PCE JOURNAL OF ELECTRONICS AND TELECOMMUNICATION

PILLAI COLLEGE OF ENGINEERING

A+ NAAC

INTERNET OF THINGS

DECEMBER 2021

VISION

Pillai College of Engineering (PCE) will admit, educate and train in technology, a diverse population of students who are academically prepared to benefit from the Institute's infrastructure and faculty experience, to become responsible professionals. It will further attract, develop and retain, dedicated, excellent teachers, scholars, scientists and professionals from diverse backgrounds whose work gives them visibility beyond the classroom and who are committed to making a significant impact in the lives of their students and the community.

MISSION

To develop professional engineers with respect for the environment and to make them responsible citizens, both from a local and global perspective. This objective is fulfilled through quality education, practical training, research, entrepreneurship and interaction with industries and social organizations.

INSTITUTIONAL OBJECTIVES

To evolve a teaching-learning process where by students have freedom of thought and thereby explore the various aspects of technological development.

To encourage the teaching faculty to pursue research in specialized and emerging areas of technology and develop their skills to impart that knowledge to students.

To provide the requisite infrastructure including workshops, Library and IT laboratories to create a learning environment.

To promote the interaction of students and faculty with the industry.

To collaborate with other leading institutions in India and overseas to gain improvement for the lives of all global citizens.

Department of Electronics and Telecommunication Engineering

The field of Electronics and Telecommunication Engineering requires the handling of complex apparatus and electronic mechanisms to produce state-of-the-art telecommunication systems capable ofprocessing information at incredible speeds. Specialist engineers of this field design the electronicequipment devised to revolutionise the industries of entertainment, IT, communication and defence.As developments in communication technology continue to shape and increasingly improve our dailylives, Electronics and Telecommunication Engineers gain a crucial catalytic role in evolving modernsociety. As globalization continues, modern engineers face the exciting challenge of providing the robust technological infrastructure for the telecommunication industry. The curriculum of Electronics and Telecommunication Engineering equips students with a rigorous understanding of basic science and engineering concepts so that learners acquire knowledge of computer architecture, microcontrollers, embedded systems, integrated circuits, electromagnetic field theory, signal and image processing and communication technologies.

VISION:

Strive towards producing world class engineers who will continuously innovate, upgrade telecommunication technology and provide advanced, hazard-free solutions to the mankind. Inspire, educate and empower students to ensure green and sustainable society.

MISSION:

Benchmarking against technologically sound global telecommunication institutions with a view towards continuous improvement.

Continually exposing students to scenarios that demand structuring of complex problems and proposing solutions.

Educate students and promote values that can prevent further degradation of our planet. Becoming responsible citizens genuinely concerned with and capable of contributing to a just and peaceful world.

PROGRAM EDUCATIONAL OBJECTIVES:

Provide graduates with a strong foundation in mathematics, science and engineering fundamentals to enable them to analyze and solve challenging problems in Electronics and Telecommunication Engineering.

Impart analytic and thinking skills to develop innovative ideas in the field of Telecommunication Engineering.

To keep students up to date with the latest advancement in the field of Electronics and Telecommunication.

Inculcate qualities of leadership skills, multi-disciplinary team work and an ability to adapt to evolving professional environment in the field of Engineering and Technology.

To create awareness among the students towards ethical, social and environmental issues in the professional career.

PROGRAM SPECIFIC OUTCOMES:

Able to understand the concept of Basic Electronics, Network and Circuit Analysis, Analog and Digital circuits, Signals and System, Electro magnetics and apply them in various areas like Microwave Engineering, Wireless Communication, Digital image processing, Advance Communication systems etc.

Able to use techniques, skills, software, equipments and modern engineering tools necessary for Electronics and Telecommunication Engineers to identify, formulate and solve problems in industries and research work.

Able to work in multi disciplinary environment to provide socially acceptable technical solutions for complex communication engineering problems.

FROM THE PRINCIPAL'S DESK

It brings me great pleasure to present the "Journal of Electronics and Telecommunication Engineering Department," which depicts numerous technological advances in the field of electronics and telecommunication. In today's engineering sector, continuous discovery and advancements are essential, and it needs the highest level of inventiveness. It creates a strong urge to express one's views and a forum for students to demonstrate their abilities in the genuine sense of the term.

Pillai College of Engineering has always been dedicated to producing environmentally mindful and ethical engineers. Our students demonstrate a professional approach by diligently keeping up with the newest technical breakthroughs and innovations, not just in India, but also globally.

The Journal is not only informative, but also instructive, with original, fascinating, and enlightening technical articles that add value and quality to the publication. I would really like to express my gratitude to the coordinators, student members, and editorial board for their valuable contributions and outstanding achievement.

Best wishes for all your future endeavors.

- Dr. Sandeep Joshi
Principal, Pillai College of Engineering

FROM THE HEAD OF DEPARTMENT'S DESK

Innovation is the soul of engineering and looking at innovative project works implemented by the final year students from the Department of Electronics and Telecommunication Engineering brings me immense pleasure. The final result put forward by students really shows their dedication towards the creation of their projects. All the works are remarkable and are implemented paying close attention to sustainability and cost-effectiveness of the projects. The papers submitted to the journal are proof of the dedication and efforts taken by the students. I would like to commend the journal committee for providing a place where the earnest efforts of our students can be noticed, and be appreciated by everyone. The work done by the students and the committee really brings forth what our department has to offer, and I really appreciate everyone involved in the process. I hope the students keep their sparks of innovation lit and keep on finding creative solutions to all the hurdles in their life. I wish all the students good luck in their future endeavors.

With Best Wishes,

Dr Avinash R. Vaidya
Head of Department
Electronics and Telecommunication Engineering
Pillai College of Engineering

FROM THE TEACHER'S DESK

This year's annual journal event will motivate students as their proposals are going to be addressed in front of everyone in the campus after almost two years since pandemic lockdown. The papers acknowledge not only students' hard work but also their dedication of research to go above and beyond traditional teachings by exploring with their own abilities. This will motivate other students as reference from their proposals.Today these papers will be the stepping stones for future research developments done by our students. These journals will act as guides for upcoming students' future in their dedicated field.These technical papers show that the students are prepared with the problem solving skills which are necessary in today's world. The Journal committee has put a tremendous amount of effort , punctuality and dedication.The members of the committee not only planned the report but also assisted the students who were writing the articles .The committee has co-ordinated impressively even after working under strict deadlines. I wish the committee best luck and look forward to more marvelous issues of this journal in the future.

Prof. Jayashri D. Bhosale
Assistant Professor
Electronics and Telecommunication Engineering

This year's efforts have all been intriguing and fruitful in their own way. We came across a wide range of projects, each demonstrating our student's inventiveness and ingenuity. Project work is a type of learning that allows students to combine material from several subjects of study and apply it critically and creatively to real-world circumstances. All of this was both cost-effective and novel, showcasing the student's capacity to think creatively. It's a thorough examination of a real-world topic that merits student's time and effort. The members of the journal committee did an excellent job of exposing the potential of our department's students. The journal committee staff worked hard to fulfil deadlines and guarantee that the papers submitted were perfect. I appreciate the collaborative effort and precise attention to detail that allowed us to shorten the process and meet our goals. I wish all the best to all the committee members and a good heart to keep up the good work.

Prof. Suchitra Patil
Assistant Professor
Electronics and Telecommunication Engineering

INDEX

IoT Based Indoor Farming

Madhuri Dhanawade ,.Aditya Katamaware,.Vipul Tiwari ,Akshay Chavan

Abstract-we **are all privy to the fact that there's an increasing want for agriculture because of the drastic boom within the population which occupies both land place and will increase the call for food products. So we can't completely depend upon the conventional approach of farming which additionally has diverse barriers. As a result we opted for Indoor farming, which is a top notch success. The Indoor farming is of two important sorts- green house farming and Hydroponics. In each the cases, human strength is required for tracking the parameters and taking important movements. This idea is focused on decreasing the workload and growing the reliability of the gadget electronically. The gain of this device is that the productiveness is two to 3 instances better, time taken is 2 to a few instances lesser and saves 70 to eighty% of water in comparison to everyday agriculture provided proper pH, NPK nutrient level, mild, Temperature, Humidity is maintained. The main goal of the proposed product is that it automates the system absolutely and we are able to have a bonus of remote tracking, facts logging for various functions and far flung control of the entire gadget the usage of IoT. Disorder identity and manage is possible from everywhere within the international and whenever. This may make a splendid impact in the destiny farming the usage of IoT.**

Keywords-Indoor **Farming, Hydroponics**

I. INTRODUCTION

Indoor farming is an exceptional enforce to meet the burgeoning demands of the sector's meals. It now not simplest fulfills the call for clean ingredients however additionally perfonns a widespread function in producing nutritious ingredients. sizable quantities of insecticides are used to guard the crop from pests. As an end result, the crops which can be produced each year are not nutritious and toxic-unfastened, so we suffer in malnutrition and persistent disorder. We additionally need to depend on our surroundings in terms of meals manufacturing. international warming is causing climate change hastily, which is pernicious for our agriculture. Indoor farming may be very crucial for bringing to an quit such troubles. Superior technology is getting used to make indoor farming more efficient and less difficult via using technology, it's far very clean to trade the fee of food production. Those consist of computerized tracking of vegetation, dealing with adequate light and ventilation, taking diverse vital preparations with a robotic, etc. it's far estimated that the population of the sector will be about nine billion by using 2050. Traditional cultivation isn't always sufficient to meet the necessities. consequently, indoor agriculture has chosen to meet the demand for healthy meals in developed countries in addition to in growing nations. several human beings are doing this as a hobby and plenty of are adopting this technique for business reasons. they're the use of their land, roof, or porch for indoor agriculture. we're able to handle indoor farming automatically through our undertaking. It automatically materials water or essential substances to the farm's plants. It is also able to manipulate while the room temperature rises.

II. LITERATURE REVIEW

Various work of indoor farming has done by a lot of researchers using different methods. The authors of paper have worked crop management that focuses on indoor farming and DHT22 sensor are used on this system. The sensors check soil moisture, humidity, and temperature, respectively. The system can operate the pump according to the moisture sensor value. In addition, it can store humidity and temperature sensor's real-time data in Excel sheets.

Another paper's authors have introduced wireless technology for indoor farming. In that they have used some sensors, routers, and RF modules on the system, so they could monitor it wirelessly. In this type of farming system, if the water is required to crops, then it will give water through the solenoid valve. Another important factor is that the buzzer will be ringing if the firm's temperature and humidity are not in the optimum condition. IoT based different farming techniques has been studied via paper. With the help of different sensors we can create our indoor farming system with the help of these new technologies.

III. PROPOSED SYSTEM

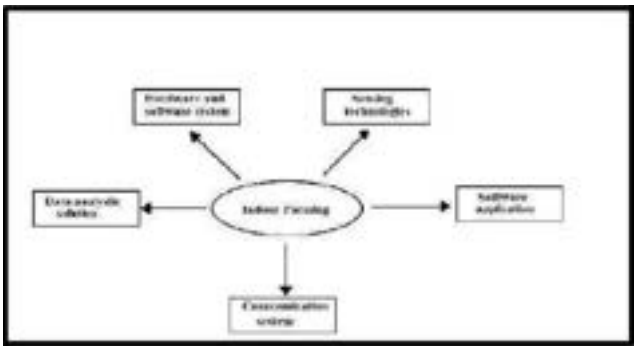

Fig 1.1 Proposed system of IOT based indoor farming

In order to design a project we have to first go through the proposed system which reflects how implementation will take place. So with respect to above mention proposed system we have design our project.

