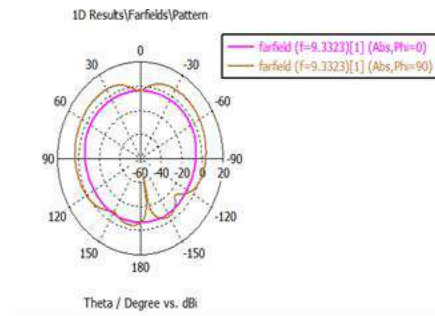Figure7: E-Plane and H-Plane at 5.102 GHz

2D Radiation Pattern 2

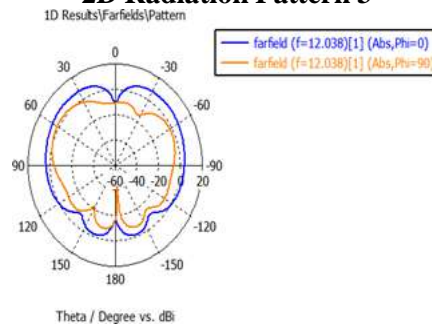Figure 8: E-Plane and H-Plane at 9.3323 GHz

2D Radiation Pattern 3

Figure 9: E-Plane and H-Plane at 12.038 GH
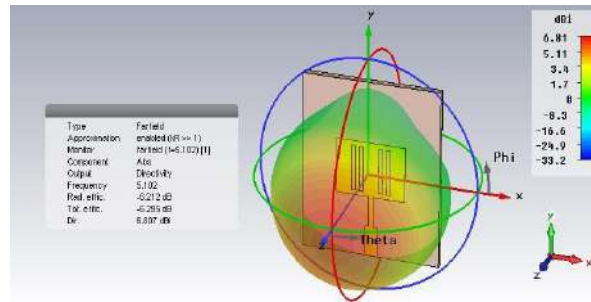
3D Radiation Pattern 1

Figure 10: 3D view of radiation pattern at 5.102 GHz
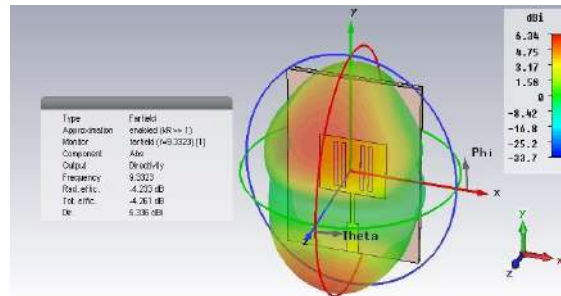
3D Radiation Pattern 2

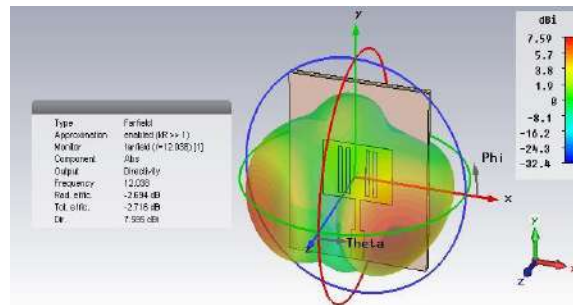Figure11: 3D view of radiation pattern at 9.3323 GHz

3D Radiation Pattern 3

Figure12: 3D view of radiation pattern at 12.038 GHz

The gain of an antenna serves as a metric for evaluating its efficiency and directional capabilities. It is determined by comparing the radiation intensity in a specific direction to the radiation intensity that would be obtained if the power were radiated isotropically. In the case of the proposed antenna, we observe gains of 0.51193 dB, 2.0859 dB, and 4.8725 dB at frequencies of 5.108 GHz, 9.3323 GHz, and 12.038 GHz, respectively. These values demonstrate the antenna's ability to concentrate and direct the radiated power in the desired direction, indicating its effectiveness in achieving enhanced performance at these frequencies.

TABLE II: ANTENNA PARAMETERS

Parameters	Simulated results		
Frequency	5.108GHz	9.3323GHz	12.038GHz
Return Loss (dB)	-17.209dB	-21.903dB	-23.053dB
Gain (dB)	0.51193	2.0859	4.8725
Directivity (dB)	6.807	6.336	7.595
Radiation efficiency	-6.212dB	-4.233dB	-2.294dB

CONCLUTION

The objective of this study is to design and simulate a multiband microstrip slot antenna capable of operating in three distinct frequency bands. The proposed antenna utilizes the microstrip feeding technique and incorporates four narrow slits within the patch structure. The design of this antenna yields the following outcomes: The first band exhibits a resonant frequency of 5.108 GHz, accompanied by a return loss of -17.209 dB and a bandwidth of 0.32933 GHz. This frequency band proves suitable for applications such as mobile communication, wireless LAN, and radar communication. The second band achieves a resonant frequency of 9.3323 GHz, accompanied by a return loss of - 21.903 dB and a bandwidth of 1.0021 GHz. This frequency band is well-suited for applications such as NJFA, satellite communication, and military applications. The third band demonstrates a resonant frequency of 12.038 GHz, accompanied by a return loss of -23.053 dB and a bandwidth of 1.2942 GHz. This frequency band finds relevance in radar and satellite communications. The proposed antenna exhibits low return loss and displays significant gain at frequencies of 5.108 GHz, 9.3323 GHz, and 12.038 GHz. These characteristics make it a promising solution for various communication applications across the aforementioned frequency bands.

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Voice Controlled Robotic Arm to assist Doctor inOperation Theatre

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Abstract—The project described involves using a combination of computer vision and robotics to track an object in real-time. The system utilizesservos to control the camera's pan and tilt and image processing techniques to detect the object's location in the images. The robot is programmed to maintain a constant distance from the object bymaking intelligent decisions based on the object's location and movement. The project showcases the potential of object tracking in various fields, including robotics, surveillance, autonomous driving, and healthcare. As computer vision technology continues to evolve, object tracking can be leveraged for innovative applications to achieve different goals.

I. INTRODUCTION

This project focuses on the development of a robotic arm that leverages the latest advancements in mechanical, electronic, computer, sensor, and communication technologies. Robotic arms have been utilized in industrial manufacturing for decades, performing tasks such as welding, gripping,and lifting, but with recent advancements, robotic arms have become more intelligent and capable of performing complex tasks with greater precision and accuracy. This project aims to explore the integration of computervision and machine learning algorithms into a robotic arm to enhance its capabilities further. The objective is to create a robotic arm that can recognize and manipulate objects of varying sizes and shapes, making it ideal for tasks such as packaging, sorting, and assembly. The project seeks to showcase the potential of robotic arms and computer vision in industrial automation and manufacturing processes.

II. LITERATURE SURVEY

Yogesh Kakdea, Niketan Botheb , Aniket PauL, Real life implementation of Object Detection andclassification Using Deep Learning and Robotic arm , 2018-19. The paper discusses a system that combines deep learning-based object detection and classification with a robotic arm for real-time object sorting and handling. The system uses a Raspberry Pi as the main controller, a camera for object detection, a 3-degree-of-freedom robotic arm, and the YOLOv2 deep learning model for object detection and classification. This cost-effective and efficient system demonstrates the potential of integrating deep learning with robotic arms for various industrial applications

The system uses a Raspberry Pi as the main controller, a camera for object detection, a 3-degree-of-freedom robotic arm, and the YOLOv2 deep learning model for object detection and classification. This cost-effective and efficient systemdemonstrates the potential of integrating deep learning with robotic arms for variousindustrial applications

Zeng, S. Song, K. Yu, E. Donlon, F. R. Hogan,M. Bauza, D.Ma, O. Taylor, M. Liu, E. Romo, N. Fazeli, F. Alet, N. C. Dafle, R. Holladay, I. Morena, P. Q. Nair, D. Green, I. Taylor, W. Liu, T. Funkhouser, and A. Rodriguez, "Robotic Pick and- Place of Novel Objects in Clutter with Multi- Affordance Grasping and Cross-Domain Image Matching," in 2018 IEEE International Conference on Robotics and Automation (ICRA), 2018, pp. 1-8. The paper discusses a system for robotic pick-and- place of new objects in cluttered environments cross-domain image matching to enable the robot to grasp unfamiliar objects. It also includes modules for object detection and pose estimation, as well as motion planning and control for

the robot arm. The paper presents experimental results showing the system's success in real- world environments. The article introduces a vision system for bin picking that utilizes dual-arm robots. The system uses both a 3D camera and a color camera to detect and locate objects within the bin.

R. J. Almusawi, L. C. Dülger, and S. Kapucu, "A New Artificial Neural Network Approach in Solving Inverse Kinematics of Robotic Arm (Denso VP6242)," Computational Intelligence & Neuroscience, pp. 1-10, 2016. The paper presents a new approach to solve the inverse kinematics problem of a Denso VP6242 robotic arm using an artificial neural network. The proposed neural network takes the desired end-effector position and orientation as inputs and outputs the corresponding joint angles. The authors trained the neural network using a dataset of end-effector positions and corresponding joint angles obtained from the robot arm. They used a feedforward neural network with one hidden layer and trained it using backpropagation. The performance of the neural network was evaluated by comparing its predictions to the actual joint angles obtained from the robot arm. The results showed that the proposed neural network approach can solve the inverse kinematics problem of the Denso VP6242 robotic arm with high accuracy and faster computation time compared to traditional methods.

Roshanianfard and N. Noguchi, "Development of a 5DOF robotic arm (RAVebots-1) applied to heavy products harvesting," IFAC- Papers On Line, vol. 49, pp. 155-160, 2016/01/01 2016. In this paper, Roshanianfard and Noguchi present the development of a 5DOF (degree of freedom) robotic arm called RAVebots-1. The robotic arm is designed for heavy product harvesting, specifically for use in agriculture. The paper describes the mechanical design of the arm, including the use of a parallel link mechanism to increase the payload capacity and a spring mechanism to absorb shock during operation. The control system of the robotic arm is also discussed, which includes a microcontroller and cross-domain image matching to enable the robot to grasp unfamiliar objects. It also includes modules for object detection and pose estimation, as well as motion planning and control for the robot arm. The paper presents experimental results showing the system's success in real- world environments. The article introduces a vision system for bin picking that utilizes dual-arm robots. The system uses both a 3D camera and a color camera to detect and locate objects within the bin.

R. J. Almusawi, L. C. Dülger, and S. Kapucu, "A New Artificial Neural Network Approach in Solving Inverse Kinematics of Robotic Arm (Denso VP6242)," Computational Intelligence & Neuroscience, pp. 1-10, 2016. The paper presents a new approach to solve the inverse kinematics problem of a Denso VP6242 robotic arm using an artificial neural network. The proposed neural network takes the desired end-effector position and orientation as inputs and outputs the corresponding joint angles. The authors trained the neural network using a dataset of end-effector positions and corresponding joint angles obtained from the robot arm. They used a feedforward neural network with one hidden layer and trained it using backpropagation. The performance of the neural network was evaluated by comparing its predictions to the actual joint angles obtained from the robot arm. The results showed that the proposed neural network approach can solve the inverse kinematics problem of the Denso VP6242 robotic arm with high accuracy and faster computation time compared to traditional methods.

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III. METHODOLOGY

Below is the block diagram of the connectionbetween raspberry pi board and robotic arm. The motive of the design is to help croakers or surgeons in the operation theatre to give required effects**.** Python IDLE used as programming software and jeer pi used as microcontroller and Ultrasonic Sensor is used to descry frontal obstacles.
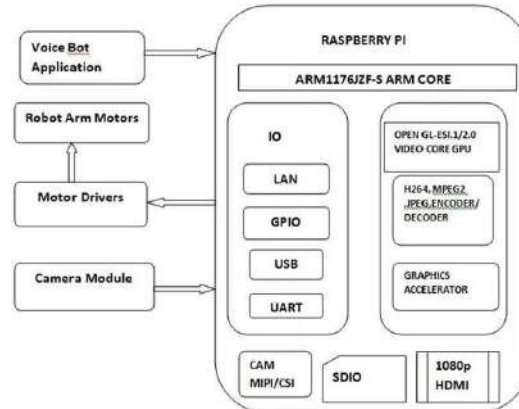

Fig. 1. Block diagram of connection between robotic arm and raspberry pi

Robot will start when it gets power and will move in predefined path. Also it'll check for obstacles. However, robdetects obstacles, also robot will turn and will move backward and turn left or right, If any handicap isn't set up. The robot will search for an given input object by stoner using image processing algorithm. It'll descry many objects which is trained by YOL After discovery ofobjects robot will pick the object using help of claw and back to ignition place and place the object. YOLO algorithm employs convolutional neural networks (CNN) to descry objects in real algorithm has 3 way to train custom objects.

Dataset collection: Minimum 400-5 images needed for classification.

Labelling: In YOLO labelling format, a. txt train with the same name is created for each image train in the same directory. Each. txt train contains the reflections for the corresponding image train, that's object class, object equals, height and range.

Training: During the training, the neural network is being fed with a large dataset of images being labelled with their corresponding class markers. The complication neural network processes each image with its values being assigned aimlessly and also make comparisons with the class marker of the input image.

IV. OBJECTIVES

- To design and implement an assistive robot for doctors in operation theatre.
- To develop a robot that can find, detect, pick and drop the object.
- To develop a YOLO algorithm using Convolutional Neural Networks. Making useof voice bot for instructing robot arm.
- To develop a user friendly and easily controllable robot which can help the doctors or surgeons in the operation theatre
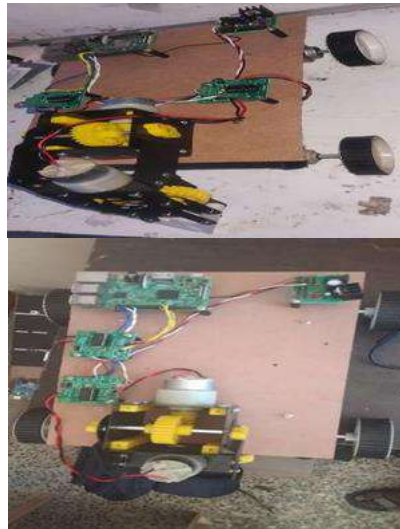
V. RESULTS

Fig. 2 Robotic arm model

VI. CONCLUSION

This project has developed an efficient and low-cost robot for pick- and-place operations using object detection and collection.   By combining concepts from automobile robotics and neural networks, this robot has various industrial applications and has the potential to serve as a platform for larger, more advanced robots. sensors for position feedback. The authors conducted experiments to evaluate the performance of the robotic arm including tests on different types of crops and harvesting scenarios. The results showed that RAVebots-1 can effectively harvest heavy products with high accuracy and efficiency. The authors conclude that the robotic arm has potential for use in the agriculture industry to reduce labor costs and increase productivity.

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DEVELOPING A FACE RECOGNITION ALGORITHM USING ARLBP

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ABSTRACT:

Facial features carry a wealth of information about an individual's identity and emotional condition. Face recognition is a challenging yet fascinating problem that has significant implications in various fields, including law enforcement, banking and security access, and identity verification. Our research consists of three key components: face rendering, characteristic retrieval, and categorization. Face representation involves modeling a face and determining the appropriate algorithms for spotting and identification. Attribute extraction focuses on extracting the most valuable and distinctive features from the face image. In the Categorization phase, the face image is evaluated against images from a data repository. Our study assesses a person-independent face recognition approach that incorporates both structure and surface characteristics using Local Binary Patterns. We first divide the face area into small regions and extract Local Binary Pattern (LBP) histograms from each region. The aggregation of these histograms creates a single feature vector, which provides an approach to yield an efficient face representation that can be utilized to yield an efficient face representation that can be utilized to measure image similarities.

Keywords: Biometrics, Preprocessing, ARLBP, Euclidean Distance, Recognition.