IV. BLOCK DIAGRAM

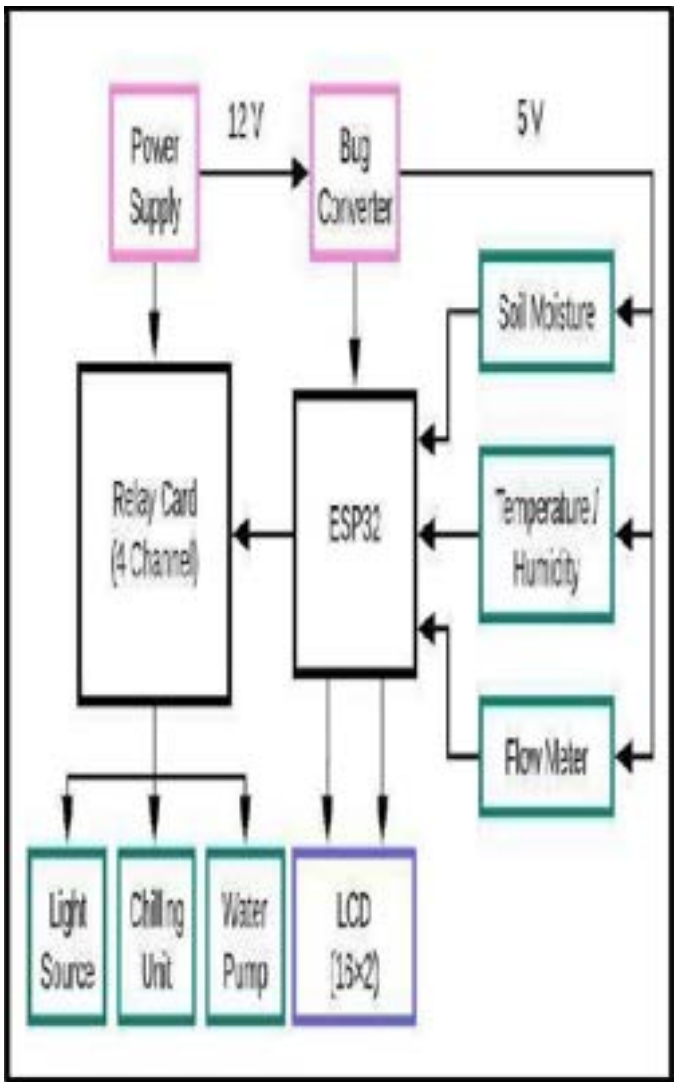

Fig 1.2 Block Diagram of IOT based Indoor Farming

V. WORKING

1. Temperature/ Humidity: Humidity is the measure of water vapour present in the air. the level of humidity in air affects numerous physical, chemical and organic procedures. In industrial appli cations, humidity can have an effect on the commercial enterprise price of the products, health and safety of the personnel. So, in semiconductor industries and manipulate system industries measurement of humidity may be very important. Humidity measurement determines the quantity of moisture gift within the fuel that can be a mixture of water vapour, nitrogen, argon or pure gas and so on... Humidity sensors are of two sorts based totally on their measurement units. they're a relative humidity sensor and Absolute humidity sensor. DHT11 is a digital temperature and humidity sensor.DHTl 1 sensor includes a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric among them. exchange within the capacitance cost occurs with the exchange in humidity ranges. The IC measure, technique this modified resistance values and change them into virtual form or measuring temperature this sensor makes use of a poor Temperature coefficient thermistor , which causes a lower in its resistance fee with increase in temperature. To get larger resistance fee even for the smallest exchange **in** temperat ure, this sensor is commonly made up of semiconductor ceramics or polymers. The temperature variety of DHTl1 is from 0 to 50 diploma Celsius with a 2-degree accuracy. Humidity range of this sensor is from 20 to eighty% with 5% accuracy. The sampling fee of this sensor is lHz .i.e. it offers one analy zing for every 2d. DHTl1 is small in size with running voltage from three to five volts. The maximum contemporary used whilst measuring is two.

2. Water Flow Sensor: Water flow sensors are installed at the water supply or pipes to measure the fee of waft of water and calculate the quantity of water flowed through the pipe. charge of waft of water is measured as liters according to hour or cubic meters Water glide sensor consists of a plastic valve from which water can pass. A water motor along side a corridor impact sensor is gift the sense and measure the water flow. while water flows via the valve it rotates the motor. by this, the alternate can be found within the speed of the motor. this alteration is calculated as output as a pulse sign with the aid of the hall impact sensor. for this reason, the rate of float of water can be measured. the primary operating precept in the back of the operating of this sensor is the hall impact. consistent with this principle, in this sensor, a voltage difference is caused within the conductor due to the rotation of the rotor. This prompted voltage difference is transverse to the electrical cutting-edge. while the shifting fan is circled due to the flow of water, it rotates the rotor which induces the voltage. This precipitated voltage is measured through the corridor effect sensor and after a few calibration values are displayed at the led display.

3. Soil Moisture Sensor: The soil sensor is of fork-shap ed probe with two uncovered conductors, acts as a variable resistor (similar to a potentiometer) whose resistance varies in keeping with the water content material in the soil resistance is inversely proportional to the soil moisture. The more water within the soil method higher conductivity and could result in a lower resistance. The less water inside the soil approach terrible conductivity and could bring about a better resistance. The sensor produces an output voltage in line with the resistance, which by using measuring we will determine the moisture level.

4. Chilling Unit System : To design this chilling unit system we have used two peltier module, cpu fan ,air blower and heat sink (North bridge and South bridge). So we have set a range of temperature in our programming part that is done via on and off function so if room temperature goes beyond this range then via microcontroller it will trigger to relay and chilling unit will be activated. Cooling side of peltier module will be near to the plant and heating side will be disspiated outside via cpu fan.

6. PH Sensor : Irrespective of the layout, the precept in the back of the generation is the identical. The pH electrode that takes the pH dimension consists internally of a reference electrode, reference solution, reference junction and a glass bulb with a hydrated gel layer. when your electrode is submerged within the diluted sample or pressed into the soil an electrical present day is brought about. The tester then calculates the charge of the reference answer inside the bulb and compares it to the soil medium outdoor of the gel layer.
This assessment results in a pH dimension that is displayed at the pH meter's screen - all within a matter of seconds.

VI. SOFTWARE IMPLEMENTATION

1. Coding for the Microcontroller

Microcontroller Used:	ESP32
Software:	Arduino Integrated Development Environment
Programming Language:	C
Libraries used:	Blynk-master, BlynkSimpleEsp32.h ESP32devmodule.
Operating system	Windows

Table 1.1 Coding for the Microcontroller

2. IoT based Blynk Application

Blynk App is an IoT based platform that allows to create amazing interfaces for projects using various widgets.
Widgets selected in implementing Indoor Farming IoT based Blynk Application are as follows :

Gauge	Soil Sensor	Virtual	V7	
Gauge	temp	Virtual	V6	
Gauge	Humidity	Virtual	V5	
Gauge	Flow sensor	Virtual	VO	
Value Display	flow rate	Virtual	vs	

Table 1.2 Widgets selected in implementing Indoor Farming loT based Blynk Application

1. *Configuring the BLYNK Application with the microcontroller code.*

Widget	Widget Name	PIN TYPE	PIN No.	To
Button	Light source	Digital	GP14	

Fig 1.4 BLYNK Application configuration

The Wi-Fi hotspot connected with the Blynk App is used in the code which is uploaded in the ESP32And the Authentication token of the project is also included in the ESP32 code. Hence, IoT based Blynk App gets interfaced with the transmitter section microcontroller ESP32.

VII. RESULTS AND DISCUSSIONS

1. PCB CIRCUIT

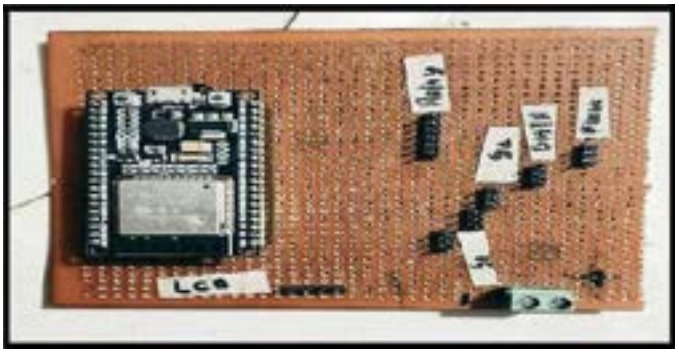

Fig 1.5 PCB Circuit

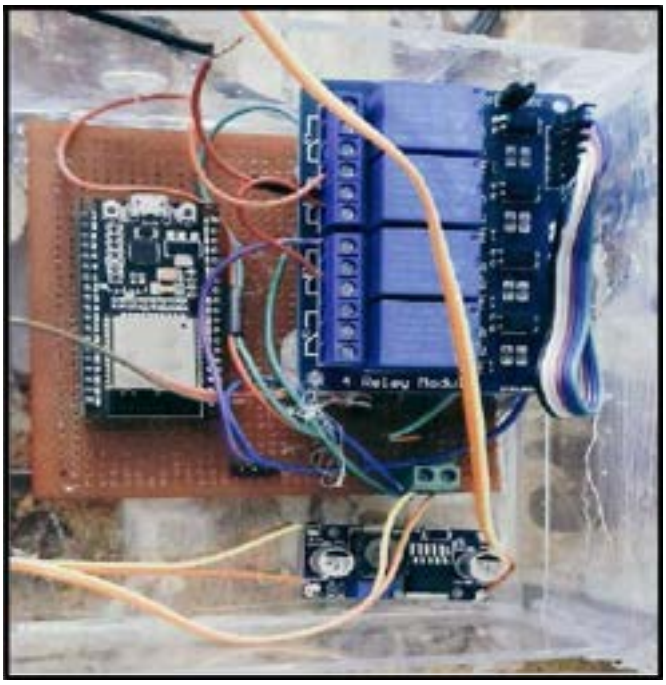

Fig 1.6 PCB circuit

2. The screenshots of output on serial display and led display.

Fig 1.7 LCD Display

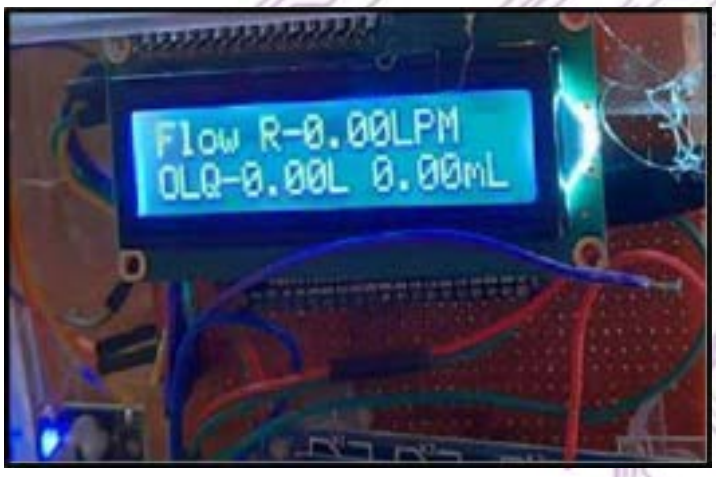

Fig 1.8 LCD Display

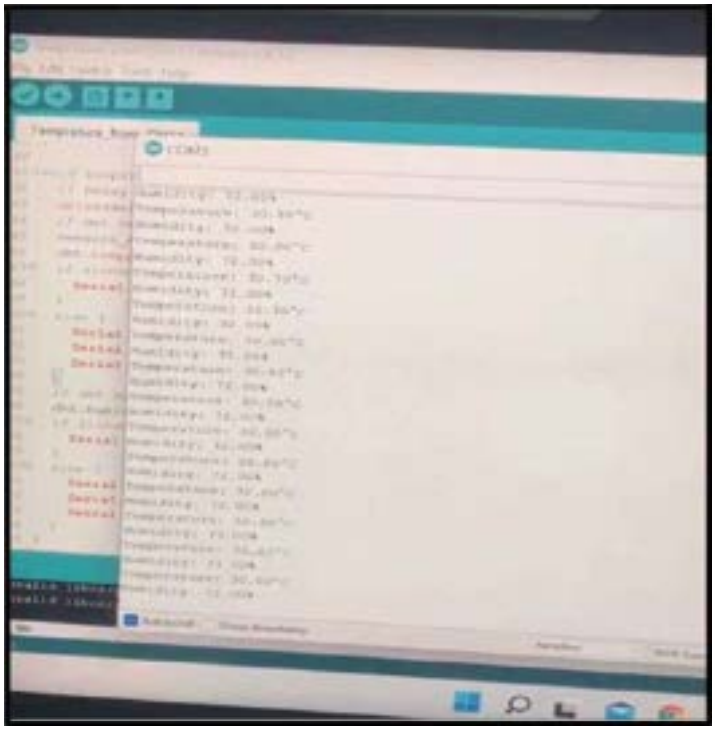

Fig 1.9 Program Code

VIII. CONCLUSION

As the global meals demand is growing, the food protection has come to be a popular problem. The conventional agriculture might have some flaws during the agriculture activities, including the weather is uncontrollable and led the lack of gold standard growing environment for the crops and flora, the agriculture activities normally depend on the farmer's reviews, a large quantity of labour is employed but efficiency and productiveness is no longer assured. Thus, this undertaking proposed the name "IoT on indoor farming". There are some current related systems, however maximum of them are emphasize at the records tracking. As compared, this project applies the idea of valuable agriculture, by way of using sensors, the surroundings parameter is monitored. As the enhancement, this mission proposed a few automation techniques which includes to manipulate the air temperature and humidity by using air circulation generated by way of the applied fanatics. on the identical time.

IX. FUTURE WORK

In future this project can be implemented in a large scale too that will reduce the pressure from farmers to produce good quality crops to meet this ever increasing population. If this project is implemented on large scale then farmer don't have to face huge losses because this technology doesn't work on prediction and forecasting it totally works on the concept of lot and precision agriculture.

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[5] Rajermani Thinakaran I* , Sarasvathi Nagalingham2 , Eng Jing Hui3 SMART VERTICAL FARMING USING IoT l,2,3Facu lty of Information Technology, INTI International University, Nilai, Malaysi

IOT Based Smart Agriculture Monitoring System.

Pratiksha Yadav, Sabir Khan, Tanush, Mayuresh Jadhav

***Abstract*— In earlier days farmers used to calculate the readiness of soils and impacted doubts to create which to sort of yield. They didn't consider the PH value, moisture content in soil, surrounding climate which was difficult to a farmer, progressively The Internet of Things (IOT) is renovating the Agribusiness engaging the agriculturist through the broad scope of methodologies, for instance, exactness just as useful cultivating to manage difficulties in the fields. IOT based agriculture systems help in get together data on conditions like atmosphere, protection, temperature and productivity of soil, level of water, cultivation area, animal break in to the field, trim turn of events, agriculture. IOT use farmers interaction to get related with his living arrangement from any place and whatever point. Distant sensor structures are used for watching the residence conditions and smaller scope controllers are used to control and motorize the field. To see distantly the conditions as picture and video, far off cameras have been utilized. IOT improvement can decrease the expense and update the efficiency of standard creating for farmers.**

***Keywords*— Node MCU, Soil moisture sensor, PH sensor, Humidity sensor, Temperature sensor, smoke sensor etc.**

I. INTRODUCTION:

We read in the new papers for many days about farmer's losses and farmers used to work out the soil maturity and suspicions for the production of yield. They won't worry about the temperature, water level and simply climate conditions that are terrible to farmers. The Internet of Things (IOT) is reconstructing the agribusiness which enables farmers to deal with challenges in the field, for example through the broad range of strategies, such as accuracy and practical farming. IOT assists in the assembling of information regarding conditions such as climate, humidity, ph value and temperature a IOT based examinations enables the discovery of wild plants, water level, exact location, field interruptions, field development, horticulture. IOT helps in assembling information IOT uses farmers to connect from anywhere to his house. Remote sensors are used to track household conditions and smaller controls are used to control and mechanize the house shapes.

II. LITERATURE SURVEY:

Paper 1: S.Sivachandran, K.Balakrishnan, K.Navin, "Real TimeEmbedded Based Soil Analyser", International Research Journal of Engineering and Technology (IRJET). Volume: 3 Issue 3 | March 2014. In this paper, authors propose an embedded soil analyzer with measures the pH value of the soil and based on this value gives measure of various soil nutrients.

Paper 2: Anand Nayyar, Er. Vikram Puri, "IoT Based Smart Sensors Agriculture Stick for Live Temperature and Moisture Monitoring using Arduino, Cloud Computing & Solar Technology" May 2015. This paper presents an IoT based smart stick that enables live monitoring of the different agricultural parameters. This stick helps farmer acquire live data of temperature, soil moisture.

Paper 3: Chandan Kumar Sahu, Pramitee Behera, "A Low-Cost Smart Irrigation Control System", IEEE sponsored 2nd International Conference on Electronics and Communication System (ICECS2015) In this paper, the author proposes a model where the flow and direction of water is supervised and controlled. This is done with the help of DHTT11 and soil moisture sensor. This method also proposes a way to select the direction of water and this information is also sent to the 9 phone and Gmail account of the farmer.

Paper 4: Laxmi C. Gavade, A.D Bhoi , "N, P, K Detection and Control for Agriculture Applications using PIC Controller", International Research Journal of Engineering and Technology (IRJET). Volume: 6 Issue: 4 | April 2017. This paper suggests a model to detect humidity of the soil, temperature, sunlight, N, P and K contents using sensors in the agricultural field. By measuring these parameters farmer can increase the productivity of the soil as it detects the nutrients deficient in the soil.

Paper 5: Mrs.T.Vineela, J. NagaHarini, Ch.Kiranma, G.Harshitha, B.AdiLaksh, "IoT Based Agriculture Monitoring and Smart Irrigation System ", International Research Journal of Engineering and Technology (IRJET). Volume: 5 Issue: 1 | Jan 2018. In many research papers it is devised that information must be collected from different sensors and live monitoring should be done but in this research paper the stress is laid on getting things automated. In this paper the writers aim at increasing the crop yield by using different technologies.

Our group is trying to do this project so that we can help farmers to grow the good quality of soil, in Quantity with quality. Using this project so that we can help to identify soil quality and climate conditions. In future if the population increases, farmers will have to do more agriculture and grow more crops as early as possible. For that they will not have time to do manual monitoring. This project will help farmers to monitor and correct the soil.

III. PROPOSED SYSTEM

According to the ancient method we cultivate crop according to the weather. with the help of the IoT we can adjust the weather according to the crop which we want to cultivate. The basic building blocks of an IoT System are Sensors, Processors and applications. So, the block diagram below is the proposed model of our project which shows the interconnection of these blocks. The sensors are interfaced with Microcontroller, data from the sensor is displayed on the mobile app of the user. Mobile app

provides an access to the continuous data from sensors and accordingly helps farmer to take action to fulfil the requirements of the soil.

A. System Architecture:

Hardware Tools:

Node MCU: It is an open sources firmware and development kits to build IoT products. It includes firmware that run on ESP8266 WiFiSoC and hardware that has an ESP-12 module. The kit has analog (A0). It also has digital (D0-D8) pins on the board. It even assists serial ports communications such as SPI, UART, I2C etc. The figure gives the description about the different pins of the microcontroller NodeMCU. There are 17 GPIO pins that are for general purpose input output functions with transmitter and receiver pins. All the sensors are attached to different analog and digital pins of this microcontroller to acquire the data.

DHT Sensor: This sensor is basically a cost-efficient digital humidity & temperature sensor. This sensor supplies digital output and therefore can be directly connected to data pins of microcontroller in spite of using ADC. It also consists of 8-bit microcontroller to provide values of temperature & humidity in the form of data that is serial. It has 4 pins they are VCC, GND, DATA and NC. It operates from 3.3-5 volts power supply. This sensor has exceptional quality, anti-interference capability, economical performance and fast reaction benefits. Humidity is calculated by means of measuring the conductivity of liquid substrate that alters with exchange in humidity and temperature is calculated by the usage of a thermistor. The function called read() is used to take readings from the sensor which is included in library.

Soil Moisture: Sensor Moisture sensor has 3 pins – one is for voltage input, second for ground and third is for analog input. Moisture content of the soil (volume %) is measured by this sensor. The analog value needs to be mapped in the range of 0-100 as moisture content is evaluated in percentage. The property used by this sensor is electrical resistance of soil. There are 2 probes in this sensor that permits the current to pass through the soil. After that it gets the value of resistance to measure the water content level. This implies that higher the water content higher is the conduction of electricity which means lesser resistance. If the soil is dry then the conduction in the soil is poor, this leads to increase in level of resistance. Hence it uses the property of resistance to measure the moisture in soil. It could be joined in two different ways they are Analog and Digital mode.

Relay: It is a switching device. To mechanically control a switch many of the relays use electromagnet but some other fundamentals can also be used like relays that are solid state. When it is important to operate a circuit by a way of independent low power signal or if different circuits are managed by means of a single signal, then relays are used. So, relay acts as an automated switch that operates on circuit having high current using low current signal.

PH Sensor: The pH amplifier inside the handle is a circuit which allows the standard combination pH electrode to be monitored by a lab interface. The cable from the pH amplifier ends in a BTA plug. The pH Sensor will produce a voltage of approximately 1.75 volts in a pH 7 buffer. The voltage will increase by about 0.25 volts for every pH number decrease. The voltage will decrease by about 0.25 volts/pH number as the pH increases. The Vernier gel-filled pH Sensor is designed to make measurements in the pH range of 0 to 14. The gel-filled reference half-cell is sealed; it cannot be refilled.

Software Tools: Arduino Ide (Integrated Development Environment) Arduino IDE is an open-source programming which is basically used to write & compile code using a module that is Arduino. This is an official programming software which makes compiling of code simple so a typical man can understand the learning procedure. This software is readily available for all operating systems like MAC, windows, Linux. Arduino Mega, Arduino Uno, Arduino Leonardo and more are range of Arduino modules that are available. It basically has a text editor which is used for writing code, a text console, a message area, a toolbar with buttons for some of the common functions. Sketches are called as the programs that are written using this software. Coding on this software mostly uses functions of c/c++.

Blynk: It was designed for IoT. This app has capacity to remotely control hardware and also shows sensor information. This app also helps to visualize and store data. This platform contains 3 main elements: 1) Blynk app- With the help of various widgets amazing interfaces for the projects can be created.

2) Blynk Server- Establishes a communication network between smartphone and hardware.

3) Blynk Libraries- All incoming and outgoing commands are processed and also enables communication between server and process.

B. Workflow Diagram:

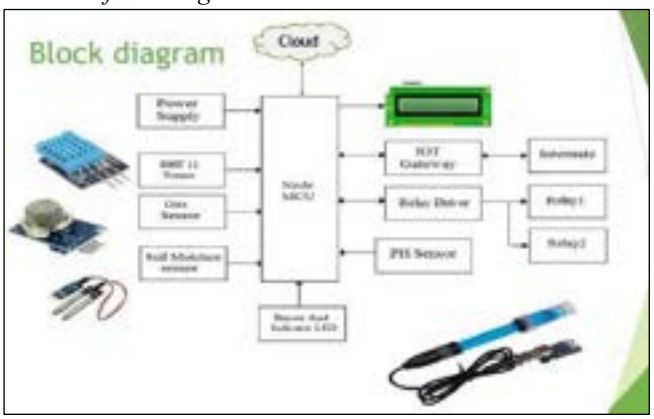

Fig 3.1: Block Diagram

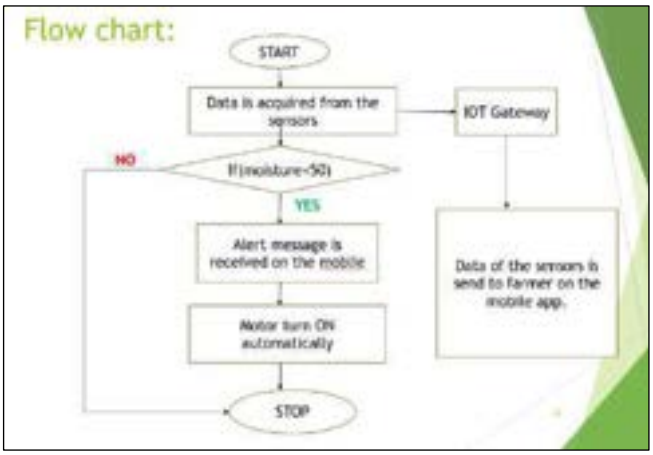

Fig 3.2: Flow Chart

IV. CONCULSION:

The setup contains Microcontroller that is NodeMCU then sensors they are soil moisture, DHT11, PH value and the last is Motor which is connected through relay. In this NodeMCU gives base for live streaming of temperature, humidity, soil moisture, Ph value and sending the sensor information to the server using ESP8266 WIFI module and also the data of these sensors are sent to the mobile app. The sensors are interfaced with the microcontroller (NodeMCU) and are given power supply. Values from the sensors is read by NodeMCU and this microcontroller posts the information to the cloud server. When the value of moisture of the soil reaches below a certain threshold value which results the relay to get ON that leads to switching ON of the motor automatically and whenever the moisture value reaches the threshold level relay automatically switches OFF the motor.

Fig 4: Project Interface

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Modern Agriculture Using IOT and Machine Learning

Sharvari Tamse, Ruchita Sutar, Abhijeet Waingankar, Sudipt Waykar

***Abstract* - Agriculture is the foundation of our economy. It also gives work to a large percentage of the population. Controlled water management, often known as irrigation, is one of the most essential elements that determine crop yield. Traditional irrigation technologies are inefficient and consequently cannot meet the needs and desires of farmers. Second, farmers are primarily concerned with the various forms of illnesses that attack their crops. IoT-based smart agriculture has piqued the interest of many researchers, who have combined Machine Learning (ML) and IoT technology to perform cutting-edge research. Data-driven farm management approaches based on the Internet of Things can assist enhance agricultural productivity. The IoT generates big amount data with different characteristics based on location and time. To improve productivity of agriculture through intelligent farm management, the data analyzing must be well analyzed and processed.**

Key Words: Agriculture, Irrigation, Machine Learning.