I. Introduction

To build a feature vector, important information must be taken out of the face representation through the method of feature extraction. Features such as the form of the eyes, nose, and mouth are captured in feature vectors, which are numerical representations of the face. LBP is a texture descriptor that compares the intensity values of nearby pixels to extract characteristics from an image. The person in the image can be recognized using classification techniques after the feature vector has been extracted. Based on the traits that are taken from the face representation, the algorithms learn to categorize faces. Face representation, feature extraction, and classification are the three main steps in face recognition. Researchers are always creating new and better methods for every stage of the process because each component is essential to the system's accuracy and performance.

Facial recognition technology has advanced significantly in recent years. These developments have made facial recognition useful for a variety of tasks, including detecting suspects in criminal investigations and unlocking cell phones and laptops. The capability of facial recognition to calculate similarities between photos is one of its most helpful characteristics. As a result, even if a person's face is partially hidden or the photo was taken from a different perspective, the system can still identify them. The system can determine whether two photographs of the same person are of that person with a high degree of accuracy by comparing the features derived from those images. Another crucial component of facial recognition is facial expression. The system can identify a person's emotional condition by observing the position and movement of facial features like the mouth, eyes, and eyebrows. Security systems frequently employ physiological biometrics like fingerprints, facial recognition, iris scans, and DNA. These biometrics are particular to each person and have exhibited a fair amount of stability over time. Although behavioral biometrics are less accurate than physiological biometrics, they can be used in conjunction with other elements to boost a biometric authentication system's overall accuracy. A more recent type of biometric, known as soft biometrics, can be employed in addition to physiological and behavioral biometrics. Age, gender, height, and weight are examples of soft biometrics that can be utilized in a biometric identification system to better define a person's identity. In comparison to conventional authentication techniques, biometric authentication systems provide a more convenient and secure way to authenticate users. The feature extraction method known as ARLBP works in the spatial domain. It is frequently used

in facial recognition systems and is used to extract texture information from photos. A binary pattern is assigned to each pixel in each small, overlapping part of the image in ARLBP based on the brightness values of the pixels around it. A feature vector for the image is created by concatenating the binary patterns that are produced. While ARLBP only works in the spatial domain, it has been demonstrated that hybrid techniques that combine methods from the spatial and transformation domains can enhance recognition performance. In facial recognition systems, for instance, integrating ARLBP with frequency-domain data derived using Fourier transforms might increase recognition accuracy.

I. Literature Survey

[1] A Review of Face Recognition Technology by Lixiang Li, Xiaohui Mu, Siying Li and Haipeng Peng (2020). In this paper, the authors provide information about the facial recognition technology development stages, as well as real- world application research, broad evaluation criteria, and databases.

[2] Open-Source Face Recognition Frameworks: A Review of the Landscape by David Wanyonyi and Turgay Celik. This research focuses on the open-source FR framework ecosystem, focusing on FR pipeline components such as face detection, alignment, representation, identification, and verification. It also addresses current difficulties in FR research as well as emerging directions.

[3] Deep learning for face Anti-spoofing: A survey by Zitong Yu , Yunxiao Qin , Xiaobai Li, Chenxu Zhao, Zhen Lei, and Guoying Zhao. The paper examines recent advancements in deep learning-based FAS, including techniques with pixel-wise supervision, domain generalization, and multi-modal or specialized sensors. The paper concludes by highlighting existing unresolved difficulties and outlining potential future research possibilities in this area.

[4] Privacy–Enhancing Face Biometrics: A Comprehensive Survey by Blaz Meden , Peter Rot ,Philipp Terhorst , Naser Damer , Arjan Kuijper, Walter J. Scheirer , Arun Ross , Peter Peer, and Vitomir Struc. This paper provides an overview of the research on privacy-related issues in the field of biometric recognition technology with a focus on facial recognition especially. Scientists have developed a range of privacy-enhancing techniques (PETs) meant to lessen the risks associated with biometric identification.

[5] A Survey of AI-Based Facial Emotion Recognition: Features, ML & DL Techniques, Age-Wise Datasets and Future Directions by Chirag Dalvi, Manish Rathodi , Shruti Patil.

[6] Shilpa Gite and Ketan Kotecha. This paper provides a comprehensive overview of AI-based FER methodology, including datasets, feature extraction techniques, algorithms, and current breakthroughs, making it a valuable resource for the academic community.

[7] Detecting Facial Landmarks on 3D Models Based on Geometric Properties—A Review of Algorithms, Enhancements, Additions and Open-Source Implementations by Oguzhan Topsakal, Tahir Cetin Akinci, Joshua Murphy, Taylor Lee-James Preston and Mehmet Mazhar Celikolar. The paper investigates current research on algorithms for autonomously distinguishing face landmarks on 3D models, which is useful in fields such as facial surgery, biometrics, and surveillance systems.

[7] Face Segmentation: A Journey from Classical to Deep Learning Paradigm, Approaches, Trends, and Directions by Khalil Khan, Rehan Ullah Khan, Kashif Ahmad, Farman Ali and Kyung-Sup Kwak. In-depth coverage of face segmentation, a difficult computer vision job with several uses in human-facial picture analysis, is provided in this work. The issue of face segmentation has been addressed by a number of algorithms, but it is still unresolved, especially for photographs shot in unrestricted environments.

[8] Face Recognition Based on Concatenation of Spatial Domain Features by Ravi J and Raveendra K. The research suggests a hybrid domain-based face recognition system that handles differences in facial emotions, position, lighting, and orientation by combining HOG and ARLBP algorithms.

[9] Face Recognition system based on convolution neural networks by Htwe Pa Pa Win, Phyo Thu Thu Khine, and Khin Nwe Ni Tun. The research emphasizes the efficiency of deep learning in facial image identification and its potential for future applications.

[10] Facial Emotion Recognition: A Brief Review by Illiana Azizan and K. Fatimah. This paper gives information about Local Binary Patterns, Fisher face Method, Principle component analysis, and Convolutional Neural Networks.

[11] Face Recognition Techniques- A Review by Bhaskar Gupta. This paper is based on The Eigenface method, Multi-Layer Perceptron (MLP) with feed-forward learning algorithms, Fisher face method.

[12] A Survey on Human Face Expression Recognition Techniques by I. Michael Revina, W.R. Sam Emmanuel. The paper offers an analysis of Face Expression Recognition (FER) methods, including preprocessing, feature extraction, and classification steps.

[13] Performance Evaluation of Face Recognition System by Concatenation of Spatial and Transformation Domain Features by Raveendra K and Ravi J. The research proposes a face recognition system that extracts features from both the spatial and frequency domains. The experiment uses various face databases and demonstrates. higher recognition rates.

14. Spatial-Phase Shallow Learning: Rethinking Face Forgery Detection in Frequency Domain by Honggu Liu, Xiaodan Li, Wenbo Zhou, Yuefeng Chen, Yuan He, Hui Xue, Weiming Zhang, Nenghai Yu. The article offers a theoretical study of using the phase spectrum and demonstrates that SPSL delivers cutting-edge performance on the cross-dataset assessment.

15. An android-based course attendance system using face recognition by Dwi Sunaryono, Joko Siswantoro, and Radityo Anggoro.This study suggests an Android-based course attendance system that measures student engagement using facial recognition.

3. Methodology

Face recognition systems rely on a training database, which is a collection of labeled images of faces used to train the system's algorithms. To achieve high accuracy, the proposed work incorporates

both spatial and transforms domain techniques for extracting facial image features. The system uses Asymmetric Region Local Binary Pattern (ARLBP) to extract local structural feature information from

the face image, reducing the dimensionality problem and capturing local features, which is useful when some regions of the face are occluded. The Euclidean distance algorithm is then used to measure

the similarity or dissimilarity between two faces. It compares the facial feature vectors extracted from an image of a face to those in a database of known faces, providing reliable matching of faces in real- world applications. Overall, the combination of the spatial and

transforms domain techniques, along with the Euclidean distance algorithm, allows for accurate comparisons of complex facial features, reducing the impact of occlusion in the face, and providing reliable matching of faces in real-world applications. The proposed approach is expected to have improved face recognition performance compared to existing systems by incorporating both spatial and transforms domain techniques, which are expected to capture more comprehensive and robust information about facial features. Developing and maintaining a high-quality training database is a critical step in developing robust and effective face recognition systems. Properly securing the training database is also crucial to prevent unauthorized access and protect individual privacy.

TRAINING PROCESS

In face recognition training, face images from different databases are combined to create a comprehensive database. The next step is face image preprocessing, which involves extracting the region of interest (ROI) or the face detection from the input image. The detected face image is then cropped to a fixed dimension and converted to a grayscale image. Asymmetric Region Local Binary Pattern (ARLBP) is then applied to the cropped image to extract spatial features. The ARLBP technique outputs a feature vector of length L for each face image, capturing important information about the local structural features of the face. These feature vectors are used in the training process to train the face recognition algorithm to accurately identify and match faces. By using a standardized approach to face image preprocessing and feature extraction, the resulting face recognition system can achieve high accuracy and robustness.

PRE-PROCESSING

In the ARLBP algorithm, pre-processing of face images is an important step in preparing the images for feature extraction. The first step is to detect the face region or region of interest (ROI) in the input image, which is then cropped to a fixed size and converted to grayscale. The grayscale image is then divided into small rectangular regions, and for each region, a local binary pattern (LBP) operator is applied to extract the local texture information.

To improve the discriminative power of the LBP operator, the ARLBP technique uses asymmetric regions to capture the spatial relationships of the pixels within the rectangular region. Specifically, the region is divided into four sub-regions, and the LBP operator is applied to each sub-region with different radii. This

results in four different LBP codes, which are concatenated to form a more discriminative feature vector. Finally, the ARLBP feature vectors for each rectangular region are concatenated to form a complete feature vector for the entire face image, which is used in the subsequent face recognition process. By using the ARLBP algorithm, important local structural features of the can be extracted and used for accurate and robust face recognition.

EUCLIDEAN DISTANCE

Euclidean Distance (ED) is a simple and effective distance metric used in the proposed face recognition system. ED is used to measure the similarity between feature vectors. The formula for calculating the Euclidean Distance is: $d = sqrt(sum((p[i]-q[i])^2))$. The feature vectors p and q represent the feature vectors from the database images and the test image, respectively. N represents the total number of images in the database. ED is utilized in nearest neighbour classification to find the closest match for a test face among the database faces. It calculates the straight-line distance between two points in the feature space. While ED is suitable for this face recognition system, other distance metrics like cosine distance or Mahalanobis distance may be more appropriate in different scenarios.
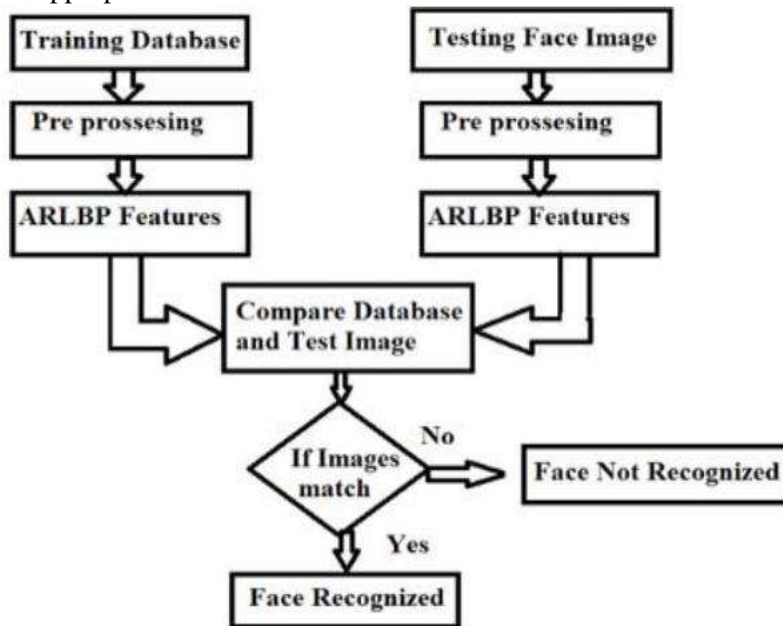

Figure-1 Proposed Model

FEATURE EXTRACTION

The standard Local Binary Pattern (LBP) operator that uses a 3x3 neighborhood has a drawback in identifying significant features in texture analysis at higher scales. To address this limitation, the ARLBP operator is utilized, which is scalable and can effectively extract prominent features at higher scales by considering the average intensities or higher values of the sub-regions surrounding the central pixel value. As a result, this approach reduces the loss of texture information and enhances the discriminative power compared to LBP.

The ARLBP operator comprises eight sub-regions labeled R1 to R8, positioned around a central region. The sizes of R1, R3, R5, and R7 vary in both horizontal and vertical directions, while R2 and R6 vary in the vertical direction and R4 and R8 vary in the horizontal direction. The central region remains fixed at 1x1, while the sub- regions sizes determine the operator's overall size. Generally, the ARLBP operator has a size of (2m+1) x (2n+1), consisting of four rectangular regions of size nxm, two regions of size 1xn, two regions of size mx1, and the central region of size 1x1. Here, m and n represent the width and height of the region. If we set m=1 and n=1, the ARLBP operator is equivalent to the basic LBP operator. To extract features, we apply the ARLBP operator to a 5x5 window with m=2 and n=2. We compute the average value of the pixels in each region, round it off to the nearest integer, and use the resulting values as

features.To obtain the average value of a subregion R1, the four- pixel values within it are added and divided by 4. Similarly, the average value is calculated for all sub-regions, including R3 where the average value of 5.5 is rounded off to 6. By averaging the subregion values, the 5x5 matrix is reduced to a 3x3 matrix. The final feature vector is obtained using the ARLBP (xc,yc) relation by comparing the pixel values of neighbors with the central pixel value.
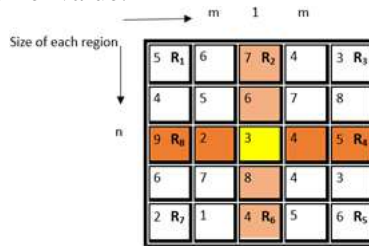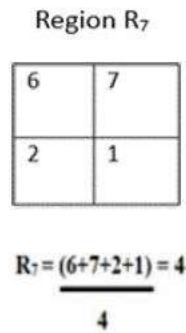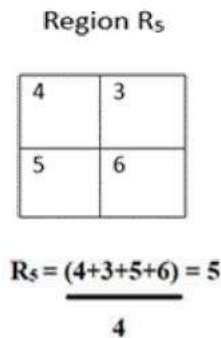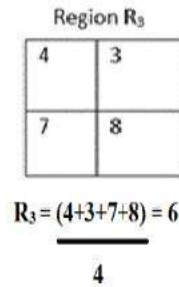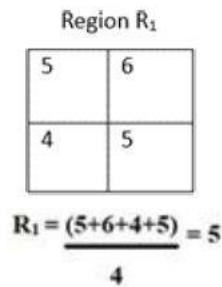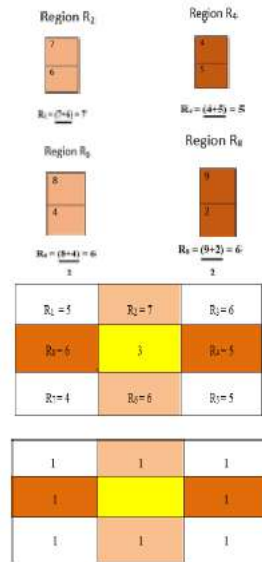

$$d = \sqrt{\sum_{i=1}^{N}(p_i - q)^2}$$

$$ARLBP(x_c, y_c) = \sum_{i=1}^{8} S(a_i - a_c)2^P$$

Average gray values is represented by ai and ac is represented as the central pixel value. The function S(ai – ac) can be represented as ,

$$S(a_i - a_c) = \begin{cases} 1, & (a_i - a_c) > 0 \quad n \\ 0, & Otherwise \end{cases}$$

Region R₁

5	6
4	5

$R_1 = \dfrac{(5+6+4+5)}{4} = 5$

Region R₃

4	3
7	8

$R_3 = \dfrac{(4+3+7+8)}{4} = 6$

Region R₅

4	3
5	6

$R_5 = \dfrac{(4+3+5+6)}{4} = 5$

Region R₇

6	7
2	1

$R_7 = \dfrac{(6+7+2+1)}{4} = 4$

When the center pixel value is 3 and the neighboring pixel value, R1, is 5 and is greater than 3, it is given the binary value 1, whereas in R6, the average pixel value is 6, which is less than 3, and it is given the binar given the binary value 1, and so on. The clockwise construction of the binary code 11111111 is translated into the equivalent decimal value of 255, which is used as an ARLBP feature value. This process is repeated for the complete facial image.