I. INTRODUCTION

Agriculture has been one of the most essential aspects of human civilization from the dawn of time. Irrigation methods that have been employed in the past, including as Inefficient overhead sprinklers chain pumps have been proven. Water is wasted as a result of these practices. a significant amount of money, and it can also help to stimulate the growth of Excessive moisture in the soil causes illnesses and fungal development. An automated irrigation system is necessary for water saving and, indirectly, farm viability. In India, agriculture is the most important source of income. Crop development in the agriculture industry has deteriorated over the last ten years. Because of the fall in crop yield, food costs have been steadily rising. There is need to implement modern science and technology in the agriculture for increasing the yield. By using IoT, we can expect the increase in production. IoT technologies can help to collect large amount of environmental and crop recital data.

II. LITERATURE SURVEY

Agriculture, which has long been a prominent occupation in India, has suffered a setback as a result of migration from rural to urban areas. Farmers should apply precision farming strategies to tackle this problem; one of the oldest methods in agriculture is the manual approach of verifying the parameters. The cloud computing devices can build a computing system from sensors to tools that observe data from aerial photographs and human actors on the ground and precisely feed it into repositories. This concept presents a wonderful approach for smart farming by wirelessly connecting a smart sensor system and a smart irrigation system. It provides a low-cost, high-efficiency wireless sensor network method for measuring soil moisture and temperature.

1.*Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk by Muhammad Ayaz (Senior Member, IEEE), Mohammad Ammad-uddin (Senior Member, IEEE), Zubair Sharif , Ali Mansour (Senior Member, IEEE), and el-Hadi M. Aggoune (Senior Member, IEEE).* This paper focus on smarter, better, and more efficient crop growing methodologies required in order to meet the growing food demand of the increasing world population in the face of the ever-shrinking arable land.

2.*Machine Learning Application in Field of Agriculture by Prof.M.D.Tambakhe, Dr.V.S.Gulhane, Prof.J.S.Karnewar*
The purpose of this paper is to broaden the farming horizon by listing and evaluating the different applications of machine learning in Indian agriculture and to help the farmers advance their work.

Sr No.	Title	Name of Journal/Conference	Significance
1	Brief study on IOT based applications	IJTSRD	In this paper, we will explore the diversity IoT application domain to understand the various approaches of IoT applications that have recently been proposed based on the systematic literature review (SLR) method.
2	WSN in Agriculture	ICACCS	Nowadays agriculture crops are affected due to many environmental changes. To overcome this WSN takes important role in the field of agriculture. In agriculture WSN used for monitoring, measuring temperature, so on.
3	Crop Yield Prediction	INCET	The paper uses advanced regression techniques and algorithms to predict the yield and uses the concept of Stacking Regression for enhancing the algorithms to give a better prediction.
4	Machine Learning Application in Field of Agriculture	IJRAT	The purpose of this paper is to broaden the farming horizon by listing and evaluating the different applications of machine learning in Indian agriculture and to help the farmers advance their work.

Table 2.1.

III. PROPOSED SYSTEM

The primary purpose of the project is to accumulate data of multiple nodes and to process this information. The application user can control fundamental services of accumulation of environmental, soil, fertilization, and irrigation data; automatically associate such data and filter – out illogical data from the prospect of appraising crop performance; and figure crop forecasts and personalized product suggestions for any selective farm using the application and reserve their data in the cloud for performance interpretation and suggestions. The sensor network is devised to acquire Soil Moisture, Temperature, Light, and Humidity. With the help of this, the scheme will determine the operations on the field. The nodes are installed on various parts on the field depending upon the parameters. Each of the node comprises of ESP32D and a sensor connected to it. Sensors may be temperature and humidity sensor or soil moisture sensors.

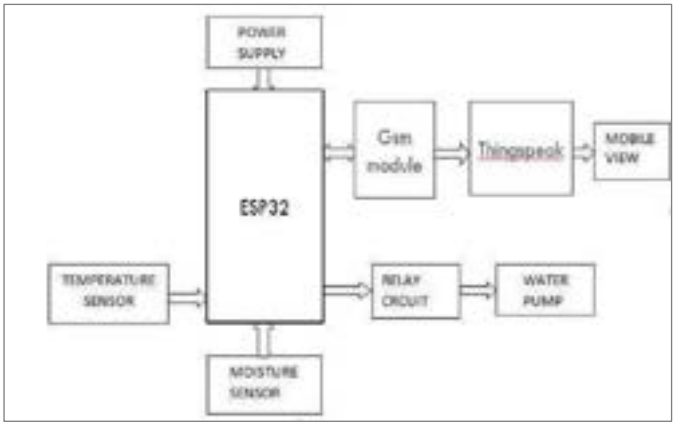

Fig 3.1. Block Diagram

The sensors are connected to ESP 32D. It gathers information from that node's sensors. There are a number of nodes strewn over the field. The farmer may make precise decisions using clustering technology, such as determining which parts of the field's soil moisture have decreased and where the irrigation system should be diverted. As well as when to turn on and off the motor pumps and other equipment in order to maintain the settings. The data from all of these nodes is collected and sent to the cloud. We also use the cloud service as a database storage system. The data delivered to the cloud is saved in a database in the cloud. The mobile application receives data from the cloud. Farmers can use the smartphone application to get information about their crops.

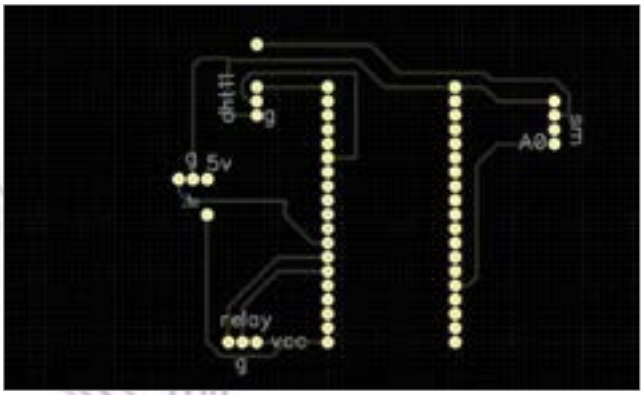

Fig 3.2: Schematic Diagram

IV. COMPONENTS

The key components used in this project are:

Fig 4.1. Soil Moisture Sensor

The sensor includes a potentiometer to set the desired moisture threshold. When the sensor measures more moisture than the set threshold, the digital output goes high and an LED indicates the output. When the moisture in the soil is less than the set threshold, the output remains low. The digital output can be connected to a micro controller to sense the moisture level.

Fig 4.2. Temperature and Humidity Sensor

DHT11 could also be the foremost commonly used temperature and humidity sensor. It's a basic, low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and thermistor, which is meant to carry airand supply a digital signal to the communications pin (no analog input pin). DHT11 is effortless to use. The sensor comes with live temperature as an 8-bit microcontroller foroutput temperature and humidity values as hardcore NTC and serial data.

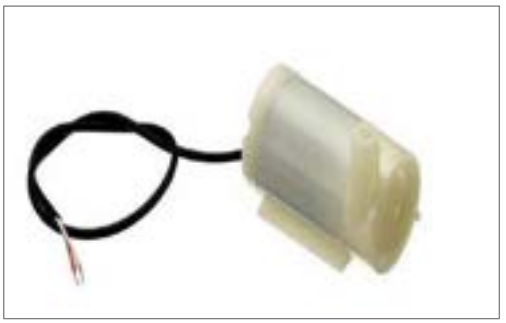

Fig 4.3. Water Level Pump

The DC 3-6 V Mini Micro Submersible Water Pump is a low cost, small size Submersible Pump Motor. It operates from a 9V power supply. It can take up to 2 liters per min with a very low current consumption of 220mA. Just connect the tube pipe to the motor outlet, submerge it in water, and power it The water pump is used to release water into the field. Thewater pump works in synchronization and on the commandof the Relay module.

Fig 4.4. Relay Module

A relay is an electrically operated switch. It consists of a set of input terminals for single or multiple control signals and a set of operating contact terminals. It is used to control a variety of external devices and for remote device switching. With it, you can remotely control devices over the Internet or any network.

ESP 32D Wroom

The ESP32-WROOM-32D are strong Wi-Fi+BT+BLE MCU modules that can handle a wide range of functions, from low-power sensor networks to the most demanding operations like voice encoding, music streaming, and MP3 decoding.

Power Supply

Ensure that the motors and other components have access to electricity. An USB port is required to power the ESP 32D. A lot of electricity is required to turn on the components. Most chargers and power banks can generate the least amount of power required.

V. RESULTS

We discussed the problems in the sub-topics of IOT, Machine Learning as well as ESP 32D in smart agriculture Understood the interfacing of ESP32D.The output of this whole system is mainly seen on the android application.
The outcomes of the system, which is an application, can be quite beneficial to farmers. The user has direct access to the cloud database, which contains all of the data collected and stored; however, the user can only access the data using his or her id and password. As a result, users will be able to save time, water, and fertilizer. The suggested cloud-based IoT system's capacity to efficiently gather, store, and process data for various agriculture applications.

VI. CONCLUSION

In this report we have tried to introduce the problem statement of our project and have put forward our proposed solution. The papers and online resources that we came across, motivated us to delve deeper into topics. We think that Smart irrigation technology is the way forward to fix these problems through the use of IoT-powered agricultural sensors that have multiple benefits. In future this technology may have high potential for marketing.

ACKNOWLEDGEMENT

We would like to express our gratitude to Prof. Tusharika Banerji, our project guide, for her assistance throughout the project for the valuable suggestions. Prof. Dr. Avinash Vaidya (H.O.D-Electronics and Telecommunication) provided us with a lot of motivation. I want to express my gratitude to our entire Electronics and Telecommunications Department for their support and guidance. Finally, I'd like to express my gratitude to our Principal, Dr. Sandeep Joshi.

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Puc Monitoring System Using Iot

Achut Patil, Divya Shelar, Mallika Kudalkar

***Abstract* — The rapid growth in infrastructure and industrial plants creating environmental issues like climate change, malfunctioning and pollution has greatly influenced for the need of an efficient, cheap, operationally adaptable and smart monitoring systems. In this context smart sensor networks are an emerging field of research which combines many challenges of computer science, wireless communication and electronics. In this paper a solution for monitoring the air pollution levels in industrial environment or particular area of interest using wireless embedded computing system is proposed. The solution includes the technology Internet of Things (IoT) which is outcome of merged field of computer science and electronics. Here the sensing devices are connected to the embedded computing system to monitor the fluctuation of parameters like Gases pollution levels from their normal levels. This model is adaptable and distributive for any infrastructural environment that needs continuous monitoring, controlling and behavior analysis. The working performance of the proposed model is evaluated using prototype implementation, consisting of ARM (LPC 2148), sensor devices and Embedded C support package. The implementation is tested parameters like gas density with respect to the normal behavior levels of environmental gases or given specifications which provide a control over the pollution monitoring to make the environment smart.**

I. Introduction

Nowadays, pollution is one of the major problems in the world. One of the major contributors to pollution is from vehicle emissions. Emissions that are released directly from the cars and trucks are the primary source of vehicular pollution. Motor vehicles also pollute the air during the processes of manufacturing, refueling, and from the emissions associated with oil refining. BS are emission standards by the Government of India to regulate the output of air pollutants from combustion engine equipment, motor vehicle. To control the pollution exhausted by vehicles, the amount of air pollution is needed to be calculated, and vehicle causing pollution must be identified. Internet of Things may become helpful in cities for monitoring air pollution from vehicles and the amount of pollution can be gathered and analyzed. This system is specially designed to operate the system using a sensor network and gather information about pollutant levels discharged by the vehicles. To control the emission from the vehicle the Government has implemented a PUC certification. PUC Certification is compulsory for all vehicles in Indian roads.It is to ensure that the vehicle is under the norms of pollution. The validity of the certificate is 6 months. After that, we must take a new certificate. This system proposes a framework for collecting real- time data from sensors using IoT.

II. Related work

A. Problem Definition

Pollution and especially air pollution has always been serious threat to the environment. One of the very important factors responsible for air pollution is the emission of gases from the vehicles such as CO which degrades the environment. A really important need here is to curtail the amount of harmful gases which are emitted from the vehicles. This can be done with the help of regular PUC checks of the vehicles but this method has proved to be a failure when undertaken by government authorities. Nowadays we see that the regular PUC checking system is not that accurate. Except at the petrol pumps, PUC checks at all other places are done at random basis. Sometimes PUC are issued merely on the basis of number of the vehicle without actual diagnostics of the vehicle. Besides this nowadays the tendency of keeping the vehicles maintained by regular services has disappeared. With the help of this system the random PUC checking, less awareness about PUC can be avoided and process could transparent means no one can interfere with the process in any way.

B. Research Methodology

1. In order to develop the vehicle emission monitoring system (VEMS) we are focusing on overcoming the environmental issue. That will help the user to know the reading of smoke emitted by the vehicle.
2. The VEMS contains CO sensor, Hydrogen sensor, NO sensor placed at the vehicle exhaust, monitor the hydrocarbon, monoxide and nitrogen oxide value emitted from the exhaust.
3. The analog value is received from the sensors is

processed by the controller with wifi connection to the internet. The value obtained from the sensors is continuously updated and seen on LCD display. When the value from the sensor reaches the threshold limit, the controller will alert to the user through alert message to the vehicle owner.

4. When the vehicle owner ignores two or three times, the alert message will be shared with the pollution control board.Vehicle Emission Monitoring System not only efficiently takes a advance in environmental quality, but it also helps vehicle owner to save a lot of unnecessary troubles compared to the traditional emission test. This system shows all the value of gases exhausted from the vehicle to the owner.

C. Block Diagram

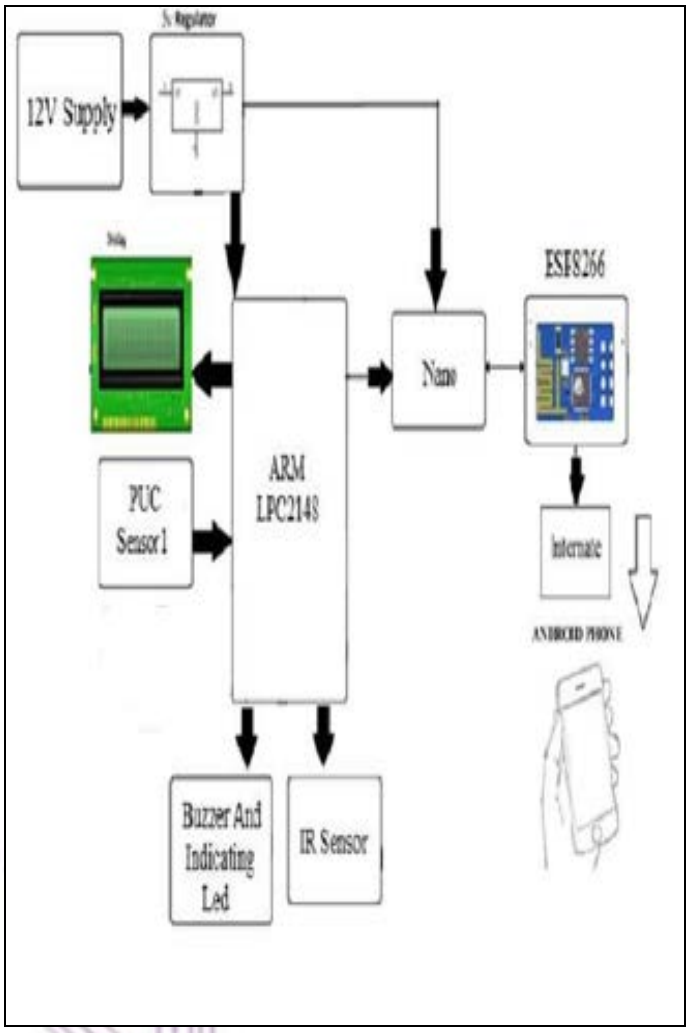

Fig 1. Block Diagram

D. Circuit Diagram

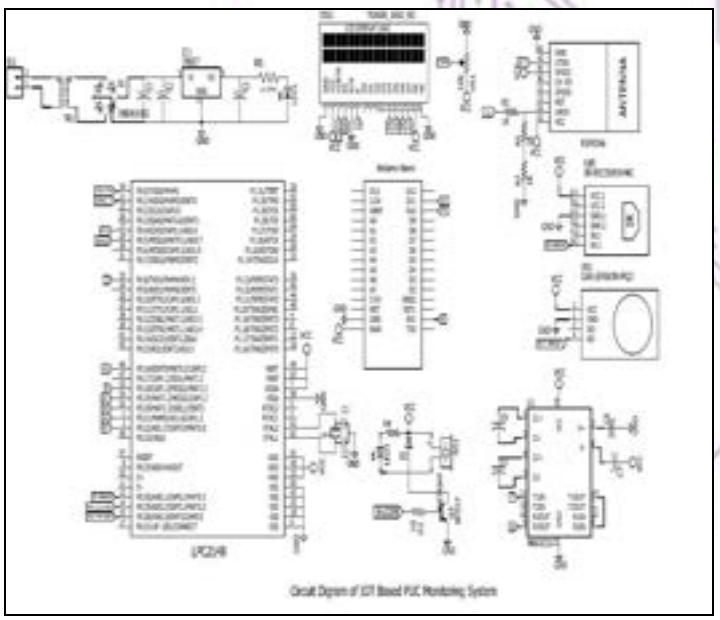

Fig 2. Circuit Diagram

E. Components

i) *ARM (LPC2148) :*

LPC2148 is a single-chip 16/32-bit RISC Microcontroller with 512KB on-chip Flash ROM with In-System Programming (ISP) and In-Application Programming (IAP) 32KB RAM having Interrupt Controller, Two 10bit ADCs with 14 channels, USB 2.0 Full Speed Device Controller, Two UARTs, one with full modem interface.

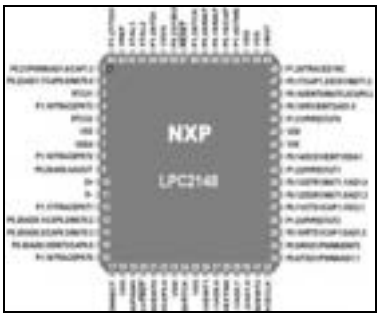

Fig 3. ARM (LPC2148)

ii*) ESP 8266 :*

The ESP8266 is a low-cost Wi-Fi microchip, with built-in TCP/IP networking software, and microcontroller capability, produced by Espressif Systems in Shanghai, China. The chip first came to the attention of Western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer Ai-Thinker.

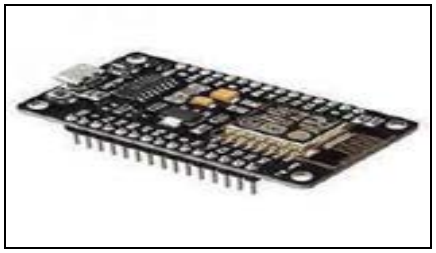

Fig 4. ESP 8266

iii*) IR Sensor* :

An infrared sensor (IR sensor) is a radiation-sensitive optoelectronic component with a spectral sensitivity in theinfrared wavelength range 780 nm-50 µm.

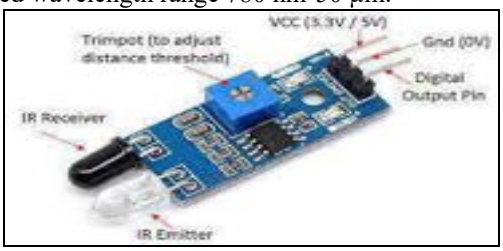

Fig 5. IR sensor

iv) *MQ3* :

MQ-3 gas sensor has high sensitity to Alcohol and CO also has good resistance to disturb of gasoline, smoke and vapor. This sensor provides an analog resistive output based on alcohol concentration. When the alcohol gas exist, the sensor's conductivity gets higher along with the gas concentration rising.

Fig 6. MQ3

v*) MAX 232N* :

The MAX232 is a dual transmitter / dual receiver that typically is used to convert the RX, TX, CTS, RTS signals. The drivers provide TIA-232 voltage level outputs (about ±7.5 volts) from a single 5-volt supply by on-chip charge pumps and external capacitors.

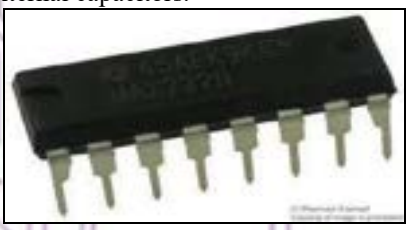

Fig 7. MAX 232N

vi*) L7805CV :*

This standard L7805CV linear regulator from ST Microelectronics will give you control over the voltage levels of your circuit. Its typical dropout voltage at current is 2@1A V. This voltage regulation device's single output can produce a current up to 1.5 A.

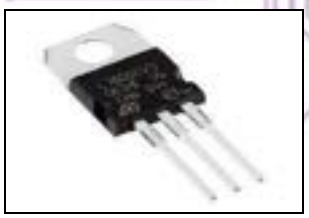

Fig 8. L7805CV

vii) *Arduino nano :*

Arduino Nano comes with a crystal oscillator of frequency 16 MHz. It is used to produce a clock of precise frequency using constant voltage. There is one limitation of using Arduino Nano i.e. it doesn't come with a DC power jack, which means you can not supply an external power source through a battery.

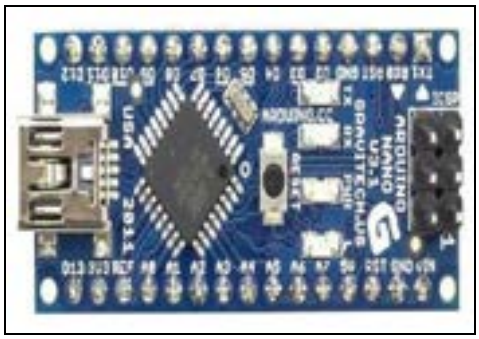

Fig 9. Arduino nano

F. Application :

PUC is a certification mark that is provided to vehicles that undergo the PUC Test successfully. The certification indicates that the vehicle's emissions are in alignment with standard pollution norms and are not harmful to the environment. All vehicles on Indian roads are mandated to carry a valid PUC certification.

The advantage of this method is its simplicity, efficiency. It can remove the noise. Identification and accountability of on road vehicles. Future application is that in software part, the online real time PUC can developed by using web technology, one alert SMS can be send to the customer, so that those people having PUC Expiry date is near and kindly checked or renew it as early as possible result is that it can checked PUC regularly.

The application of PUC detection system is to detect and regulate emission using communication technology like GSM. In vehicle, temp. ... Reading can show the online graph for CO2 and temperature of engine. Keywords— Air Pollution, CO2 Sensor, Exhaust emission.

III. CONCLUSION

This system is capable to measure the value of pollutant CO emitted by the vehicles continuously and sends report to RTO using GSM.

RTO will check the concentration of CO and accordingly allow the PUC certificate.

The performance of the system is also verified using IoT technology. The designed smart intelligent environmental system monitors the pollutants produced by the vehicles and also warn the vehicle owners to control the pollution.

The system also sends the pollutant level data to the server for future analysis. The air pollution agencies can able to analyzethe data and also detect the vehicle registration numbers that causes more pollution in the atmosphere.

The developed system is a low cost, simple to operate and is easily inserted in any locations. The developed system provides better accuracy with low cost than the existing system.

This project is capable to measure the value of pollutants emitted by the vehicle continuously and display it on 16x2 alphanumeric LCD display. Also if the pollutant level exceeds the prescribed value, then a SMS will be sent to the respective authority to take necessary disciplinary action.

ACKNOWLEDGMENT

The completion of this project would not have been possible without the support of various individuals whose presence and involvement in this project provided it the right amount of impetus that is required to become a success.Firstly, we would like to thank our Principal, Dr.Sandeep Joshi whose leadership has motivated us to develop a project of this scale and utility. We would like to extend our gratitude towards the Head of Department for EXTC, Dr.Avinash Vaidya who has always guided us to succeed in various domains throughout our academic journey.

This project would not have been realized in its current state if it weren't for our project guide Dr. R. H. Khade & co-guide Prof. Manisha Singh who always provided us with valuable inputs. His calm demeanor accompanied by a vast experience of the domain instilled a sense of self-belief in us which helped us largely while working on this project. We would also like to thank our friends, family, classmates, and all the individuals around us whose mere presence and support helped us reach where we are in life today. This project has been an amazing journey with its own set of life lessons achieved amongst the four of us group members. We hope to implement similar teamwork and professional skills for the rest of our lives.