IV. Result

A face recognition system based exclusively on the Asymmetric Region Local Binary Pattern (ARLBP) and concatenated characteristics was proposed in this paper under discussion. The study calculated the recognition rate for various threshold levels using the system's performance on several face datasets, including L-Spacek and NIR. The results demonstrated that, even without the use of more sophisticated feature extraction techniques like FDCT, the suggested system had good identification rates across all datasets. On the L- Space database, for instance, the system's recognition rate was 92.50%, while on the NIR database, it was 90.63%. In addition, various cutting-edge facial recognition systems were evaluated in this ststudy, and it was discovered that their system surpassed them in terms of recognition rate. Therefore, these results indicate that the proposed face recognition system, which just uses ARLBP and concatenated features, is capable of accurately identifying faces from various databases and may be a useful and practical alternative to more involved feature extraction techniques.

$$Recognition\ Rate = \frac{Number\ of\ genuine\ samples}{Total\ number\ of\ Images\ in\ Database}$$

Training Database	Testing Face Image	Result
		FACE RECOGNIZED "Ambika"
		FACE RECOGNIZED "Gouthami"
NOT PRESENT IN DATABASE		FACE NOT RECOGNIZED

V. Conclusion

The proposed article focuses on face recognition utilizing the Asymmetric Region Local Binary Pattern (ARLBP) approach for extracting spatial domain features. The ARLBP method extracts texture information from each part of an image using binary patterns after segmenting the picture into distinct sections. The face section of a picture is first preprocessed by cropping and scaling it to a fixed dimension of 100×100 pixels. This approach is used to extract spatial characteristics from the face portion of the image. ARLBP is used both by itself in the experiment as well as in conjunction with a curvelet, another frequency domain feature extraction method. To determine the recognition rate for several face datasets including FERET, L-Space k, JAFFE, and NIR, the researchers employ a variety of distance measurements and an SVM classifier. The algorithm's performance is assessed using a measure called the recognition rate. The percentage of successfully detected faces among all examined faces is known as the recognition rate. The effectiveness of the ARLBP technique alone and the ARLBP and curvelet approaches combined are compared by the researchers. They note that the hybrid approach performs better than ARLBP alone, demonstrating that integrating several feature extraction techniques can increase face recognition accuracy.

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ALGORITHMIC TRADING USING MACHINE LEARNING (ML) ALGORITHMS

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Abstract - Stock market activity holds significant importance in the world. The primary objective of this study is to forecast the value of the Nifty 50 stock market index and compare the performance of different algorithms for stock market prediction by analyzing their respective graphs. The programming language utilized for this purpose is Python. The research employs a Machine Learning (ML) approach to train a module using available stocks data and acquire intelligence to facilitate accurate predictions. Four machine learning techniques, namely Support Vector Machine (SVM), Random Forest, Linear Regression, and Long Short-Term Memory (LSTM) algorithms, will be employed to forecast the closing value of the Nifty 50 stock market index.

Keywords - Machine Learning (ML); Support Vector Machine (SVM); Long Short-Term Memory (LSTM); Python Programing Language; Stock market index Nifty 50 (Close)

I.INTRODUCTION

A share market is a place where shares of publicly held companies or individuals are exchanged for the purpose of raising funds. The prices of shares constantly change based on the demand and supply of shares. Only registered companies are permitted to engage in trading activities. The stock market involves attempting to forecast the future value of a company's stock. It is a highly researched and complex problem that attracts scholars from various disciplines such as economics, history, finance, mathematics, and computer science. This analysis is beneficial for individuals and organizations looking to invest in the stock market. The research paper focuses on developing a financial data predictor program using a dataset consisting of historical stock prices, which serves as the training set for the program. The primary objective of the prediction is to minimize uncertainties associated with investment decision-making.

II.CHRONICLE OF STOCKMARKET

A.   Stock Market Ground Work

The stock market serves as both the primary and secondary market, bringing together investors and buyers to trade shares in companies at agreed-upon prices. Prices are determined by the interplay of demand and supply. In the primary market, companies directly issue new securities. Owning a share entitles the holder to be one of the company's owners and can result in receiving dividends or capital gains through selling the shares. Stock exchanges function as clearing houses, ensuring the secure payment of securities to sellers. These activities collectively enable the expansion of businesses, economic growth, employment, and the production of goods and services. For a security to be traded on a specific stock exchange, it must be listed there. Listing requirements encompass a set of conditions imposed on companies seeking to be listed by a particular stock exchange. Traders, who can be professionals from financial institutions, corporations, or individual investors, engage in buying and selling financial instruments such as stocks, bonds, and derivatives.

B. Importance of stock Market

The Indian stock market holds the third position globally. Stocks represent ownership in a company, offering partial ownership rather than mere paper certificates, and can be traded in the stock market. When a company's ownership is divided into 100 parts, an investor can purchase one part, which equals one share, enabling them to own 1 percent of the company. The stock exchange employs an automated matching system based on orders. Stock prices are determined by the availability of buyers and sellers for

a particular stock at any given time. If there are more buyers than sellers, the stock price increases, while if there are more sellers than buyers, the stock price decreases. The Security and Exchange Board of India (SEBI) regulates the stock market. Different customers have varying preferences and requirements in stock markets. As of early October 2008, the estimated value of the global stock market reached $36.6 trillion. Additionally, the total value of the global derivatives market was estimated at around $791 trillion in face value or nominal value, which is 11 times the size of the world economy.

III.   STOCK MARKET PREDICTION (SMP)

By predicting the trends in the stock market, we can prevent the wastage of money. Stock market prediction (SMP) involves analyzing past data to forecast future outcomes. This prediction process helps reduce the risk for investors and boosts their confidence in making investments. By setting predetermined goals based on these predictions, investors can avoid financial losses. All these factors contribute to the functioning of SMP. By examining historical data trends, we make educated guesses about future market trends, thereby engaging in SMP.

IV. METHODOLOGY

This project focuses on predicting the stock market index Nifty 50 using various machine learning techniques such as Support Vector Machine (SVM), Random Forest, Linear Regression, and Long Short-Term Memory (LSTM). The following section will delve into the specifics of each step involved in the prediction process.

A. Data collection and analysis stage

During the Data Collection and Analysis stage, our focus will be on examining the raw data at our disposal and conducting a thorough study to identify relevant attributes that can be utilized for predicting our selected label. For this program, we have obtained the dataset from a renowned platform that offers comprehensive datasets. Specifically, we have extracted the dataset from Kaggle, a premier dataset provider. To incorporate real-time values, we will leverage the API key of nse.com. The dataset we will be utilizing encompasses the data from the past 21 years, ensuring a substantial historical perspective for our analysis.

B. Feature Extraction

The raw data undergoes a transformation process known as feature extraction to obtain processed data. Since the raw data may contain unnecessary information, it is crucial to extract the relevant data for the purposes of training and testing. The dataset includes specific attributes such as the Open (Opening price of a stock), High (Highest price achievable at a given point in time), Low (Lowest price achievable at a given point in time), and Close (Closing price of a stock). These attributes provide essential information for further analysis and prediction.

C. Prediction

The dataset comprises various attributes that provide essential information for analysis and prediction. These attributes include:

Open: This represents the opening price of the stock at a given time.

High: It denotes the highest price reached by the stock during a specific period. Low: This signifies the lowest price recorded by the stock during a specific period. Close: It indicates the closing price of the stock at the end of a given time period.

These attributes play a significant role in understanding the price fluctuations and trends of the stock market.
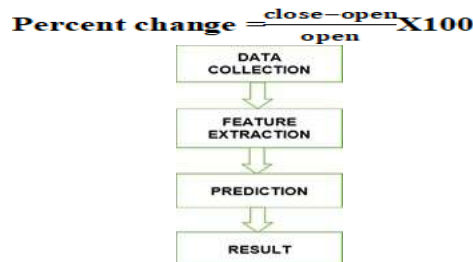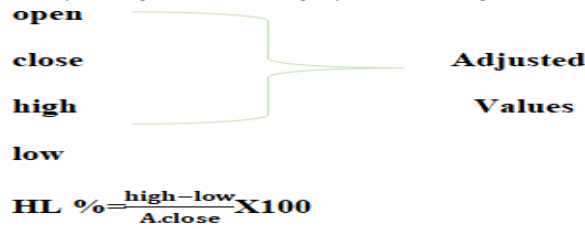
D. Training & Testing

The training and testing process of the model follows a straightforward approach, with the requirement of proper data. To carry out this process, 80 percent of the total dataset will be allocated for training purposes, while the remaining 20 percent

will be used for testing. This division ensures a comprehensive evaluation of the model's performance. Based on these training and testing datasets, a graph will be plotted to visualize the results and assess the effectiveness of the model.

E. Support Vector Machine

Dimensional space, this hyper plane appears as a line that divides the plane into two parts, with each class situated on either side. SVM is widely recognized as a highly suitable algorithm for time series prediction,

open

close   Adjusted

high   Values

low

$$HL \% = \frac{high - low}{A.close} \times 100$$

$$Percent\ change = \frac{close - open}{open} \times 100$$

DATA COLLECTION

↓

FEATURE EXTRACTION

↓

PREDICTION

↓

RESULT

offering superior efficiency and accuracy compared to other available algorithms. The correlation analysis between SVM and the stock market reveals a strong connection between stock prices and the market index. This supervised algorithm can be employed for both regression and classification tasks. The SVM involves plotting data points in an n-dimensional space, facilitating effective analysis and prediction.

F. Random Forest

The utilization of machine learning techniques for stock price prediction is a growing trend in the field. Researchers dedicate significant time and effort to developing methods that enhance the accuracy of stock prediction models. With numerous options available, there are multiple approaches to predicting stock prices, but not all methods yield the same results.

Even when applied to the same dataset, different techniques produce varying outputs. In the mentioned paper, the random forest algorithm is employed to predict stock prices using financial ratios from the previous quarter. This represents one approach to the problem, utilizing a predictive model that leverages historical data to forecast future stock prices. However, it is important to consider other factors that can impact stock prices, such as investor sentiment, public opinion about the company, news reports, and broader market events that can cause fluctuations.

model, incorporating financial ratios and employing a sentiment analysis model can be beneficial. This approach takes into account both financial indicators and the analysis of market sentiment.

G. Linear Regression

Linear regression is a fundamental and widely used method of predictive analysis. Its primary objective is to assess the following:

(1) How well can a set of predictor variables predict the outcome (dependent) variable?

(2) Which specific variables significantly contribute to predicting the outcome variable? The magnitude and sign of the beta estimates indicate the impact of these variables on the outcome.

The regression equation, in its simplest form, involves one dependent variable and one independent variable:

Here, y represents the estimated score of the dependent variable, c denotes the constant term, b represents the regression coefficient, and x corresponds to the score on the independent variable. This equation allows us to understand and explain the relationship between the dependent and independent variables.

V. COMPARATIVE ANALYSIS OF DIFFERENT APPROACHES
Table: Comparative analysis of different approaches

Sr.no	Algorithm used	Evaluation metrics used	Advantages	Disadvantages
1	Linear Regressio n	Mean Absolute Error- 17.0039, Mean Squared Error- 940.30664, Root Mean Squared Error- 30.6644, (R^2) Score- 0.9999.	Easier to implement, interpret& efficient totrain.	It is often quite prone tonoise and fitting.
2	Support Vector Machine (SVM)	Mean Absolute Error- 6014.7, Mean Squared Error- 53419696.4, Root Mean Squared Error- 7308.8779, (R^2) Score—2.0966.	Support Vector Machine is Comparably memorysystematic.	Exaggerate to minor fluctuations in the trainingdata which decrease the predictive ability.
3	LongShort- TermMemory LSTM)	Mean Absolute Error- 463.5558, Mean Squared Error- 434545.7882, Root Mean Squared-Error- 659.200, (R^2) Score-0.9999.	Speech and Handwritin g Recognitio n.	Comparative analysis is not extensive
4	Random Forest	Mean Absolute Erro-3.6471, Mean SquaredError-92.3353, Root Mean Squared Error- 9.6091, (R^2) Score- 1.0.	It is used in radar forobject detection.	A forest is less interpretable than a single decision tree.

$$RMSE = \sqrt{\frac{\sum_{i=1}^{N}\left(Predicted_i - Actual_i\right)^2}{N}}$$

Here, we calculate a Mean Absolute Error(MAE), Mean Squared Error(MSE), Root Mean Squared Error(RMSE).
Mean Absolute Error:- MAE are used to measure the error produced by a predictive model.

$$MAE = \frac{1}{n}\sum_{j=1}^{n}|y_j - y_j|$$

Mean Squared Error:-There are no acceptable limits for MSE the higher the accuracy of prediction as there would be

$$MSE = \frac{1}{n}\sum_{i=1}^{n}(Y_i - \hat{Y_i})^2$$

Root Mean Squared Error:-Root Mean Square Error (RMSE) is a standard way to measure the error of a model in predicting quantitative data. The lower the RMSE, the better a given model is able to fit dataset.
RESULT
The model is designed to yield the desired results in the desired format. As previously discussed in this paper, we will generate a graph that aligns with our specific requirements. By doing so, we can visually analyze and interpret the results. The accuracy of the predicted outcomes is expected to be high, indicating the effectiveness of the model in providing reliable predictions.
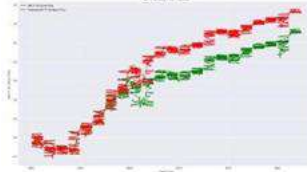
Conclusion
Financial markets offer a convenient platform for investors and traders to engage in trading activities using any internet- connected device. In recent years, there has been a growing attraction towards stock trading as individuals seek opportunities to grow their investments. The stock market, like many other areas, has been transformed by technological advancements. Online trading has revolutionized the process of buying and selling stocks, making it more accessible to a wider audience. Furthermore, the financial markets have rapidly evolved, forming a globally interconnected marketplace. These developments have created new avenues and possibilities for investors.

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Comparative Analysis of Heart Disease Prediction using Different Machine Learning Classifiers

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Abstract—Heart is the main component of the human body and without it the body can't function. It provides the flow of blood to different organs and body parts. It purifies the blood by removing the carbon dioxide(CO_2). It is also known as cardiovascular disease, it creates many risk factors for a human, including death. Researchers apply several data mining and machine learning techniques to analyses huge complex medical data, helping healthcare professionals to predict heart disease.[1] The research paper presents various attributes available from the dataset which has 300 instances and 14 features/attributes which will be used to perform the given problem. The main idea for the paper is to do comparative research on machine learning classification techniques and to show which is the best performing algorithm to predict the heart disease at a much earlier phase to avoid the repercussions that would be faced by the patients later.

Keywords - Comparative analysis, machine learning, heart disease prediction, random forest, Classification.

I. INTRODUCTION

Diseases are the biggest threat to human life and cardiovascular are the most dangerous ones. Thee disease are increasing on day-to-day basis. The treatment of heart problems has recently been stated in a study that has received huge attention in the medical system worldwide. On median, 17.7 million deaths result from heart disease, which counts for about 31% throughout the world in 2016, according to World Health Organization (WHO). The number of cardiac cases, which is the focus of this study, shows that 82 percent of cases are from low and middle income countries, 17 million people are under 70 years old and susceptible to non-infectious diseases, 6.7 million people are affected by stroke, and 7.4 million people have heart disease (WHO, 2016)[3]. The machine learning techniques that are used by the authors are Random Forest classifier, decision tree classifier, KNN, Support vector machine and Naive Bayes classifier.

Determining the probability of having the cardiac disease is tough, and we need a proper dataset for achieving a proper accuracy for success of determination. Hence, a classification comparison is performed to achieve so.

II. LITERATURE OVERVIEW

There are many research works done on heart diseases diagnosis, The results revealed that LR had a higher accuracy of 85.68 percent than XGBoost, which had a lower accuracy of 84.46 percent. Bhatet et cetera After that, he devised a model for diagnosing heart illness that combines a multilayer perceptron network (MLP) with a backpropagation method. The suggested model has a reduced error and an enhanced accuracy of 80.99 percent, according to the results. To forecast heart illness, Abushariah et al. used ANN and an adaptive neuro-fuzzy inference system (ANFIS). ANFIS has the lowest accuracy of 75.93 percent, while ANN has the highest accuracy of 87.04 percent. Hasanet and his colleagues [4]. [5] used seven machine learning algorithms: LR, ANN, KNN, NB, SVM, DT, and RF with three feature selections: minimal redundancy- maximal-relevance (mRMR), Relief, and Shrinkage and Selection Operator (LASSO) to predict heart disease. LR with Relief achieved the highest accuracy of 89% compared to other techniques.

III. METHODOLOGY

A. DATA PREPARATION

The dataset is collected from a internet know dataset known as the heart attack analysis and prediction dataset. Because the data is difficult to come by, the only way to run the model and make a forecast was to use data from a reliable source. The dataset contains various attributes such as Age, gender, fasting blood sugar, serum cholestrol, maximum heart rate achieved, rating blood pressure, exercise indexed angina, old peak, number of vessels etc. The length of the dataset is 300 with 14 different attributes mentioned above.

Figure 1: Dataset Overview

B. DATA PREPROCESSING

Real world things contain errors in it so does our data so for this the preprocessing is a good step to improve it. The speed of the method is determined on whether or not the data has been preprocessed. Better the preprocessing done better will be the result of the model which will one use. Firstly, the author checks for all the null values and then remove the id column which won't hinder the results.

Figure 2: Checking Null Values in the dataset

C. FEATURE SELECTION

Features are important component for getting proper results from the algorithm used. Visualization helps us to see the different features and how they would make an impact on the results. Figure 3 shows which gender is more affected by the disease. Again figure 4 shows the visualization of which age is more impacted by the disease which give a great factor to the model for the deciding weather the patient will be prone to the disease or not. Finally, a coorelation matrix would help the authors to get an idea of the relations between all the features/attributes which can be seen in figure 5.
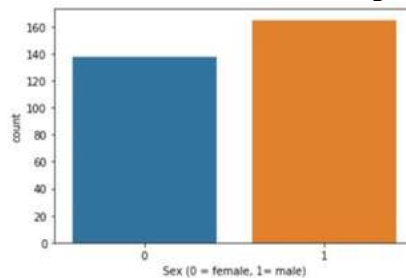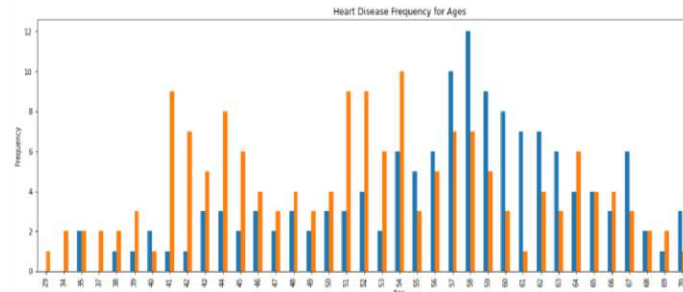
Figure 4

Figure 5: Correlation map between the features

D. MODEL ARCHITECTURE

1) RANDOM FOREST CLASSIFIER

It's a method that falls under the ensemble model umbrella. Combining classification and regression techniques, it may be utilised to create a good prediction model. Decision trees are employed as the basis estimators in this study. Decision trees are a poor predictor on their own, but they improve when paired with other decision trees. In classification tasks, decision trees vote on how to categorise a single instance of input data, and in regression tasks, they output the class that is the mode of the classes or the mean of forecasts. We can avoid parameter tweaking and decrease overfitting this way.

2) SUPPORT VECTOR MACHINE

Support Vector Machines employ a linear model to implement nonlinear class boundaries. Support vectors (lines or hyperplanes) are used to distinguish the target classes. To deal with a nonlinear situation, the model applies several transformations to the input using a mapping function before training a linear SVM model to classify the data in a higher-dimensional feature space.

3) NAIVE BAYES CLASSIFIER

It is another classification technique in which there is collection of algorithms based on the bayes theorem. It is a classifier so it is used to discriminate different objects based on certain features. The main task of bayes is classification task with the help of the bayes theorem.

4) DECISION TREE CLASSIFIER

A decision tree is a tool for making decisions that uses a treelike model of options and their possible consequences, such as chance event outcomes, resource costs, and utility. It's one way to demonstrate an algorithm that's entirely made up of conditional control statements.

5) KNN

We would first choose the number of clusters k, and then assume the cluster's centroid. Any random item, or the first k objects in a series, might be used as the starting centroid.

IV. EXPRIMENTAL RESULTS

The process of picking a dataset and preprocessing it to make a good one in order to increase the accuracy of the models chosen. The models chosen have excellent accuracies, as seen in the table below. Starting with Random Forest classifier which gives ~100 percent accuracy followed by naive bayes which gives ~94 percent, Decision tree gives ~86 percent, support vector machine gives ~92 percent and finally k nearest neighbhor gives ~89 percent. Hence, after observing we get to know that naive bayes performs the best.

V. CONCLUSION

Hence, the authors finally observe that naive bayes gets the best accuracy compared to support vector machine, decision tree, KNN, random forest classifier after performing all the modes. The accuracy would be used by the other researchers to while choosing the best model out amongst the other models and would definitely help in treating the breast cancer most of the time.

VI. FUTURE SCOPE

Furthermore, we can use the following dataset to test out different regression models and neural networks and see how does it perform. Secondly, we can try this algorithm on a different dataset to know how does it perform and what problems it faces during the testing of the model. The research intended by the authors would help in the development of better and more productive and trustable prediction method of illness, which will in turn not help the medical community but also to many other communities and people in the world.

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PREDICTIONS OF SEAT OCCUPANCY USING ENSEMBLE STACKED LEARNING BASED ON GENRE OF THE MOVIE

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Keywords: stacked algorithm, ensemble method, seat occupancy prediction, logistic regression, support vector machine.

Abstract: Intelligent techniques have been used to forecast the box office hit of the movies in recent times. Various machine learning approaches are applied to find the methods to improve the revenue of film industry. In this work, an ensemble method is proposed to predict the seat occupancy of first weak after release using the genre of movie. The proposed method uses K - Nearest Neighbor (KNN), Decision tree, Gaussian naïve bayes and support vector algorithm classifiers are arranged in stacking model which is estimated with logistic regression technique. The normalized genre parameter of standard movie dataset is used to evaluate the developed method. The results prove that the ensemble method has better outcome compared to the prediction of non-ensemble methods. The proposed method organized in stacking model analyzed with the methods arranged in bagging and boosting model proved the effectiveness of ensemble method.

1 Introduction

The motion picture industry releases thousands of films every year that generates billions of revenue globally. Millions of people depend on that industry directly and indirectly. The prediction of seat occupancy is essential for the continuous growth of the industry and understands the market risk [1]. It is a challenging problem and the success prediction depends on various factors like the release timing, advertisement, etc.

The data available in the internet helps to predict the success of the movie. It is collected by designing forms in social networks, blogs, video sites, etc [2]. This processing mechanism is collectively named as electronic word-of-mouth (eWOM), etc. eWOM increases the awareness of movies to the consumer. This online supported prediction helps the customer's decision-making process effectively. The bulk amount of data collected by this method requires proper business intelligence methods to utilize the datasets satisfactorily [3]. Various business intelligent methods have been used to find the winning ratio of the movie. In [4], the influence of social media on movie revenue using Roger's innovation diffusion model is given.

Many researchers have worked in the movie revenue prediction problem and proved the better performance using regression methods. Along with machine learning algorithms, the enhanced methods are proposed by the researchers. Wang et al. proposed a multilayer perceptron based neural network for the revenue predictions [5]. It requires large amount of data for the correct forecasting of results and the availability of dynamic data requires frequent training. In [6], the deep neural network is used to overcome these problems in the prediction of daily income. In some cases, multiple algorithms are combined to increase the prediction ratio. The back propagation algorithm is introduced for the correct prediction of the success performance in [7]. In some cases, multiple algorithms are combined like decision trees and K-nearest Neighbor (KNN) based algorithm are used in [8] to predict the accurate movie revenue.

Moreover, the ensemble methods are employed for the forecasting of movie revenue. It has better performance than utilizing individual methods. Bagging and boosting are the two popular methods used to implement ensemble algorithms. In [9], the bagging technique-based ensemble producing methods are included; whereas, the multiple algorithms are combined to produce boosting based technique is given in [10]. The decision trees, linear regression and KNN algorithms are merged as a single algorithm to predict the revenue generated by the movie in [11]. It is applied to predict the 1st week seat occupancy ratio from the movie release date.

Multiple parameters are considered for the accurate forecasting of movie revenue. Abidi et al. proposed machine learning techniques to find the popularity of film using the features like genre, director, etc [12]. The category of movie is an important parameter in the pre-prediction film revenue. In this work, an

ensemble method is designed to predict the first week revenue prediction. The normalized data using the genre parameter is alone considered for forecasting the income by the suggested method. The developed ensemble method is verified with the standard IMDB dataset.

The remaining sections of the paper are organized in following order. Section II contains the details of existing algorithms and the details of proposed method are given in Section III. The evaluation of the suggested ensemble method is specified in Section IV and the paper is finally concluded at Section V.

2. Preliminaries

2.1 KNN algorithm

K-Nearest Neighbor is a supervised learning algorithm that utilizes the feature similarity method and K value [13]. The 'K' value must be greater than 1 to avoid the overfitting problem. For predicting the category of data, the distance from the test data to each row of training data is calculated using Euclidean, hamming distance, etc. The results found by that methods are arranged in ascending order. The most recurrent class from top 'K' rows is selected as predicted output. This method has better prediction ratio in non-linear data but has the drawback of slow prediction, large computational time and poor detection ratio in the environment with most irrelevant features.

2.2 Gaussian Naive Bayes

Naïve bayes (NB) classification algorithm works on the principle of bayes theorem with Gaussian normal distribution [14]. It predicts the value of each feature independently without the help of other features using the Eq.1,

$$p(c|x) = p(x|c).p(c)$$

2.4 Support vector machine

Vapnik et. al. [15] designed support vector algorithm to predict the category of data in two class problems. It uses hyperplane with decision boundaries to split the input data. It is represented as,

$$f(x) = WT * X + b = 0 \qquad (3)$$

Where, W is weight vector and b is bias value. In real environment, hyperplanes are not sufficient; it needs the curve for accurate classification. Hence, the kernels like Radial basis function (RBF), Polynomial, linear, etc. are introduced to solve the problem. It is a mathematical model that maps the input data into multiple dimension and then split into classes.

2.5 Logistical regression

Logistical regression (LR) model contains the techniques of statistics to find the category of data. It uses the sigmoid function as represented in Eq (4) for predicting the binary class [16].

$$y = \quad p(X) \qquad (1)$$

The Gaussian naïve bayes algorithms worked on the

$$e(B0+B1x) \; 1+ e(B0+B1x) \quad (4)$$

continuous data and it takes the assumption of each class using the normal distribution and the likelihood of features are found by,

$$\text{Maximum posteriori } (c) = \max (p(c|x)) \quad (2)$$

It produces better result in the large dimensional and high complex problems but the implementation starts with zero probability reduce the prediction ratio of the algorithm.

2.3 Decision Tree Classifier

The supervised learning model of decision tree algorithm is designed in the form of tree structure. The leaf nodes of the structure represent the category of the data and the features are marked as the internal node of the tree. Initially, the training set with all parameters are considered as root and the records are considered as node which is extended till reaching the leaf of the tree.

The classification and regression tree (CART) is a decision tree algorithm invented in 1984 by Breiman et. al [14]. It is the basis for the modern tree algorithms like Random forest. It uses binary splitting method to construct the classifier from the input space. The split at each node has evaluated by the greedy approach named as recursive binary splitting. Numerically, it is represented as the values are arranged in order and introduce split points at various positions. The selected points are then tested using a cost function and the position returns the maximum cost is selected as split node.

Where, y is predicted output, B0 is bias and B1 is Coefficient of each input (x). It predicts the input data belongs to the class '0' or '1'. In multiclass problems, it hires the method of 'one vs all'. It means that the data of particular class is considered as one class and all the other data are considered as another class. In that way, it iteratively compared with all class data to find the output of each data. LR functions are implemented in various applications as individual or combined with some other methods. In ensemble methods, it has been widely utilized as last layer for evaluation purpose.

3 Proposed Ensemble method

The genre information from the IMDB dataset [17] is used to generate the modified dataset. The generated dataset contains 20 features that represent the category of the motion picture. If the movie belongs to particular genre, the value for that feature is given as '1', otherwise it is marked as '0'. Similarly, the seat occupancy of the first four weeks is considered as output class which is framed based on the threshold values of each week which is found by dividing the revenue generated with the average ticket rate. Once the dataset generated, it is split into train and test data. The training data helps to train the designed stacked setup and is evaluated by testing data.

On the other hand, ensemble methods are used to predict the seat occupancy of first four weeks using the generated dataset. Ensemble method is a combination of multiple algorithms that has better performance than using individual algorithms. In this work, the stacked method is employed by using the algorithms like KNN, support vector machine, CART decision tree and Gaussian naïve bayes as components
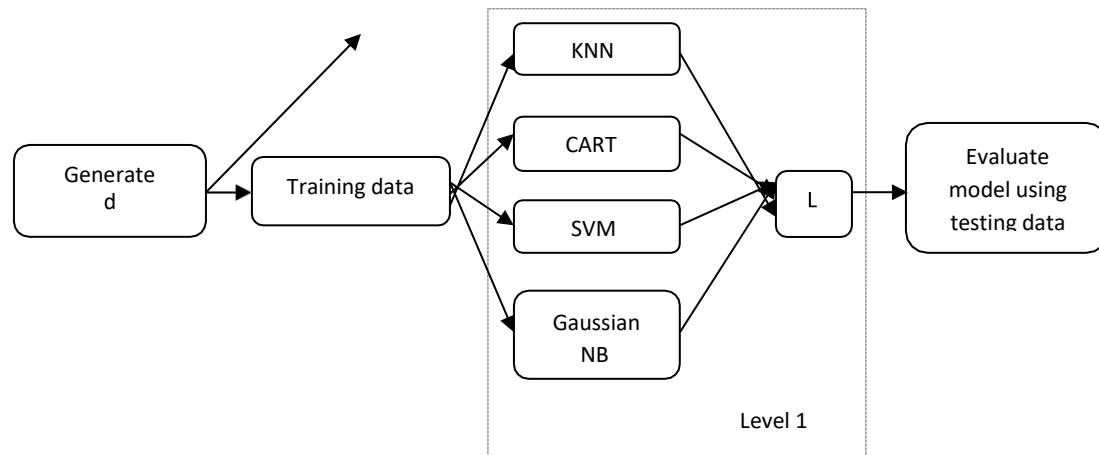

Fig. 1. Block diagram representation of the proposed stacked ensemble model

at level '0' and the logistic regression is used as combiner for finalizing the output of proposed method at level '1'. The objective of this stacked arrangement is to reduce the generalization error and to predict the accurate movie seat occupancy of first four weeks. The block diagram representation of the proposed model is given in Fig.1.