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Smart Baby Cradle System Using IOT

Ajay Nair, Siddhesh Patil, Adwait Pawar, Shreyash Mhatre, Prof. Jayshree, Prof. Ishmeet Singh Riar

***Abstract*-The current number of working parents have greatly increased. Subsequently, baby care has become a daily challenge for many families. Thus, most parents send their babies to their grandparents' house or to baby care houses. However, the parents cannot continuously monitor their babies' conditions. Availability of high-speed internet and wide use of mobile phones leads to the popularity of IoT. The proposed system exploits sensors to monitor the baby's vital parameters, such as ambient temperature, moisture, and crying. The system architecture consists of a baby cradle that will automatically swing using a motor when the baby cries. Also, it activates the buzzer and gives alerts on phone if-first, baby cry continues till specific time which means now the cradle cannot handle the baby and it needs personal attention and second, when the rain sensor on the mattress detects wetness. This cradle has an automatic rotating toy for baby's entertainment which will reduce the baby cry possibility. Parents can also monitor their babies' condition through an external web camera and play a lullaby on a device located on the baby cradle.**

***Keywords*- Cry Recognition, Temperature sensor Microcontroller, Rain sensor, Buzzer alarm**

I. INTRODUCTION

The Modern world has given an opportunity to both men and women to go after their dreams and career. Needless to say, the female participation in the workforce has increased over the years. Due to the parents always at their jobs many infants / kids lack parental care.

And when the parents come home, they need rest; they can't look after their baby properly. At night, when the parents have to get up from their sleep and attend to the baby's needs. They can't look after their baby if they are tired and fully energy drained from all their job or work. Many parents, what they do is, keep a babysitter at their home to look after their baby in their absence. Some parents drop their infants or their babies at a day-care and carry off to their work. And when they come home, they cannot really fully concentrate on their baby if their baby is crying all the time. Some parents keep a full-time sitter while some can't afford that.

To overcome this problem, we introduced a simple solution. They need a system which will alert them only when it's absolutely necessary to attend to the needs of the baby. Also, a system which can take care of the baby and monitor all the basic conditions of the baby and the room. With the help of various IOT devices and programming we developed a Smart Baby Cradle System. This system will reduce the all-time attention to a baby. This system will only act as a helping hand to the parents since a parental care is a must when it comes to babies.

With this system installed into the baby cradle a parent can have some alone time after their hectic day. He/she can solely focus on running some errands or relax without the fear of leaving the baby alone. They can even go to the nearby store if needed while monitoring the live feed of their baby.

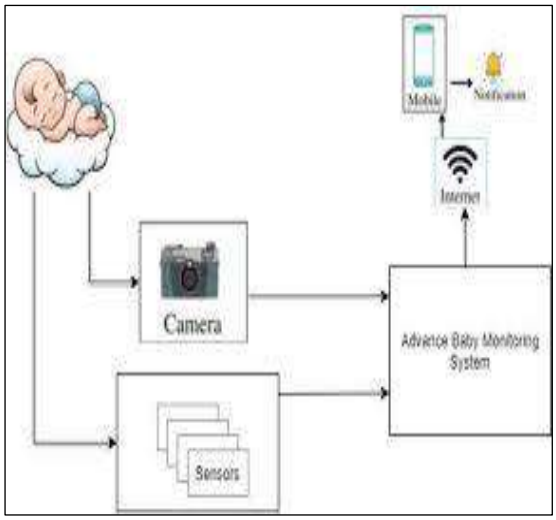

Figure 1: Workflow

II. OVERVIEW

A. Review Stage

The Raspberry Pi unit was interfaced with temperature sensor DHT11 and sound sensor which were connected to the Buzzer alarm. The sound sensor is used to pick up the baby's cry. The normal temperature of the room was analyzed by the temperature sensor.

B. Final Stage

The temperature sensor and the sound sensor which were previously interfaced successfully with the Raspberry Pi unit was interfaced with the rest of the sensors used. The PIR sensor was adjusted accordingly so that the motion of the baby is detected. The servo motor was placed so as to rock the cradle gently manually. The data from the sound sensor was also taken into consideration for the swinging mechanism as the servo motor will also be activated when sound sensor picks up the sound of the baby's cry. The Raspberry Pi camera is interfaced with the Raspberry Pi unit to monitor the baby at all time.

1. Proposed system consists of

   a) Transmitter section
   b) Receiver section

2. Transmitter section consists of

   a) Temperature sensor
   b) Rain sensor
   c) Sound sensor
   d) Video surveillance camera
   e) Power supply
   f) PIR sensor
   g) Servo motor

In addition to these sensors, if required, we can also add other sensors like heartbeat sensor can also be installed with only slight variations in the codes and structure of the system.

3. Receiver section consists of

   a) Raspberry Pi 3
   b) LCD Display
   c) Buzzer

All the data from the installed sensors will be computed with the help of the Raspberry Pi 3 unit and it will instruct the output devices such as the buzzer, LCD display, to perform the task. A servo motor ensures the swinging mechanism of the entire cradle system.

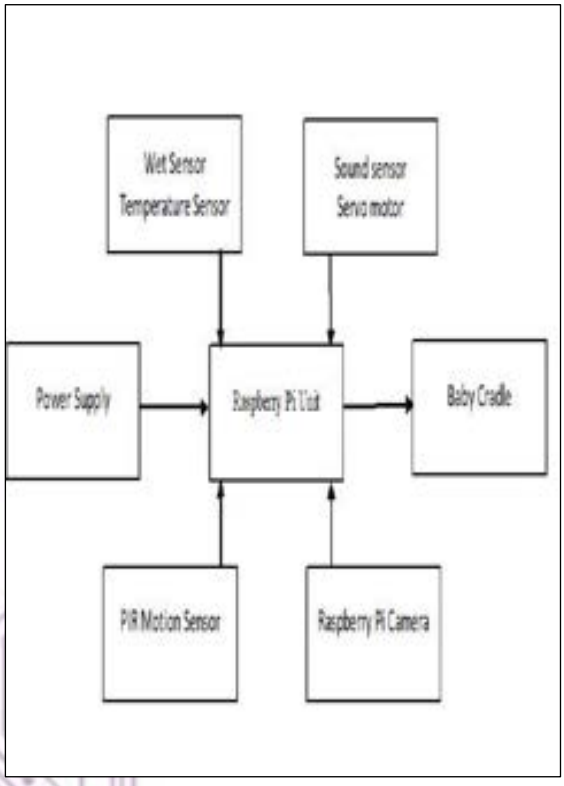

Figure 2: Block Diagram

III. HARDWARE AND SOFTWARE COMPONENTS

A. Microcontroller:

The main unit of the system is the Raspberry Pi unit. It is a Quad Core 1.2GHz Broadcom BCM2837 64bit CPU with 1GB RAM in it. It has BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board with 100 Base Ethernet and 40-pin extended GPIO. Python programming is used to implement all the software along with their hardware.

B. Software and Language:

The Proteus software is used to virtually test all the components before finalizing their purchases and Python is used for the programming purpose. This software is very user friendly and can be uploaded with the code into microcontroller and can also be used to compile and correct the errors.

C. Hardware Implementation:

The sound sensor is installed at the very top of the cradle so that it can primarily focus only on the baby's cry. The sound sensor is tuned into a certain frequency which almost matches the frequency of the baby's cry with the help of the inbuilt potentiometer which can be achieved after a few test runs. A temperature sensor continuously checks the room temperature. The PIR sensor is placed on the verge of the baby's cradle. This is a Passive Infrared sensor which can be useful in detecting the motion of the baby. If the baby is about to climb on top of the cradle, then there is a high chance that the baby will fall off from the cradle. And that is when the PIR sensor detects the motion of the baby and records the data.

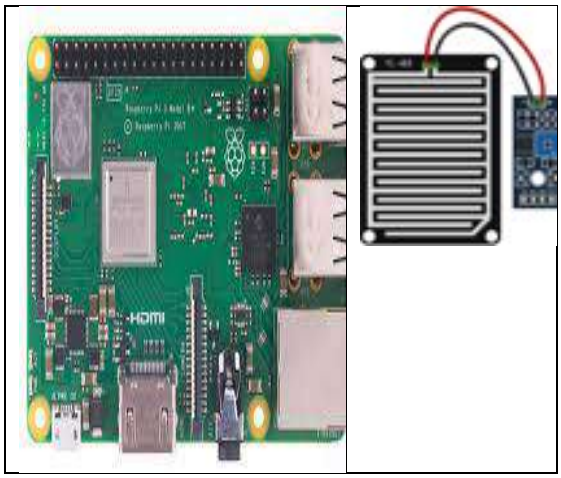

Figure 3: Raspberry Pi and Rain sensor

A servo motor is mounted on the bottom of the cradle with its arm extended to be in contact with

the cradle. The motion or the rocking mechanism of the cradle and the speed are set according to the user's needs. A rain sensor or wet sensor is kept under the bed of the baby cradle. This can be used to detect the wetness of the bed caused by the baby's urine or if there is any kind of spillage inside the cradle at all. The baby is constantly monitored with the help of the Raspberry Pi camera installed at an angle facing the baby. The Raspberry Pi system easily supports the Pi camera. The Raspberry Pi camera provides a still picture resolution and is easy to use.

Fig.4: PIR sensor and Servomotor

IV. METHODOLOGY

After implementing and interfacing all the hardware to their respective software, the Raspberry Pi unit is provided with an uninterrupted power supply. All the sensors and devices connected to the Raspberry Pi unit will be activated and would perform their tasks simultaneously. The Raspberry Pi camera ensures the constant monitoring of the baby. This live feed can be recorded and displayed at a later time as per the user's convenience. When the baby starts crying, its cry is picked up by the sound sensor and this will activate the buzzer which will alert the parents. The rain or the wet sensor will be activated when the bed of the cradle is wet due to the presence of any kind of spilled liquid or urine. This will in turn alert the parents to change the bed and the baby's diaper. The PIR sensor which is located on the railing of the cradle will activate the buzzer thereby alerting the parents that the baby is at risk of falling off from the cradle. This sensor will ensure the safety of the baby. The sound sensor is also interfaced with the servo motor which is located at the foot of the cradle. If the baby starts crying, the sound sensor will be activated and along with the buzzer it will also activate the servo motor which will then make the whole cradle swing or rock gently. The servo motor can also be activated manually. The room temperature is continuously analyzed by the DHT11 temperature sensor. If the room temperature exceeds or decreases from a preset temperature, an alert will be sent to the parents.

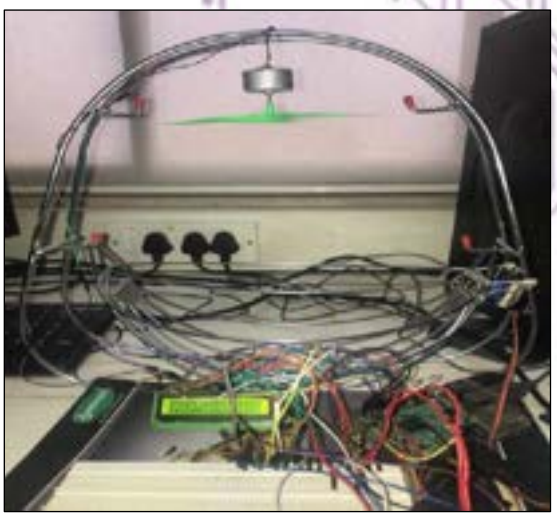

Fig.5: Working model

V. CONCLUSION

Smart Baby Cradle system opens up a big opportunity for parents to keep an eye on their infant/toddler while taking a break from their daily chores/jobs. In this work we have presented a simple procedure using the help of various IOT devices that comprises the system. We monitor the baby all the time using the Raspberry Pi camera. The baby's cry is sensed by the sound sensor which then will alert the parents. The wet sensor will send a signal to the buzzer which will alert the parents that the baby's bed is wet. The PIR sensor will sense the motion of the baby. When the baby cries, the sound of the cry will be picked up by the sound sensor which then will instruct the servo motor which is attached to the side of the cradle, in which the baby resides, to start the swinging mechanism. The swinging mechanism can be easily controlled by changing the primary code. The swing can be sped up or slowed down according to the user's needs.

VI. FUTURE SCOPE

In future we can add more features to make it more efficient and user-friendly. By using machine learning it is possible to detect only a baby's specific voice and do the possible measures to stop it from crying and entertaining them. With the development of technology daily routine has been eased for the parents along with the care of the baby. We can also make the entire cradle system voice-activated so that the parents can easily access their kids' health even from a very large system. Just like Home automation we can also automate the whole baby's cradle and the whole cradle can work on its own. With the arrival of 5G it will make it a lot easier for the parents to look after their infants and control various new sensors and devices which can be attached to

the cradle easily. The entire system can also be communicated through the GSM technology to communicate with the parents. If the baby needs special care, for example if the baby has a natural heart condition, then a heart monitoring sensor can be fitted to the baby's cradle with just a few adjustments to the primary source code. Thus, by slightly adjusting the source code many such sensors can be easily mounted into the baby cradle according to the status or condition of the baby or the parent's needs.

ACKNOWLEGDEMENT

We would like to express our gratefulness to our guide and co-guide. We would like to thank all the teaching experts for giving their opinion on our project and sharing their knowledge. We like to thank the facilities of Pillai College of Engineering to provide us with the required equipment used in our project. We would like to thank our guide and co-guide for their contribution to our project and their involvement throughout the entire duration of the project. Their constant motivation, encouragement and time management deeply affected the productivity of our project and gave a proper and constant boost to our project.

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SMART SECURITY CAMERA

Varun Bhoir, Rutik Dhumal, Sagar Bhiwade and Yash Sawant

***Abstract*—Over the last few years due to globalisation a major change has been occurred in different sectors worldwide such as business, security, health, etc. One of their key sectors which are now concern worldwide is security and privacy. Due to the emergence of protecting premises, providing security is one of the most important tasks. Thus, to provide security, the video surveillance system was introduced. A video surveillance system is used for the monitoring of the behaviour, activity or other information generally of people in a specific area. The application of video surveillance is now not only limited to provide security for area but expanded to the various sectors. Nowadays the need for a safe and secure system is desired by each and every individual in the society. The most commonly used system, Closed Circuit TeleVision (CCTV) is being implemented everywhere such as in hospitals, warehouses, parking lots, buildings etc... However this very system though effective has its downside when it comes to cost. Thus the need for a cost effective system is required. In this project we propose to use a security camera with the night vision capabilities using raspberry pi and openCV. This is a cost effective method that uses a credit card sized chip RPI. The image is captured and each frame is processed. The image is stored and an email is sent if human is detected. This system has accuracy of about 83 %. Also we use a pi camera. So the image is captured via the pi camera and it is send to the raspberry pi for processing for face and human detection with the help of openCV.**

***Index Terms*—Face Detection, Machine Learning, Video Intelligence system, video surveillance**

I. INTRODUCTION

Smart camera is a term given to those cameras that have the ability not only to take pictures, but also, maybe more importantly, to make sense of what is happening in the picture and, in some cases, maybe take some actions on behalf of the camera user. For example, a camera that can monitor a door entry and trigger an alarm or send an email to a user when an entry is attempted outside of opening hours would qualify to be a "smart camera" because it can figure out what is happening and take actions (triggering an alarm or sending an email). While this may be a good description of what a smart camera is, it is not a technical definition for smart cameras. While there are many "definitions" of smart cameras in the public space, offered by media, camera manufacturers, developers etc, there does not seem to be a well-established or agreed-upon definition for smart cameras. Many definitions emphasize the fact that smart cameras have in-built image processing ability. We believe these are not sound technical definitions, because virtually all digital cameras, consumer or industrial, have in-built image processing capability. For us, what separates a smart camera and a non-smart camera, is the nature of the tasks performed by the in-built image processor, and the primary outcome or output generated by a smart camera. For the purpose of this book, we define "smart camera", or "intelligent camera", as an embedded vision system that is capable of extracting application-specific information from the captured images and generating event descriptions or decisions that are used in an intelligent and automated system.

II. PROPOSED SYSTEM

A. Objective/scope

The objective of this project is to develop a system that monitors the area in which it is being implemented. An Intelligent surveillance system is applicable in the area where no one is permissible to enter, also where we need to detect if any motion has been done. For this a digital camera is used. By combining the OpenCV software and camera we can use this system to detect the motion. The Camera is used to catch the live images of the area in which it is being implemented, if any object is moving. It is use to increase intelligence in video surveillance and detect all the irregular movements within the area.

B. Problem statement

It is necessary to make use of automatic video analysis technologies for developing smart surveillance system which can aid the human operator in both detecting and reacting to potential threats.The internet and wireless broadband infrastructure is becoming robust enough to permit excellent remote video surveillance. With advances in hardware and software technology, and the emergence of ubiquitous internet infrastructure and wireless networks with broadband capability, it is now possible to design and build a networked video surveillance system that can do an excellent job of remote video supervision from anywhere and at any time. The requirements of a video surveillance system differ in important ways from CCTV, NVR's and DVR's. Smart Video Surveillance System(SVSS) provides video based object analysis capabilities. The developed SVSS provides a wide range of features in order to solve the following problems in surveillance areas: • Detecting objects. • Face detection. • Sending prompt messages in case of intruder. • Internet Of Things (IOT) • AI Assistant.

C. Hardware Components

a) Raspberry pi

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries.[5][6][7] The original model became far more popular than anticipated,[8] selling outside its target market for uses such as robotics. It does not include peripherals (such as keyboards, mice and cases). However, some accessories have been included in several official and unofficial bundles.[8] Several generations of Raspberry Pis have been released. All

models feature a Broadcom system on a chip (SoC) with an integrated ARM compatible central processing unit (CPU) and on-chip graphics processing unit (GPU). Processor speed ranges from 700 MHz to 1.4 GHz for the Pi 3 Model B+; on-board memory ranges from 256 MB to 1 GB RAM. Secure Digital (SD) cards are used to store the operating system and program memory in either SDHC or MicroSDHC sizes. The boards have one to four USB ports. For video output, HDMI and composite video are supported, with a standard 3.5 mm phono jack for audio output. Lower-level output is provided by a number of GPIO pins which support common protocols like IC. The B-models have an 8P8C Ethernet port and the Pi 3 and Pi Zero W have on-board Wi-Fi 802.11n and Bluetooth. Prices range from US$5 to $35. The first generation (Raspberry Pi 1 Model B) was released in February 2012, followed by the simpler and cheaper Model A. In 2014, the Foundation released a board with an improved design, Raspberry Pi 1 Model B+. These boards are approximately credit-card sized and represent the standard mainline form-factor. Improved A+ and B+ models were released a year later. A ”Compute Module” was released in April 2014 for embedded applications. The Raspberry Pi 2 which added more RAM was released in February 2015. A Raspberry Pi Zero with smaller size and reduced input/output (I/O) and general-purpose input/output (GPIO) capabilities was released in November 2015 for US$5. By 2017, it became the newest mainline Raspberry Pi. On 28 February 2017, the Raspberry Pi Zero W was launched, a version of the Zero with Wi-Fi and Bluetooth capabilities, for US$10.[15][16] On 12 January 2018, the Raspberry Pi Zero WH was launched, the same version of the Zero W with pre-soldered GPIO headers.[17] Raspberry Pi 3 Model B was released in February 2016 with a 64 bit quad core processor, and has on-board WiFi, Bluetooth and USB boot capabilities.[18] On Pi Day 2018 model 3B+ appeared with a faster 1.4 GHz processor and a 3 times faster network based on gigabit ethernet (300 Mbit / s) or 2.4 / 5 GHz dual-band Wi-Fi (100 Mbit / s).[1] Other options are: Power over Ethernet (PoE), USB boot and network boot (an SD card is no longer required). This allows the use of the Pi in hard-to-reach places (possibly without electricity). The organisation behind the Raspberry Pi consists of two arms. The first two models were developed by the Raspberry Pi Foundation. After the Pi Model B was released, the Foundation set up Raspberry Pi Trading, with Eben Upton as CEO, to develop the third model, the B+. Raspberry Pi Trading is responsible for developing the technology while the Foundation is an educational charity to promote the teaching of basic computer science in schools and in developing countries. The Foundation provides Raspbian, a Debian-based Linux distribution for download, as well as third-party Ubuntu, Windows 10 IoT Core, RISC OS, and specialised media centre distributions.[19] It promotes Python and Scratch as the main programming language, with support for many other languages.[20] The default firmware is closed source, while an unofficial open source is available

Fig 2.1. Raspberry pi 3B Module

b) Pi camera module

The Raspberry Pi Camera v2 is the new official camera board released by the Raspberry Pi Foundation. The Raspberry Pi Camera Module v2 is a high quality 8 megapixel Sony IMX219 image sensor custom designed add-on board for Raspberry Pi, featuring a fixed focus lens. The Raspberry Pi Zero now comes complete with a camera port! Using the new Raspberry Pi Zero Camera Adapter, you can now use a Raspberry Pi camera to your Zero It’s capable of 3280 x 2464 pixel static images, and also supports 1080p30, 720p60 and640x480p90 video. It attaches to Pi by way of one of the small sockets on the board upper surface and uses the dedicated CSi interface, designed especially for interfacing to cameras.

Features:

• Fixed focus lens on-board
• 8 megapixel native resolution sensor-capable of 3280 x 2464 pixel static images
• Supports 1080p30, 720p60 and 640x480p90 video • Size 25mm x 23mm x 9mm
• Connects to the Raspberry Pi board via a short ribbon cable (supplied)
• Weight just over 3g
• Camera v2 is supported in the latest version of Raspbian, Raspberry Pi’s preferred operating system.

Fig 2.2. PI Camera Module

c) NEMA 17 stepper Motor

NEMA 17 is a hybrid stepping motor with a 1.8° step angle (200 steps/revolution). Each phase draws 1.2 A at 4 V, allowing for a holding torque of 3.2 kg-cm. NEMA 17 Stepper motor is generally used in Printers, CNC machines and Laser Cutters.

NEMA 17 Stepper Motor Technical Specifications :
Rated Voltage: 12V DC
Current: 1.2A at 4V
Step Angle: 1.8 deg.
No. of Phases: 4
Motor Length: 1.54 inches
4-wire, 8 inch lead
200 steps per revolution, 1.8 degrees
Operating Temperature: -10 to 40 °C
Unipolar Holding Torque: 22.2 oz-in

Fig 2.3 NEMA 17 Stepper Motor Technical

NEMA17 Stepper Motor is commonly used in CNC machines, Hard Drives and Linear Actuators. The motor have 6 lead wires and rated voltage is 12 volt. It can be operated at lower voltage but torque will drop. These motors has a step angle of 1.8 deg., this means that it has 200 steps per revolution for every step it will cover a 1.8° hence the level of control is also high. These motors run on 12V and hence can provide high torque. So if you are looking for a compact easy to use stepper motor with high torque then this motor is the right choice for you.

d) A4988 Stepper Driver Module

The A4988 driver Stepper Motor Driver is a complete micro-stepping motor driver with built-in converter, easy to operate. It operates from 8 V to 35 V and can deliver up to approximately 1 A per phase without a heat sink or forced air flow (it is rated for 2 A per coil with sufficient additional cooling).

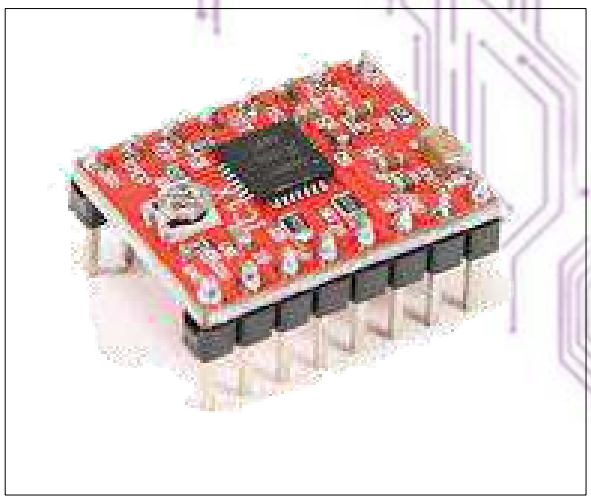

Fig 2.4 A4988 Stepper Driver Module

A4988 driver Stepper Motor Driver includes a fixed off-time current regulator, the regulator can be in slow or mixed decay mode. The converter is the key to the easy implementation of the A4988.
There are no phase sequence tables, the high-frequency control interface programming etc. The application of A4988 interface is very suitable for a complex microprocessor is not available or overload. In the stepping operation, the chopping control in the A4988 automatically selects the current decay mode (slow or mixed). The mix decay current control scheme can reduce the audible motor noise, increased step accuracy, and reduced power consumption.
Provide internal synchronous rectification control circuitry, in order to improve the pulse width modulation (PWM) power consumption during operation.