4. Result analysis

In this section, the effectiveness of the proposed method is evaluated by using the extracted features of IMDB dataset. The analysis is carried out by executing the python program in the online execution environment Google Colab. The end system data communicated with the environment is using the network with the speed of 100 Mbps.

The dataset considered for evaluation is assumed as 5044. The genre category of the movie is considered for the creation of new dataset which is generated as per the details given in the previous section. The output data is generated from the

Table 1 Comparison of ensemble method over individual learning algorithms

Methods	Accuracy	Sensitivity	Specificity	Precision
LR	0.986	0.99	0.988	0.983
KNN	0.985	0.988	0.984	0.983
Cart	0.980	0.984	0.982	0.976
SVM	0.986	0.989	0.986	0.982
Gaussian NB	0.284	0.467	0.356	0.029
Stacking	0.991	0.993	0.992	0.988

gross values of the dataset. Initially the total number of tickets sold is calculated by assuming the average ticket cost is considered as 150. Then the number of shows projected from that and the number of days the movie generate box office collection is predicted. If the shows greater than the threshold number of days of each week, the value '1' is given to the corresponding output column, otherwise it is marked as '0'. The training and testing dataset are found by using the train_test_split function.

The accurate prediction ratio of the proposed stacking technique with individual method is given in Table 1. It clearly indicates that the proposed ensemble algorithms predict the seat occupancy better than the single algorithms. It also explains the learning algorithms are suffered during the detection of false positives compared with true positives and true negatives. It is further evaluated by the 'K' fold cross validation technique and the prediction ratio is given in Fig 2. It shows the efficiency of stacked method over executing the algorithms separately.
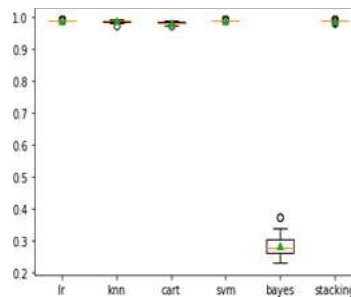

Fig. 2 Validation of proposed method using K-fold crossvalidation method

It proved that the proposed method has better performance in larger complex dataset that smaller dataset.

Table 2 Comparison of ensemble method over individual learning algorithms

Methods	Accuracy	Sensitivity	Specificity	Precision
LR	0.834	0.856	0.846	0.799
KNN	0.854	0.853	0.865	0.844
Cart	0.887	0.901	0.867	0.893
SVM	0.934	0.956	0.946	0.899
Gaussian NB	0.89	0.97	0.91	0.8
Stacking	0.983	0.991	0.988	0.97

Table 3. Comparison of proposed method with individual algorithms on the basis of execution time on the dataset of size 5004

Methods	Execution time (inseconds)
LR	1.88
KNN	2.17
Cart	0.195
SVM	0.81
Gaussian NB	0.14
Stacking	21.10

The execution time of the designed ensemble method with standard algorithms is given in Table 3. The result indicates that the time consumed by the combined technique is not in the acceptable rate and is considered as major drawback in the suggested integrated methods. In future, the proposed method is further improved with advanced lightweight algorithms to reduce the time consumption and increase the accuracy.

Conclusion

In this work, an ensemble method is used by stacking KNN, Gaussian naive bayes, SVM, LR and decision tree algorithms to predict the seat occupancy of a film based on the genre of movie. The seat occupancy of first four weeks is considered as output in this work. It is represented in four binary digits; as '1' in corresponding bit position represents the seat is fully occupied for that week. The result clearly indicates that the proposed ensemble methods has better prediction ratio compared to that algorithms used as individual. It has certain drawbacks like genre parameter is only considered for analysis and the improvement ratio is not sufficient for the time taken by the proposed technique compared to the individual method. In future, the problem will be solved by considering more suitable algorithms for constructing the ensemble method and more parameters are considered in the prediction of seat occupancy.

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Defected Ground plane based plus shape microstrip antenna with enhance bandwidth

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ABSTRACT

In this paper a concept of broadband slotted plus shape microstrip antenna with open end meandering slots in the ground plane is presented. Three identical narrow open end meandering slots were embedded in the antenna ground plane parallel to plus shaped radiating edge. Study is made this antenna is radiating at dual resonant frequencies This covers part of wibro(2300-2390), full band of ISM (2400- 2484MHz),Full band of satellite DMB(2605-2655MHz) and overall bandwidth of 474 MHz(19.1%) are achieved. The slotted plus shaped microstrip antenna is simulated using the method of moments based commercial software (IE3D) and was found to perform will in terms of bandwidth and , radiation patterns.

Index Terms: Plus shaped antenna, Microstrip antenna, multi band antenna. Wide band antenna.

I. Introduction

Rapid progress in wireless communication promises to replace wired communication networks in the near future in which antennas plays a more important role. Microstrip antennas are used in a broad range of applications from communication systems to biomedical system, primarily due to several attractive properties such as light weight, low profile, low production cost, conformability, reproducibility, reliability, and ease in fabrication and integration with solid state devices. One of the most serious disadvantages of microstrip antenna is their limited band width. In order to overcome above difficulty the several methods have been considered to reduce the antenna size such as use of shorting pins, meandering, putting slots on the radiating patch and ground plane etc.[1-3]. Meandering technique when applied to ground plane of the microstrip antenna was proved to be one of effective method in reducing the size of the microstrip antenna and enhancement of bandwidth[4].However, the obtained bandwidth in this case is comparatively very less when met with the requirements of the above applications. Further enhancement in the antenna bandwidth and size reduction was very much in need. Many combinations of radiating patch and ground plane slots were configured and analyzed to achieve extreme compact and broad band antennas. T.W Chiou et al [5] introducing slots in the ground plane that helped to enhance bandwidth of a terminal antenna at the upper end of the invested frequency band. Recently broadening of the lower operating frequency band was achieved using two open end slots in the ground plane under the radiating element(inverted F-Typed patch)[6]. microstrip patch antenna has designed and compare with the rectangular microstrip patch antenna. Cutting of a slot in antenna increases the current path which increases current intensity and as a result efficiency is increased and desired results are obtained [7]. Design, modeling, and study of nanomaterial-based novel type GHz patch antenna with defected ground structure etched on an epoxy dielectric material suitable for wireless communication network applications. Proposed antennas are homogeneously coated with titanium oxide nanomaterial that appears to have greater conductivity compared to copper patch to yield the best possible results[8]

II. Antenna Design

Plus shaped patch antenna which is considered as base antenna whose two strips of dimensions are considered15.1mm *45.3mm & 11.8mm*35.4mm respectively is mounted on dielectric substrate of thickness 1.6mm and material used is Glass epoxy with relative dielectric of εr=4.4 is designed for operating frequency of 2.2GHz.This rectangular patch in turn fed by center fed microstrip line feed of dimensions(L f50, W f50)=18.4mm,3.05mm through a quarter wave transformer having (Lt50 ,

Wt50)=18.55mm, 0.5mm) .They are mounted on a ground plane of dimension 82mm*55mm fed by microstrip line using 50 ohm SMA connector for wideband applications is shown in figure1.

Study has been made further by considering base shape of plus is modified by inserting horizontal slots on both side with respect to center of patch optimized distance between slots is being considered as 2mm which gives lowest frequency but reduced band width in order to enhance band width later we consider three identical narrow open end slots were embedded in the antenna's ground plane that are aligned with an equal spacing of L/4 parallel to radiating edge of the plus shaped patch.. The embedded open end slots are narrow (Ws=2mm) and have a slot length Ls of about 75% is considered as shown in figure2. which gives maximum bandwidth.

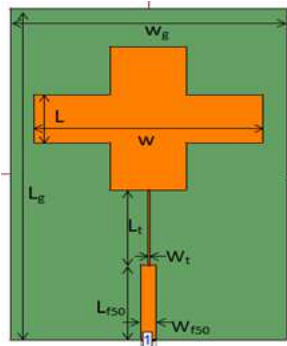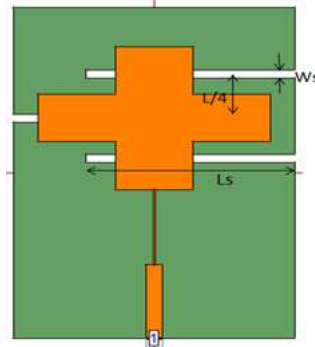Figure1.Plus shaped base antenna

Figure2a. Geometry of base Antenna with open end Meandering slots in the ground plane

III. Results and Discussions

The proposed Antenna design has been simulated using Zeeland's simulation package i.e. IE3D. Comparative study has been made with respect to plus shaped base antenna without having slot in ground plane and by considering optimized slot of plus shape patch i.e distance between slot is maintained at 2mm there by considering width of slot is 2mm which is called Antenna1. It is also being compared with effect of slot in ground plane being called Antenna 2 is summarized in Table 1.Figure 3a shows the variation of return loss with frequency for base shape. Similar results for the effect of slot in ground plane as shown in figure 3b.From the result it is clear that the band widths of a proposed antenna with effect of slot in ground plane are more compared to base antenna and with respect to that of base antenna with slot in plus shaped patch. The antenna with optimized ground plane slot gives dual band of overall band width of 474MHz. Radiation patterns for plus shaped base and plus shaped patch antenna with slotted ground plane as shown in fig 4(a) & 4(b) respectively. From the fige4 (a) low back lobe radiation is an added advantage for using this antenna in a cellular phone, since reduces the amount of electromagnetic radiation which travel towards the user head.

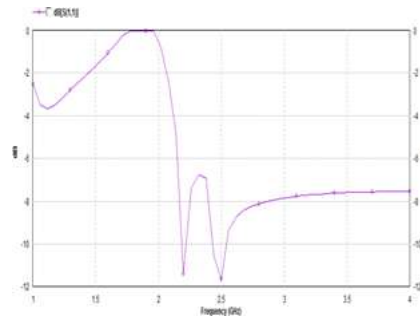| Prototype Antenna	Resonant frequency	Return loss	Band width	Over all band width
Plus shaped base antenna	f1=2.2	-11.63	20	120
	f2=2.49	-11.64	100	
Base antenna with slot(Antenna 1)	f1=2.57	-11	190	190
Base antenna with slot in Ground plane(Antenna2)	f1=2.25	-21	184	474
	f2=2.61	-26.5	290	

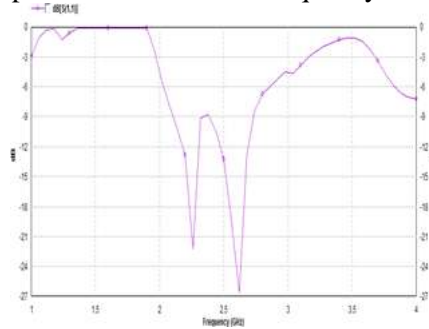Fig 3a Graph for return loss v/s frequency for base shape.

Figure3b: Graph for return loss v/s frequency open end meandering slots in the ground plane of Plus shape antenna.
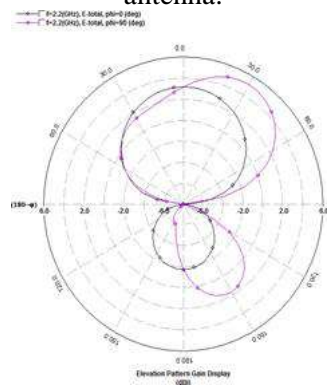

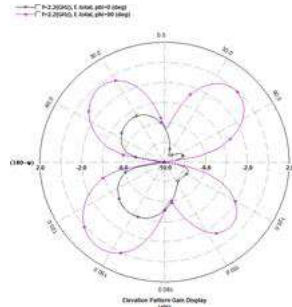Fig 4a : Radiation patterns of plus shaped base antenna @ 2.2GHz

Figure 4b: Radiation pattern of slotted ground plane based Plus shaped antenna @ 2.25GHz

IV. Conclusion

This paper outlines slotted ground plane based plus antenna gives total band width of 474MHz (19.1%). These bandwidths satisfy the requirements the many services including part of wibro, Full band of ISM and full band of satellite DMB applications. So from the results we conclude that the modified antenna with slots with slots in ground plane give enhanced band width compared to that of base or reference antenna and intern with respect to that of slotted plus shaped patch antenna.

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Creating a Dual-Band Microstrip Patch Antenna Specifically Tailored for RFID Applications

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Abstract- This paper presents the design and analysis of a rectangular microstrip patch antenna operating at 5.8 GHz for RFID applications. The antenna utilizes a quarter-wave transformer feeding technique. Microstrip patch antennas are gaining popularity due to their desirable characteristics such as compact size, lightweight, easy fabrication, and cost- effectiveness.

The physical parameters of the antenna structure, including the patch and ground plane, were calculated and optimized using CST Microwave Studio simulation tool. The results demonstrate that the designed antenna achieves dual frequency bands. The first frequency band resonates at 3.65 GHz, exhibiting a return loss of -20.6 dB, a gain of 0.9025 dBi, and a bandwidth of 79.79 MHz. The second frequency band resonates at 4.47 GHz, with a return loss of -46 dB, a gain of 2.57 dBi, and a bandwidth of 110.26 MHz. The Voltage Standing Wave Ratio (VSWR) of both resonance bands is less than 2, ensuring efficient performance.

The proposed antenna holds promise for various RFID applications, capitalizing on its characteristics and dual-band capability.

KEY WORDS: Return loss, Voltage standing wave ratio (VSWR), Microstrip patch antenna, Gain.

INTRODUCTION

Recently, RFID systems have transitioned from being obscure to becoming widely adopted in various applications due to their numerous attractive features. These systems offer significant benefits such as extended reading range, high data transfer speeds, and potentially low costs. The applications of RFID technology can be classified into two categories: near-field and far-field applications, depending on the desired reading range.

In the realm of near-field applications, UHF RFID systems have garnered considerable attention, particularly in scenarios involving item-level applications and desktop setups. The interaction between the reader and transponder antennas plays a crucial role in these systems. RFID serves as a wireless modem approach for object recognition, enabling tasks such as tracking goods and access control. It employs wireless transmission and reception techniques over short distances [1].

The role of antennas in RF systems is increasingly prominent, as their performance significantly impacts the overall system's efficiency. Specifically, the design of an antenna for an RFID system holds immense significance. Modern RFID systems are commonly utilized across various frequency bands, including LF (125 KHz), HF (13.56 MHz), UHF (860-960 MHz), and microwave bands (2.45 GHz and5.8 GHz). The antenna model discussed in this context is focused on the microwave frequency band.

The size of an antenna is generally determined by its operating frequency. Lower frequencies require larger antenna dimensions, which subsequently result in larger tag sizes. Conversely, as the antenna dimensions are reduced,higher frequencies can be achieved, leading to improved gain.

The size of the antenna often poses a challenge when aiming for tag miniaturization. It becomes crucial to carefully select the operating frequency for the RFID system, taking into consideration several factors simultaneously. These factors include return loss, gain, and the overall size of the tag.

The design of an RFID antenna involves addressing various considerations, such as the antenna configuration, physical dimensions, bandwidth, radiation pattern, polarization, and return loss [2]. These aspects play a significant role in determining the performance and effectiveness of the RFID system.

In wireless communication systems, microstrip antennas come in various types, with the patch antenna being the most commonly used. The patch antenna consists of a conducting patch on one side of a dielectric material, with a ground plane on the other side. This antenna design offers several notable

advantages, including small size, ease of fabrication, low cost, light weight, and compatibility with printed circuit board technology [3]. Patch antennas can provide linear, dual, and circular polarizations, offering flexibility in signal propagation.

To feed the patch antenna, different techniques are employed, such as probe feeding, aperture coupling, proximity coupling, and inset feeding [4]. Among these techniques, inset feeding and quarter- wave transformer feeding are particularly favored due to their simplicity in fabrication. These techniques facilitate the efficient transfer of electromagnetic energy to the patch antenna, enhancing its performance.
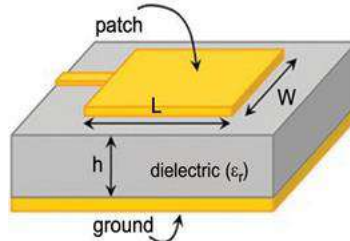

Fig 1: Structure of Rectangular Microstrip Patch Antenna

Patch antennas may have certain drawbacks, including reduced gain and limited bandwidth. However, these disadvantages can be mitigated to some extent by carefully considering the antenna design. Several factors impact the radiating characteristics of the antenna, and by taking them into account, the performance limitations can be addressed [5]. By optimizing parameters such as the antenna dimensions, substrate material, feeding mechanism, and other design considerations, it is possible to improve the gain and bandwidth of patch antennas.

ANTENNA DESIGN

To design the proposed rectangular microstrip patch antenna, the following equations were utilized to calculate the antenna dimensions. The selected antenna operates at resonance frequencies of 3.65 GHz and 4.47 GHz, and the design was simulated using CST software. By employing the equations and simulation tools, the antenna's length, width, and other critical parameters were determined, ensuring optimal performance at the desired resonant frequencies.

 Estimation of width:

$$W = \frac{Co}{2fr}\sqrt{\frac{2}{\varepsilon+1}}$$

Calculation of dielectric constant

$$\varepsilon reff = \frac{\varepsilon r+1}{2} + \frac{\varepsilon r-1}{2}\left[1+12\left(\frac{h}{w}\right)\right]^{-0.5}$$

Lentgh is calculated by

$$\Delta L = 0.412h\left[\frac{(\varepsilon reff +0.3)(\frac{w}{h}+0.264)}{(\varepsilon reff -0.258)(\frac{w}{h}+0.8)}\right]$$

$$L = \frac{Co}{2fr}\sqrt{\frac{2}{\varepsilon reff}} - 2\Delta L$$

The patch antenna, operating at a frequency of 5.8 GHz, is presented in two configurations: with and without a slot. The antenna is fabricated on a glass epoxy substrate with a dielectric constant (ε_r) of 4.3. The substrate has a height (ht) of 1.6 mm. The patch dimensions include a width(w) of 40 mm and a length (L) of 31 mm. To feed power to the antenna, a quarter-wave transformer feeding technique is employed.
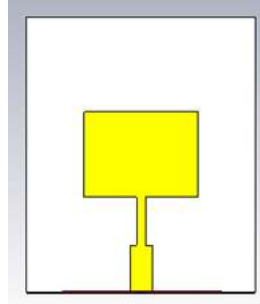

Fig.2: Basic Patch antenna
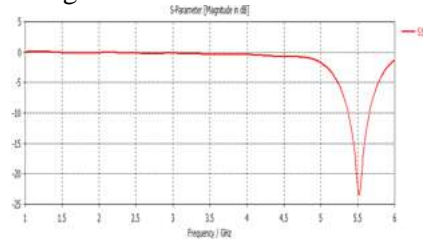
Fig.3:Return loss of without slot designed patch antenna
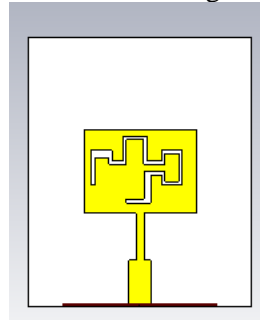
Fig.4: Designed patch antenna with slot

5. RESULTS

This paper presents the simulation and analysis of key performance parameters including return loss, VSWR, radiation pattern, and gain for the designed patch antenna. The antenna design takes into account various parameters to achieve the desired performance. Figure 5 illustrates the return loss graph, showcasing dual frequencies with a return loss of -20.6 dB at 3.65 GHz and -46 dB at 4.4 GHz. The simulated results of the proposed antenna demonstrate excellent agreement with the desired specifications.

Fig.5: Return loss of with slot depicted patch antenna

:Fig..6 VSWR of with slot designed antenna

Fig.7. Gain plot of designed antenna

Fig.10: Radiation pattern at frequency 4.47 GHz E-field
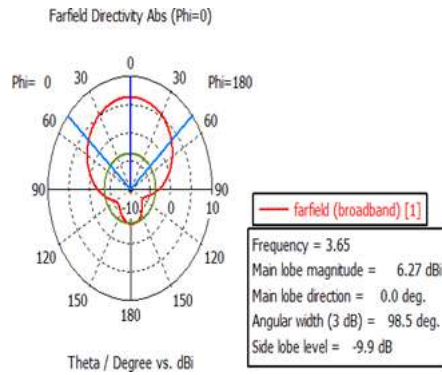
Fig.11: Radiation pattern at frequency 4.47 GHz H-field

CONCLUSION

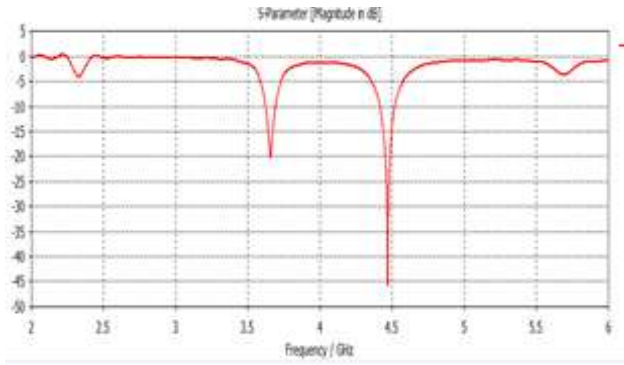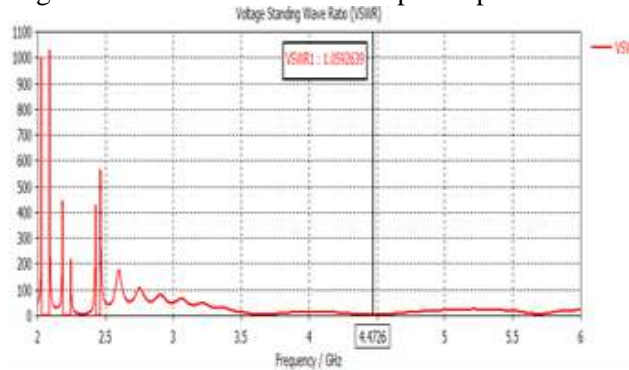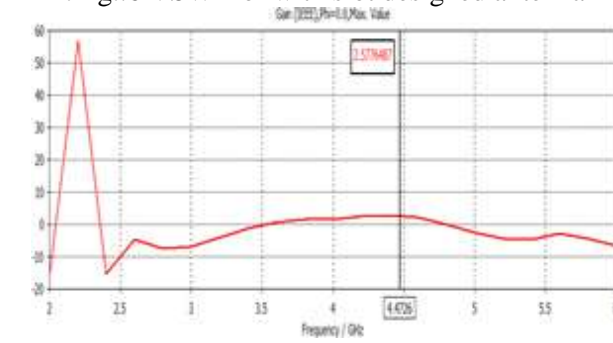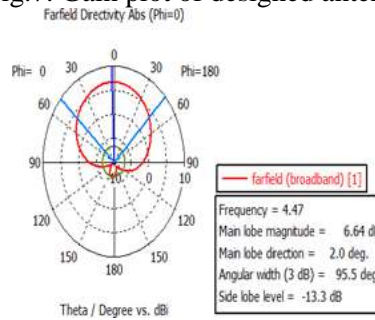The microstrip patch antenna was designed and simulated using CST Microwave Studio software. The design exhibits desirable characteristics, including high gain, low return loss, and enhanced bandwidth. The antenna resonates at 3.65 GHz with a return loss of -20.6 dB, and at 4.4 GHz with a return loss of -46 dB. The gain of the first and second frequency bands is 0.902 dB and 2.57 dB, respectively. Additionally, the bandwidth of the first and second bands is measured at 79.79 MHz and 110.26 MHz. The versatility of the designed antenna makes it suitable for a wide range of RFID applications.

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ARDUINO BASED FIRE FIGHTING ROBOT

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ABSTRACT: A fire accident is a catastrophe that may result in a victim's lasting impairment, loss of life, and property destruction. Nuclear power plants, oil refineries, petrol tanks, chemical factories, and other large-scale industries do experience major fire mishaps that have grave repercussions. These accidents have claimed the lives of thousands of individuals. This idea is improved as a result to control fire using a robotic vehicle. Human intervention is becoming less and less common as robotics advances, and robots are frequently utilised for safety-related purposes. Fire mishaps are very common in our daily lives, and sometimes it is very challenging for firefighters to preserve lives. In this situation, a firefighting robot enters the picture.

INTRODUCTION:

Firefighters run the risk of experiencing heat exhaustion, burns, and physical and mental stress while on the job. Furthermore, they frequently encounter dangerous threats including excessive levels of carbon monoxide. The risk that firefighters face when placing their lives in jeopardy to put out flames and protect others has been the subject of numerous studies. In this project, we use Arduino to create a simple firefighting robot that can move in the direction of the fire and pump water all around it to put it out, lowering the risk to fire workers. Fire management and suppression are the main responsibilities of the firefighting robot, but it can also evaluate and detect fires, conduct search and rescue operations.

METHODOLOGY:

Firefighting robot is operated to detect the fire and also to extinguish it. It can be operated in two modes one is manual mode and other is autonomous mode. Manual mode is operated using joysticks and for autonomous mode there is no human intervention. Here we proposed to use autonomous mode. The project consists of user controllable or automatically operable firefighting robot which has a water pump, relays, DC motor, sim module, sensors attached to it for extinguishing fire. Firefighting robot is operated using Arduino microcontroller, the program has developed for robot using Arduino software. If robot itself detects the fire automatically, then its relay gets ON and it goes to the fire detected area and then extinguishes the fire by sprinkling the water on to it. Initially sim module is attached to Arduino microcontroller & it acts as client node. Through MQ3 sensor if it senses the fire, it sends the signal to microcontroller as soon as microcontroller receives the signal a call is made after call and message sent microcontroller actuates the driver circuit(L293D). This L293D driver drives the robot towards fire place, as the robot reaches where fire exists, microcontroller actuates relay and pump switched ON and finally through sprinkler water is sprinkled on the fire.
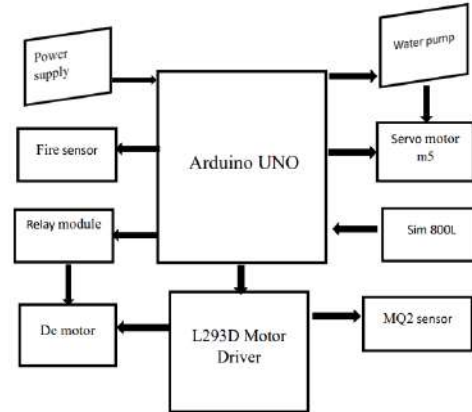
Fig.1.Block diagram

ARDUINO UNO:
It is a microcontroller board, contains on-board power supply, USB port to communicate with PC, and an ATmega328P microcontroller chip. It simplifies the process of creating any control system by providing the standard board that can be programmed and connected to the system without the need to any sophisticated PCB design and implementation. It is an open-source hardware, anyone can get the details of its design and modify it.

FLAME SENSOR: To sense fire, we use the Fire sensor
Flame sensors have an IR Receiver (Photodiode) which is used to detect the fire. When fire burns it emits a small amount of Infra-red light, this light will be received by the IR receiver on the sensor module.
SERVO MOTOR (SG90
A servo motor is a linear or rotary actuator that provides fast precision position control for closed loop position control applications. Unlike large industrial motors, a servo motor is not used for continuous energy conversion. Servo motors have a high-speed response due to low inertia and are designed with small diameter and long rotor length. Servo motors work on servo mechanism that uses position feedback to control the speed and final position of the motor. Internally, a servo motor combines a motor, feedback circuit, controller and other electronic circuit. Servo motors have a high-speed response due to low inertia and are designed with small diameter and long rotor length. Servo motors work on servo mechanism that uses position feedback to control the speed and final position of the motor. Internally, a servo motor combines a motor, feedback circuit, controller and other electronic circuit.
LM2956: DC-DC Buck Converter Step Down Module LM2596 Power Supply is a step-down(buck) switching regulator, and load regulation. In these devices are available in fixed output voltages of 3.3 V, 5 V, 12 V, and an adjustable output version. The LM2596 series operates at a switching frequency of 150kHz, thus allowing smaller sized filter components than what would be required with lower what would be required with lower frequency switching regulators.
**MOTOR DRIVER MODULE:**
It is a low voltage operating device like other ICs. L293d provides the continuous bidirectional Direct Current to the Motor. It is also known as motor driver. The Polarity of current can change at any time

without affecting the whole IC or any other device in the circuit. L293d has an internal H-bridge installed for two motors. H-Bridge is an electrical circuit that enables the load in a bidirectional way.

It controls any DC motor speed and direction with a voltage range of 4.5 – 36 Volts. To control the max 600mA amount of current an internal "Darlington transistor sink" installed in it, which could be used to control a large amount of current by providing a small amount of current.


MQ2 Gas Sensor

The MQ2 sensor is one of the most widely used in the MQ sensor series. It is a MOS (Metal Oxide Semiconductor) sensor. The MQ2 gas sensor operates on 5V DC and consumes approximately 800mW. It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide concentrations ranging from 200 to 10000 ppm.
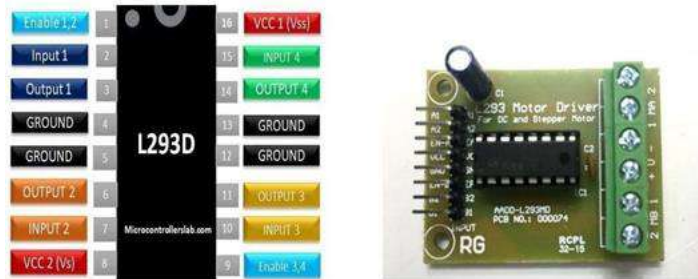
It controls any DC motor speed and direction with a voltage range of 4.5 – 36 Volts. To control the max 600mA amount of current an internal "Darlington transistor sink" installed in it, which could be used to control a large amount of current by providing a small amount of current.

PROBLEM STATEMENT: Firefighters face numerous challenges when responding to fire, including the risk of injury and death, exposure to smoke and toxic fumes, and difficulty navigating through burning buildings or inaccessible locations. We can reduce the risk of injury and death faced by firefighters by using robots that can enter burning buildings or hazardous environments to assess the situation, provide situational awareness to firefighters, and put out fires with water. In a burning building, firefighters may come into contact with toxic substances and dangerous compounds. Robots can monitor the environment and find hazardous materials, delivering real-time information that can protect firefighters and direct their operations. Communication can be challenging or disrupted for firefighters in several circumstances. Robots can be utilised to establish a channel of communication among firefighters, allowing for the transmission of crucial information and enhancing coordination. All things considered, robots have the potential to make firefighting operations safer and more efficient, increasing the likelihood of success and lowering the danger of harm and death to both firefighters and the people they are trying to save. To overcome this, Robots can be used to handle hazardous materials, such as chemicals, that can pose a risk to firefighters.
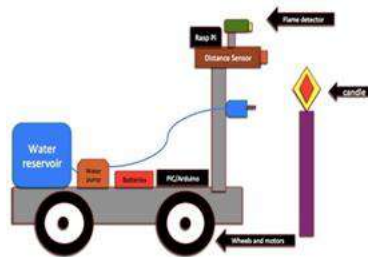
CONCLUSION: Fire causes tremendous damage and losses of human life and property. It is sometimes impossible for the fire fighter personnel to access the site of fire because of explosive material, smoke and high temperature. Though by this we can conclude that the robot can be placed where human lives are at risk. The robot can operate in environment which is out of human reach in very short time. In such environment, fire fighter robot can be useful for fire extinguishing. Also, we can monitor it manually and autonomously. Furthermore, the use of firefighting robots can potentially save lives by reducing the need for human firefighters to enter dangerous environments. They can operate remotely and be controlled from a safe distance, which can give firefighters real-time situational awareness, enabling them to make informed decisions quickly.

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DEVELOPMENT OF ANTI-SLEEP ALARM

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ABSTRACT: Number of road accidents now a days have been increasing, which are leading to enormous fatal accidents. One of the reasons for such road accidents is drowsiness of driving. As we all know that being asleep on wheels is very dangerous and which may lead to loosing lives of people, detection of such drowsiness is very crucial. Our projects aim is to generate a system which can prevent such accidents.

KEYWORDS: Tilt sensor, Arduino, Buzzer, LED, Eye glasses.

INTRODUCTION: Number of road accidents are more and 70% are caused due to drowsy driving. Detection of drowsiness of drivers is very crucial to prevent such accidents. Our project aim is to detect signs of drowsiness in drivers and alert them promptly, reducing the chances of accidents caused by falling asleep at the wheel. By combining the power of Arduino, with a tilt sensor, we can create an effective and affordable anti-sleep alarm. The focus will be placed on designing a system that will accurately monitor the state of the driver's head in real-time. When the driver's head nods forward due to drowsiness or fatigue, the tilt sensor detects the tilt and triggers an alarm to alert the driver. We are using eye glasses as prototype for our project, where the tilt sensor is mounted on it. Developing an anti-sleep alarm using Arduino and a tilt sensor offers a practical and cost-effective solution to mitigate the risks associated with drowsy driving.

METHODOLOGY: A device for keeping awake a person that is about to fall asleep, comprising a pair of glasses with a frame that has two arms, a sensor for detecting the movements of head. As of sensor we are using tilt sensor which is used to check the plane shift of head movement from horizontal to vertical and send the signal when it happens. Tilt sensor here acts as input which is given to the controller. Output is given to the buzzer and led. We are using eye glasses as prototype and will be mounting the tilt sensor on one side of the glass. Whenever the driver tilts his head due to drowsiness when wearing the glasses, the tilt sensor senses the planar shit and take that as input and will it in the controller. As soon as there is tilt for maximum 2500ms then the buzzer will blow and led will start to glow.

BLOCK DIAGRAM:
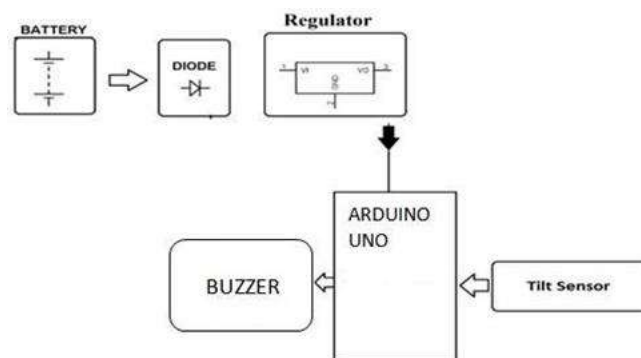
COMPONENTS DESCRIPTION:

1.TILT SENSOR: Tilt sensor module is a device used for knowing the planar movement. Although they are available in various types their basic function remains the same. Their function is to detect the plane shift from horizontal to vertical and sent of a signal when it happens.

Fig: Tilt Sensor

2.ARDUINO: It is a microcontroller board, contains on-board power supply, USB port to communicate with PC, and an ATmega328P microcontroller chip. It simplifies the process of creating any control system by providing the standard board that can be programmed and connected to the system without the need to any sophisticated PCB design and implementation. It is an open-source hardware, anyone can get the details of its design and modify it.

3.BUZZER: An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

Fig: BUZZER

4.LED: LEDs are semiconductor devices. Like transistors, and other diodes, LEDs are made out of silicon. What makes an LED give off light are the small amounts of chemical impurities that are added to the silicon, such as gallium, arsenide, indium, and nitride. When current passes through the LED, it emits photons as a byproduct. Normal light bulbs produce light by heating a metal filament until it is white hot. LEDs produce photons directly and not via heat, they are far more efficient than incandescent bulbs.

Fig: LED

PROBLEM STATEMENT: The main concern of the modern automotive industry is passenger safety and to avoid accidents due to drivers' negligence. This problem is addressed with the use of this anti-sleep alarm. The tilt sensor must be highly sensitive and accurate in detecting the subtle head and body movements associated with drowsiness or nodding off while driving. The challenge lies in developing a sensor that can reliably differentiate between normal driving motions and drowsiness-related movements. The alarm system should avoid generating false alarms to prevent unnecessary distractions and annoyance

to the driver. It should be capable of distinguishing between genuine signs of drowsiness and other movements that might trigger false alarms, such as sudden braking or pothole impact. The anti-sleep alarm system should be adaptable to different driving conditions and individual drivers' preferences. It should allow customization of sensitivity levels and alarm thresholds, taking into account variations in driving styles, road conditions, and individual differences in sleep patterns.

CONCLUSION: The purpose of our project is to help solving real life problems in cost effective way. This system alerts the user if he/she falls asleep at the wheel thereby, avoiding the accidents and saving lives. This system is useful especially for people who travel long distance and people who are driving late at night. The main objective of this project is to develop a system which alerts the driver when he falls asleep at the wheel thereby, avoiding accidents and saving lives. By utilizing an anti-sleep alarm system, the goal is to provide an early warning to the driver by taking appropriate measures to stay alert and avoid potential hazards. Whenever the driver feels drowsy and tilt his head, the buzzer is blown. As a result, the accident ratio decreases. Hence, our project if commercially developed will help in saving the precious life of driver.

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Recent Trends in Embedded Systems: A Comprehensive Review

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Abstract:
Embedded systems have become ubiquitous in our daily lives, powering a wide range of devices and applications. As technology continues to evolve rapidly, new trends are emerging in the field of embedded systems. This paper provides a comprehensive review of recent trends in embedded systems, focusing on advancements in hardware, software, and system design. The aim of this paper is to provide researchers and practitioners with insights into the latest developments and identify potential areas for future research and innovation in embedded systems.

Keywords: embedded systems, hardware, software, system design, trends, research, innovation

1. Introduction

Embedded systems are specialized computer systems designed to perform specific functions within larger systems. They are found in various domains, including consumer electronics, automotive, healthcare, industrial automation, and IoT. This section provides an overview of embedded systems and highlights the importance of understanding recent trends in this field.

2. Hardware Trends

A. System-on-Chip (SoC) Integration: System on-Chip integration is a significant hardware trend in embedded systems. SoC refers to the integration of multiple components, including processors, memory, peripherals, and communication interfaces, onto a single chip. This integration reduces power consumption, improves performance, and enhances overall system efficiency. SoCs enable compact and cost-effective embedded system designs.

B. Low-Power Design Techniques: Power efficiency is a critical consideration in embedded systems, especially for battery-powered devices or energy-constrained applications. Hardware trends focus on low-power design techniques, such as power gating, clock gating, dynamic voltage and frequency scaling (DVFS), and optimized circuit design. These techniques reduce power consumption, extend battery life, and improve energy efficiency in embedded systems.

C. Artificial Intelligence (AI) Acceleration: The integration of AI capabilities into embedded systems is a growing trend. Hardware accelerators, such as dedicated AI processors, neural processing units (NPUs), and field-programmable gate arrays (FPGAs), are utilized to accelerate AI-related tasks. These accelerators enable efficient implementation of machine learning algorithms, neural network inference, computer vision, and natural language processing in embedded systems.

D. Internet of Things (IoT) Integration: The integration of embedded systems with IoT networks is a significant hardware trend. IoT integration requires hardware components that support wireless communication protocols, such as Wi-Fi, Bluetooth, Zigbee, or cellular connectivity. Embedded systems designed for IoT applications often incorporate microcontrollers or low-power processors with built-in wireless capabilities, enabling seamless connectivity and data exchange with other IoT devices.

E. Sensor Integration: Embedded systems rely on various sensors to gather data from the physical world. Hardware trends focus on sensor integration, including the miniaturization and integration of sensors onto single chips, reducing the overall system footprint. Integrated sensors may include accelerometers,

gyroscopes, magnetometers, temperature sensors, pressure sensors, and environmental sensors. Sensor fusion techniques are employed to combine data from multiple sensors for accurate and context-aware measurements.

F. High-Performance Computing: Some embedded systems require high-performance computing capabilities to handle complex computational tasks. Hardware trends focus on incorporating powerful processors, such as multicore CPUs or Graphics Processing Units (GPUs), into embedded systems to handle demanding workloads. High-performance computing enables applications such as image and video processing, gaming, virtual reality, and data analytics in embedded systems.

G. Secure Hardware Architectures: As embedded systems become more interconnected, security becomes a critical concern. Hardware trends involve the development of secure hardware architectures to protect embedded systems from unauthorized access, tampering, or attacks. Secure hardware architectures may include features such as hardware-based encryption/decryption, secure boot,trusted execution environments, and secure key storage to ensure the integrity and confidentiality of
embedded system data.

H. Real-Time Interfaces: Real-time interfaces play a crucial role in embedded systems that require timely communication with external devices or peripherals. Hardware trends focus on implementing real-time interfaces, such as CAN(Controller Area Network), Ethernet with Time Sensitive Networking (TSN), USB with real-time extensions (USB-RTS), and industrial fieldbuses like PROFIBUS or EtherCAT. These interfaces enable precise and deterministic communication in real-time embedded systems. These hardware trends in embedded systems are driving advancements in various industries, enabling more efficient, powerful, secure, and connected devices. Implementing these trendsrequires careful consideration of application requirements, power constraints, connectivity needs, and security considerations to design optimized and reliable embedded systems.

3. Software Trends

Embedded systems software plays a critical role in providing functionality and managing system resources. This section explores the following software trends:

A. Real-Time Operating Systems (RTOS):
Lightweight operating systems tailored for embedded systems, ensuring timely and deterministic execution of tasks.

B. Middleware and Communication Protocols: Middleware solutions for seamless communication between embedded systems, as well as standard protocols like MQTT, CoAP, and DDS.

C. Open-Source Software: The increasing adoption of open-source platforms and tools for embedded systems development, enabling collaborative development and code reuse.

D. Over-the-Air (OTA) Updates: Remote software updates for embedded devices, ensuring security patches, bug fixes, and feature enhancements without physical intervention.

4. System Design Trends System Design Trends in Embedded Systems:

A. Safety and Security: With the increasing connectivity of embedded systems, ensuring safety and security is a critical system design trend. This involves incorporating robust security measures, such as secure boot, encryption, access control, and intrusion detection, to protect against cyber threats. Safety-critical systems require techniques like fault tolerance, redundancy, and fail-safe mechanisms to ensure reliable operation and mitigate risks.

B. Edge Computing: Edge computing is a system design trend that involves moving computation and data processing closer to the edge devices or sensors, reducing latency and minimizing reliance on cloud services. By processing data locally, embedded systems can provide real-time responses, handle sensitive data locally, and reduce network congestion. Edge computing is particularly beneficial for time-sensitive applications and resource-constrained environments.

C. Heterogeneous Computing: Heterogeneous computing involves the integration of diverse computational resources, such as CPUs, GPUs ,FPGAs, and AI accelerators, within embedded systems. This trend enables optimized performance and power efficiency by leveraging the strengths of different processing units for specific tasks. Heterogeneous computing enhances capabilities like image processing, machine learning, and signal processing in embedded systems.

D. Human-Machine Interaction: Designing embedded systems with intuitive and seamless human-machine interaction is an important trend. This includes incorporating user-friendly interfaces, voice recognition, touchscreens, gesture-based interactions, and natural language processing. The aim is to enhance usability, user experience, and accessibility, making embedded systems more intuitive and easier to operate for end-users.

E. Connectivity and IoT Integration: The trend of connectivity and IoT integration focuses on embedding devices and sensors within a networked ecosystem. This enables seamless communication between embedded systems, as well as with cloud platforms, mobile devices, and other IoT devices. Communication protocols such as MQTT, CoAP, and DDS facilitate efficient data exchange, while IoT integration allows for centralized management, remote control, and data analytics.

F. Software-Defined Systems: Software-defined systems involve the separation of hardware functionality from software control and configuration. This trend enables flexibility, scalability, and adaptability in embedded systems.By abstracting the hardware layer, software-defined systems facilitate easier updates, reconfiguration,and customization of embedded systems, allowing for more agile and versatile deployments.

G. Power Management and Energy Efficiency:Energy efficiency is a crucial aspect of embedded system design. With the growing demand for battery-powered and energy-constrained devices,system design trends focus on optimizing power consumption. This includes techniques such as power gating, dynamic voltage and frequency scaling (DVFS), sleep modes, and power-aware scheduling algorithms to maximize battery life and minimize energy consumption.

H. Real-Time and Deterministic Operation: Many embedded systems require real-time and deterministic operation, where tasks must be completed within specific timing constraints.System design trends focus on utilizing real-time operating systems (RTOS), scheduling algorithms, and prioritization mechanisms to ensure timely and predictable execution of tasks. Deterministic operation is critical for applications such as industrial control, automotive systems, and medical devices. These system design trends in embedded systems are driving advancements in various industries, enabling enhanced functionality, connectivity, security, and energy efficiency. Implementing these trends requires careful consideration of application requirements, hardware capabilities, and system constraints to design robust and optimized embedded systems.

5. Case Studies and Applications This section presents case studies and real-world applications that showcase the practical implementation of recent trends in embedded systems. Examples may include smart homes, autonomous vehicles, wearable devices, and industrial automation.

A. Smart Homes:

Case Study: Home Automation System Description: A smart home system that integrates various embedded devices and sensors to automate and control household appliances, lighting, security systems, and energy management. The system utilizes IoT connectivity, wireless communication protocols, and edge computing capabilities to provide a seamless and personalized home automation experience. Users can control and monitor their homes remotely through mobile applications or voice assistants.

B. Autonomous Vehicles:

Case Study: Self-Driving Cars

Description: Self-driving cars are a prime example of the practical implementation of embedded systems in the automotive industry. These vehicles employ a combination of sensors, such as LiDAR, radar, and cameras, along with powerful embedded processors to perceive their surroundings and make real-time decisions. The embedded systems in autonomous vehicles enable features like lane keeping, adaptive cruise control, object detection,and collision avoidance, revolutionizing the concept of transportation.

C. Wearable Devices:

Case Study: Fitness Trackers

Description: Fitness trackers are wearable devices that monitor and track users' physical activities, health metrics, and sleep patterns. These devices integrate multiple embedded sensors, such as accelerometers, heart rate monitors, and gyroscopes, to collect data. Embedded systems within the fitness trackers process this data, provide real-time feedback to users, and synchronize the information with smartphones or cloud

platforms. The trends in this area include miniaturization, power efficiency, and advanced health monitoring algorithms.

D. Industrial Automation:

Case Study: Smart Factory

Description: In industrial automation, embedded systems are utilized to create smart factories that optimize production processes, increase efficiency, and enable real-time monitoring and control. These systems incorporate embedded sensors, actuators, and controllers to automate tasks such as assembly line control, inventory management, predictive maintenance, and quality control. Communication protocols like MQTT and OPC UA facilitate seamless data exchange between machines, while edge computing enables faster decision-making and reduced latency. These case studies demonstrate how recent trends in embedded systems are being applied to practical applications, enhancing convenience, safety, efficiency, and overall user experiences in various domains.

6. Challenges and Future Directions in

Embedded System The advancements in embedded systems also present various challenges and opportunities for future research. This section highlights key challenges and suggests potential research directions to address them.A.

Power Management and Energy Efficiency: Embedded systems often operate on limited power sources, such as batteries or energy harvesting. Ensuring optimal power management and energy efficiency is a continuous challenge. Future directions involve developing low-power hardware designs, energy-aware algorithms, and power optimization techniques to extend battery life and minimize energy consumption.

B. Security and Privacy: As embedded systems become more interconnected and communicate with external networks, ensuring robust security and privacy measures is crucial. The future direction

involves developing secure hardware architectures, encryption techniques, secure communication protocols, and authentication mechanisms to protect embedded systems from cyber threats and safeguard sensitive data.

C. Real-Time Performance: Many embedded systems require real-time performance, where tasksmust be completed within strict timing constraints. Future directions involve developing real-time operating systems (RTOS) with enhanced scheduling algorithms, predictable task execution, and efficient resource management to meet real time requirements in complex and dynamic environments.

D. System Complexity and Integration: Embedded systems are becoming increasingly complex, incorporating multiple functionalities, sensors, and communication interfaces. The future direction involves developing design methodologies, modeling techniques, and system integration frameworks to manage the complexity, facilitate interoperability, and ensure seamless integration of various components within embedded systems.

E. Heterogeneous Computing and AI

Integration: The integration of heterogeneous computing resources, such as CPUs, GPUs, FPGAs,

and AI accelerators, is a growing trend in embedded systems. Future directions involve exploring innovative architectures, programming models, and optimization techniques to effectively utilize

heterogeneous resources, leverage AI capabilities, and achieve high-performance computing in resource-constrained environments.

F. Safety-Critical Systems: In safety-critical applications like automotive, aerospace, and medical devices, embedded systems must adhere to stringent safety standards. Future directions involve developing safety-critical design methodologies, fault tolerance mechanisms, and verification/validation techniques to ensure reliable and fail-safe operation of embedded systems, minimizing the risk of accidents and hazards.

G. Internet of Things (IoT) Integration: The integration of embedded systems with IoT networks presents both opportunities and challenges. Future directions involve addressing issues related to scalability, interoperability, data management, and edge computing capabilities to effectively connect and manage a large number of embedded devices within IoT ecosystems.

H. Human-Machine Interaction: As embedded systems become more pervasive, enhancing human machine interaction and user experiences is crucial. Future directions involve developing intuitive

interfaces, voice recognition, natural language processing, and gesture-based interactions toimprove usability, accessibility, and user satisfaction with embedded systems.

I. Software Development and Testing: Embedded systems software development requires specialized skills, tools, and testing methodologies. Future directions involve advancing software development environments, debugging techniques, simulation platforms, and automated testing frame works to streamline the development process, improve software quality, and reduce time-to-market.

J. Standardization and Collaboration: With the rapid evolution of embedded systems, standardization efforts and collaboration among industry stakeholders, researchers, and regulatory bodies become vital. Future directions involve promoting standardized interfaces, protocols, and frameworks to enable interoperability, facilitate knowledge sharing, and accelerate innovation in embedded systems .Addressing these challenges and exploring future directions will contribute to the advancement of embedded systems, enabling the development of more efficient, secure, and intelligent solutions that meet the evolving needs of various industries and domains.

7. Conclusion

This paper provides a comprehensive review of recent trends in embedded systems, covering hardware, software, and system design aspects. By understanding these trends, researchers and practitioners can stay up-to-date with the latest developments and contribute to the advancement of embedded systems.

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Black Box System Using Raspberry Pi

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Abstract

The World Health Organization (WHO) says that every year millions of people demise due to vehicle accidents. To prevent this, the car black box system is introduced. Like black box in flight, the car black box technology can play a vital role in vehicle crash investigations. Hence it is significant to have recorders which will track all the activity in vehicles during and after accident or crash. This paper proposes a model of a car black box system which can be installed in the cars. In addition to this, the car black box system sends an alert message to the user mobile which is connected through GSM module. The black box system also uses GPS sensor to collect the data location. This project proposes a technique to monitor the vehicle performance and the behaviour of the driver using sensors with the use of IoT technology. This system consists of Alcohol sensor, IR sensor, Temperature sensor, GPS and GSM module. Whenever an abnormal value is detected, it will be created in the form of log and send to the cloud it contains location and the abnormality detected. These abnormalities can be increase in the alcohol consumption of the driver, or increase in temperature of the engine or an obstacle ahead of the car upon which the car may get collided due to increased speed.

Key words:IoT, Raspberry Pi, Abnormality, Sensors.

Introduction

The car black box system is a crucial tool for improving vehicle safety and reliability. This project proposes the use of a Raspberry Pi 3B microcomputer to develop a car black box system that integrates temperature sensing, GPS, and GSM capabilities to collect and analyse data from various sources. The Raspberry Pi 3B is a versatile and affordable microcomputer that can be easily integrated with various sensors and modules to provide real-time feedback on any physical oddities in the vehicle. The temperature sensor can detect any unusual changes in the vehicle's temperature and

alert the driver or maintenance personnel to prevent damage or breakdowns. The GPS module can provide real-time tracking and location data, which can be used to improve route planning and monitor vehicle movements. Additionally, the GSM module can be used to transmit location data and other information to a central monitoring system or emergency services in the event of an accident. By combining these features with the Raspberry Pi's processing power and storage capacity, the car black box system can provide a comprehensive solution for improving vehicle safety and reliability. The recorded data can be used to identify potential issues, optimize vehicle maintenance, and provide valuable insights into accident investigations. The car black box system is not only useful for civilian vehicles but also has broad applications in military and industrial settings. Field technicians, soldiers, and command centre specialists can use the black box to analyse and fix issues that may arise while out in the field or at the command post. Passengers and field professionals can also utilize the black box to determine the vehicle's status. The project's main objective is to improve the safety and reliability of vehicles, leading to fewer accidents and fatalities on the road. The recorded data obtained from the car black box can be used by investigators to identify the actual cause of the accident and provide ways to prevent future mishaps. To achieve this objective, the project will involve the design and development of the car black box system using the Raspberry Pi 3B microcomputer, temperature sensor, GPS module, and GSM module. The system will collect and analyse data from various sources, store it locally, and transmit it to a central server for further analysis.

The project will also involve the development of software to enable real-time monitoring of the vehicle's temperature, location, and other parameters. The software will also include a user- friendly interface for

accessing the recorded data and generating reports. The project team will work collaboratively to design and develop the car black box system and software, test the system's performance, and optimize it for real-world applications. The project will also involve field testing to evaluate the system's performance in different scenarios and identify areas for improvement. In conclusion, the car black box system based on the Raspberry Pi 3B microcomputer with temperature sensing, GPS, and GSM capabilities is an innovative solution for improving vehicle safety and reliability. The project aims to develop a cost-effective and efficient system that can be used in civilian, military, and industrial settings to prevent accidents and improve crash investigations. The project has significant potential to reduce fatalities and injuries on the road, making driving safer and more efficient for everyone.

Literature survey

Vehicle Black Box Based on Can and IOT Protocol,Jayesh Rathod, Sanjana Thakur, Shital Waghotkar.[1] This project presents the development and implementation of a digital driving system for a semi-autonomous vehicle to improve the driver-vehicle interface along with black box features. It uses an Arduino based data acquisition system that uses ADC to bring all control data from analog to digital format and visualize through LCD. The communication module used in this project is embedded networking by CAN which has efficient data transfer.

Authentication and Distributed Storage of IoT Data from Constrained Sensors, Panagiotis Chatzigiannis, Foteini Baldimtsi, Constantinos Kolias, Angelos Stavrou.[2] The use of distributed, immutable ledgers has been proposed as a prominent solution in the IoT setting allowing rapid detection of inconsistencies in sensory data and network communications, providing a conflict resolution mechanism without relying on a trusted authority [10]. A few relevant schemes have been proposed in the literature [51, 54], integrating distributed ledgers (commonly referred to as Blockchain) with IoT.

Black-box Fuzzing of IoT Firmware via Message Snippet Inference, Xiaotao Feng, Xiaogan Zhu, Minhui Xue, Sheng Wen.[3]. This paper presents a black box system that is very useful for automobile industry. Digital control of the vehicle is an important criterion of modern cars. With the rapid development of embedded technology, highperformance embedded processor is penetrated the auto industry, which is low cost, high reliability, and other features to meet the needs of the modern automobile industry.

M. Anil Kumar, M. Venkata Suman , Yogesh Misra, M. Geetha Pratyusha.[4] This paper mainly focuses on alerting the driver from the Collision situations and using Cloud Computing Services, the location can be easily traced. Our contribution is that we proposed a low power microcontroller which can be used in the hardware implementation as its main controller in the automation of this device.

Operation of Black box System

In present situation any accident occurs the information about an accident is needed to find out the cause of the accident. In this case the investigators should know about the accident at that time the Black box is more useful. Then the investigators should easily know about the accident. In case of any accident occurs immediately location and message should be sent to the ambulance and rescue team. Then they should easily know about the accident. The information about the accident is gathered from Black box. It can store information about the vehicle and surrounding images also. Previously it can be used in Helicopters and Airplanes. Now we are trying to implement it in our own vehicles. If any accident occurs then message will send to the provided mobile numbers. Various sensors are used to build the black box in order to find the speed of the vehicle, pressure and angle detection. If angle of vehicle will be changed then the sensor will detect the accident immediately motor will stop. It continuously records the information like speed of the vehicle, sensor values surrounding images and stores in the internal memory. Various sensors are used to build the black box in order to find the speed of the vehicle, pressure, and angle detection. If angle of vehicle will be changed then the sensor will detect the accident immediately motor will stop.

Methodology

Black box system using raspberry pi

Consider a car had an accident the sensor will activated automatically and start its surveillance mode. If user is not in critical condition and can help himself then he will for every 30 seconds GPS will receive the information from the satellite and fed to the microcontroller. Control the form of longitude and latitude. Then it records car details will read information and display it on the LCD display. A memory card is solid-state electronic flash memory data storage device capable of digital contents. Black Box system that can be installed into vehicles. The system aims to achieve accident analysis by objectively tracking the vehicle. The system also involves enhancement of security by preventing tampering of the Black Box data. This system consists of Alcohol sensor, Speed measurement sensor, Ultrasonic sensor, MEMS sensor and Mobile GPS. Whenever an abnormal value is detected, it will be created in the form of log and send to the cloud it contains location and image stop surveillance mode. Once the system started in assistance mode first system will gather the car location using GPS device Power supply is a supply of electrical power, that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The Global Positioning System (GPS) is a burgeoning technology, which provides flexibility of positioning for navigation, surveying. The GPS provides continuous three-dimensional positioning 24 hours a day throughout the world. Once the user's position has been determined, GPS unit can calculate other information, such as speed, bearing track, trip distance, distance to destination. Consider a car had an accident the sensor will activated automatically and start its surveillance mode. If user is not in critical condition and can help himself then he will for every 30 seconds GPS will receive the information from the satellite and fed to the microcontroller. Control the form of longitude and latitude. A memory card is solid-state electronic flash memory data storage device capable of digital contents. Black Box system that can be installed into vehicles. The system aims to achieve accident analysis by objectively tracking the vehicle. The system also involves enhancement of security by preventing tampering of the Black Box data. This system consists of Alcohol sensor, Speed measurement sensor, Ultrasonic sensor, MEMS sensor and Mobile GPS. Whenever an abnormal value is detected, it will be created in the form of log and send to the cloud it contains location and image.

Stop surveillance mode. Once the system started inassistance mode first system will gather the car location using GPS device Power supply is a supply of electrical power, that supplies electrical or other types of energy to an output load or group of loads is called a power supply.

Circuit Diagram
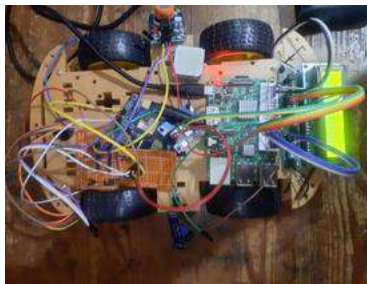
Hardware Description

Raspberry Pi

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. An SD card inserted into the slot on the board acts as the hard drive for the Raspberry Pi. It is powered by USB and the video output can be hooked up to a traditional RCA TV set, a more modern monitor, or even a TV using the HDMI port. Because, it keeps its operating system, documents, and programs. If your raspberry pi did not come with an SD card, then the min size you should get is 4GB.

Advantages of the raspberry pi is, it is small, and it works as a normal computer at low-cost server to handle. Although Raspberry Pi is as small as the size of a credit card, it works as if a normal computer at a relatively low price, it is possible to work as a low-cost server to handle light internal or web traffic. Grouping a set of Raspberry Pi to work as a server more cost-effective than a normal server.

If all light traffic servers are changed into Raspberry Pi, it can certainly minimize an enterprise's budget.
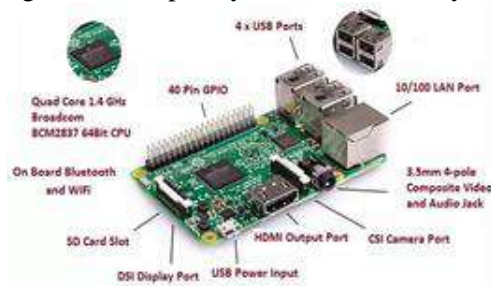

Fig : Raspberry Pi Board

GPS Module

This is a complete GPS module that is based on the NEO 6M GPS. This unit uses the latest technology to give the best possible positioning information and includes a larger built-in 25 x 25mm active GPS antenna with a UART TTL socket. A battery is also included so that you can obtain a GPS lock faster. This is an updated GPS module that can be used with ardupilot mega v2. This GPS module gives the best possible position information, allowing for better performance with your Ardupilot or other Multirotor control platform

Fig: GPS Module

GSM Module

Fig: GPS Module GSM SIM 800C Modem with Antenna Module's baud rate is configurable from 9600-115200 through AT command. The GSM GPRS Modem is having internal TCP/IP stack to enable you to connect with the internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer applications in the M2M interface. The modem will work with 5-12V DC, which can be fed either through on board 2 Pin RMC connector or DC Jack. The modem is powered by a High Current Low Dropout Linear Voltage regulator to withstand high surge current requirement (may rise to 2A).

Fig: GPS Module

Temperature Sensor

Engine temperature is the important in engine control unit if this value goes to abnormal, some unwanted gases exhaust from vehicles due to improper combustion. In this project in order to obtain the vehicle engine temperature, we have used LM35 temperature sensor this temperature sensor continuously read the engine temperature and fed to the microcontroller. It converts temperature value into electrical signal. Its temperature sensing range is   -55   to   +150   °C.

Fig : Temperature Sensor

Advantages

- Reliable device.
- Easy to extract the data .
- Easy to analyse the recorded data.
- It will not affect the privacy of driver.

- Help to investigation team.
- Help to Insurance Company.
- If it is connected to GPS system.
- Module alerts the accident to present mobile numbers stored in it.
- The alert message includes the location in latitude and longitude.
  Results

- The car black box system developed using Raspberry Pi 3B microcomputer with temperature sensing, GPS, and GSM capabilities.
- The system detected and alerted drivers to abnormal temperature changes, allowing them to take corrective action before any damage or breakdowns occurred.
- The GPS module provided accurate location data, which was used to optimize route planning and monitor vehicle movements.

- The GSM module was able to transmit location data and other information to a central monitoring system or emergency services in real-time, improving response times in the event of an accident.
- The recorded data obtained from the car black box system has been valuable in accident investigations, enabling investigators to identify the actual cause of the accident and provide ways to prevent future mishaps. The system's software has a user-friendly interface and the ease of accessing recorded data and generating reports.

Conclusion

The proposed system will provide important information at the time of any accident. When any type of accident will occur due to any reason, the car black box system provides necessary data to generate the report of accident and its cause. This paper offers a user-friendly program to analyze the data of the accident. This car black box system can be implemented in any vehicle. As soon as the driver runs or start the vehicles the system will start collecting data from all the sensors along with date and time.

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ABOUT INSTITUTE

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