D. Software Components

a) OpenCV

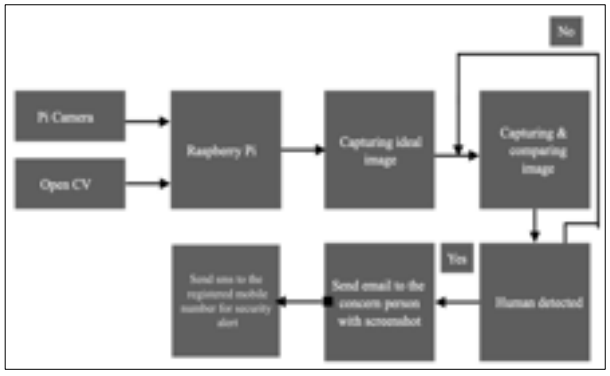

Fig 2.5. open cv

OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications

and to accelerate the use of machine perception in commercial products.
Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc. OpenCV has more than 47 thousand people of user community and estimated number of downloads exceeding 14 million. The library is used extensively in companies, research groups and by governmental bodies. Along with well-established companies like Google, Yahoo, Microsoft, Intel, IBM, Sony, Honda, Toyota that employ the library, there are many startups such as Applied Minds, VideoSurf, and Zeitera, that make extensive use of OpenCV. OpenCVs deployed uses span the range from stitching street-view images together, detecting intrusions in surveillance video in Israel, monitoring mine equipment in China, helping robots navigate and pick up objects at Willow Garage, detection of swimming pool drowning accidents in Europe, running interactive art in Spain and New York, checking runways for debris in Turkey, inspecting labels on products in factories around the world on to rapid face detection in Japan. It has C++, Python, Java and MATLAB interfaces and supports Windows, Linux, Android and Mac OS. OpenCV leans mostly towards real-time vision applications and takes advantage of MMX and SSE instructions when available. A full-featured CUDA and OpenCL interfaces are being actively developed right now. There are over 500 algorithms and about 10 times as many functions that compose or support those algorithms. OpenCV is written natively in C++ and has a templated interface that works seamlessly with STL containers.

b) Ngrok
Ngrok provides a real-time web UI where you can introspect all of the HTTP traffic running over your tunnels. After you've started ngrok, just open http://localhost:4040 in a web browser to inspect request details. Try making a request to your public URL. After you have, look back at the inspection UI.

c) Twilio
Twilio's SMS API helps you send and manage messages programmatically: To send an outbound SMS, WhatsApp, or Channels message with the API, POST to the Message resource. You'll also use the Message resource to fetch messages and list messages associated with your account.

E. System Requirements

1. Functional Requirements:
Functional Requirement defines a function of a software system and how the system must behave when presented with specific inputs or conditions. These may include calculations, data manipulation and processing and other specific functionality. In this system following are the functional requirements:-
• Acquiring object images
• Acquiring face images
• Processing face images
• Face detection
• Automation

2. Non-functional Requirements:
Non-functional requirements are the requirements which are not directly concerned with the specific function delivered by the system. They specify the criteria that can be used to judge the operation of a system rather than specific behaviours. They may relate to emergent system properties such as reliability, response time and store occupancy. Non-functional requirements arise through the user needs, because of budget constraints, organizational policies, the need for interoperability with other software and hardware systems or because of external factors such as:-
• Product Requirements
• Organizational Requirements
• User Requirements
• Basic Operational Requirements
In systems engineering and requirements engineering, a non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviours. This should be contrasted with functional requirements that define specific behaviour or functions. The plan for implementing non-functional requirements is detailed in the system architecture. Broadly, functional requirements define what a system is supposed to do and non- functional requirements define how a system is supposed to be. Functional requirements are usually in the form of system shall do requirement, an individual action of part of the system, perhaps explicitly in the sense of a mathematical function, a black box description input, output, process and control functional model or IPO Model. In contrast, nonfunctional requirements are in the form of system shall be requirement, an overall property of the system as a whole or of a particular aspect and not a specific function. The system's overall properties commonly mark the difference between whether the development project has succeeded or failed. Non-functional requirements of our project include:
• Security
• Maintainability - As a tool to obtain the ease of maintainability UML will be used in the development process.
• Portability - To ensure portability, the system will be developed in PYTHON language.

G. Flowchart/Activity Diagram

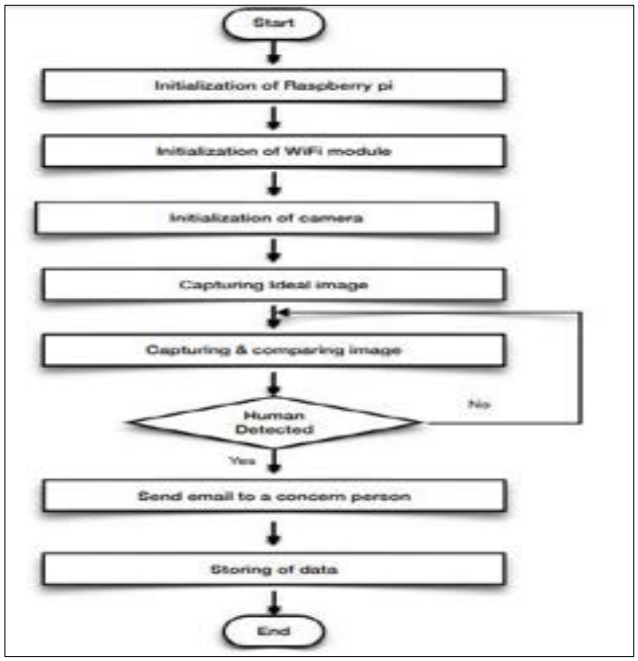

Fig 2.6 flowchart

H . Use Case Diagram

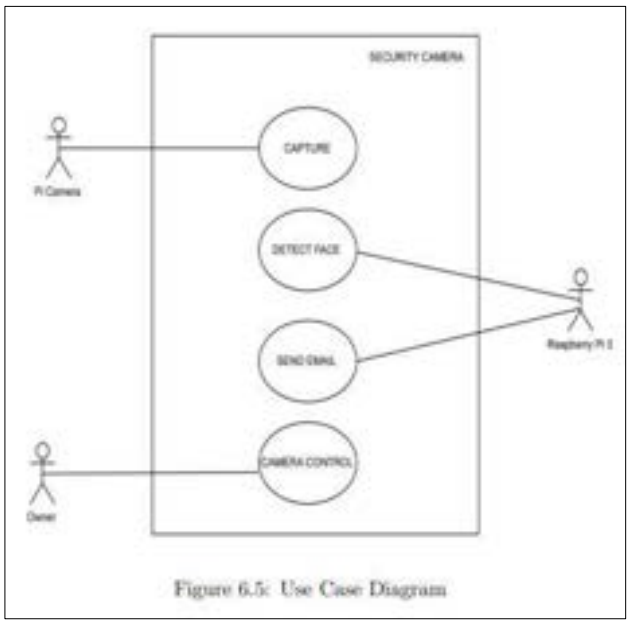

Fig 2.7 use case diagram

I. Implementation

The implementation phase of the project is where the detailed design is actually transformed into working code. Aim of the phase is to translate the design into a best possible solution in a suitable programming language. This chapter covers the implementation aspects of the project, giving details of the programming language and development environment used. It also gives an overview of the core modules of the project with their step by step flow.

J. Working Principle

The input is the pi camera, which is used to capture the image and the captured image is sent to the processor which checks for the faces. If any faces are detected then it is further processed to check if the face is familiar or not. Finally the output is produced.The overall working of the camera can be explained with the help of a flowchart. The image is captured by the picamera which has 5MP pixel resolution with 30 FPS, this image is then sent to the face detection module, which checks the frame obtained for any faces that can be found with the help of the Haar like features, if the face is detected then it is cropped out. Once the face is compared with the well trained database, it is checked if the face is recognized. If the image matches with the database, then the person is a visitor and a message is sent to the user via email indicating that someone who is known has come home. However, if the face doesn't match with the database, then the person is identified as a stranger, and email is sent alerting the user, and an audio output is produced to warn and alarm the intruder.

We are providing a secure system, whose in ut I,0captured from the pi camera is sent to processor for face detection. The algorithm used for face detection is Haar like feature cascade classifier. Haar-like features are digital image features used in object recognition. They owe their name to their intuitive similarity with Haar wavelets and were used in the first real-time face detector.[2] Viola and Jones adapted the idea of using Haar wavelets and developed the so-called Haar-like features. A Haar-like feature considers adjacent rectangular regions at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference between these sums. This difference is then used to categorize sub-sections of an image. Therefore a common haar feature for face detection is a set of two adjacent rectangles that lie above the eye and the cheek region. The position of these rectangles is defined relative to a detection window that acts like a bounding box to the target face. The captured image is first converted into the numpy which is a multidimensional array supported by the openCV. Now this image is converted to gray scale, with the help of the loaded haar cascade file from the openCV documentation, the feature is compared with the image, if any face is found based upon the haar like feature, [3]a rectangle box is drawn to indicate that a face is detected.

Hardware Architecture

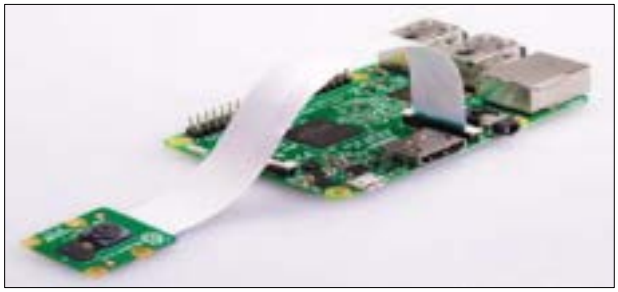

Fig 2.8 hardware architecture

In the figure , Raspberry Pi is connected to the PI Camera with the help of port .In the PC ,Raspbian operating system is installed. Raspberry-pi works only on Raspbian operating system ,Linux., Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi.

Putty configuration and VNC viewer are needed to install Raspbian OS . Putty configuration is SSH and Telnet client .It is a open source software that is available with source code. Virtual network computing is a Graphical desktop sharing system that allows us to remotely control the desktop interface of one computer from another. The Raspberry Pi primarily uses Linux kernel-based operating systems (it is not possible to run Windows on the Raspberry Pi). The ARM11 is based on version 6 of the ARM on which several popular versions of Linux no longer run (in current releases), including Ubuntu. The install manager for Raspberry Pi is NOOBS. The OSs included with NOOBS are: Arch linux ARM Open ELEC Pidora (Fedora Remix) Raspbmc and the XBMC open source digital media center RISC OS The operating system of the first ARM-based computer Raspbian (recommended) Maintained independently of the Foundation; based on the ARM hard-float(armhf) Debian 7 'Wheezy' architecture port originally designed for ARMv7 and later processors (with Jazelle RCT/ThumbEE, VFPv3, and NEON SIMD extensions), compiled for the more limited ARMv6 instruction set of the Raspberry Pi. A minimum size of 2 GB SD card is required, but a 8 GB SD card or above is recommended. There is a Pi Store for exchanging programs. The Raspbian Server Edition is a stripped version with other software packages bundled as compared to the usual desktop computer oriented Raspbian. Ÿ The Wayland display server protocol enable the efficient use of the GPU for hardware accelerated GUI drawing functions Raspbian for Robots - A fork of Raspbian for robotics projects with LEGO, Grove, and Arduino.

K. Circuit Diagram

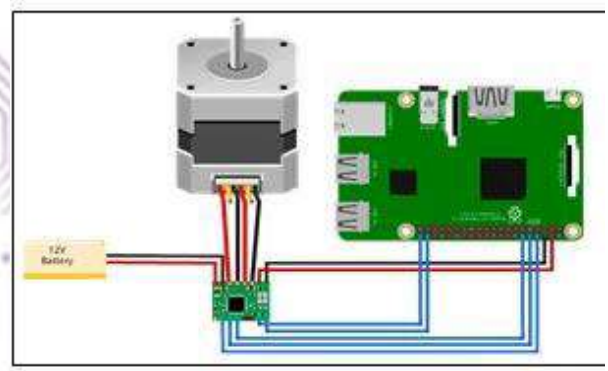

Fig 2.9. circuit diagram

L. SMS Alert

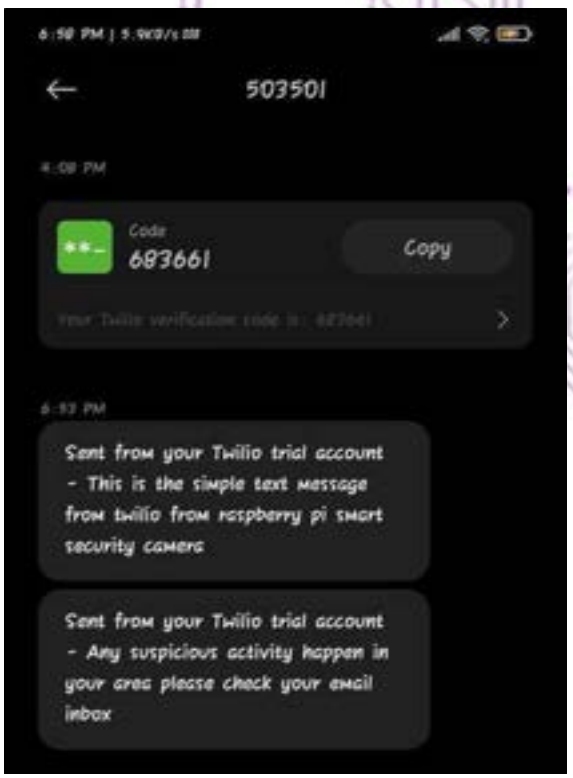

Fig 2.10. Sms alert

III. APPLICATIONS

There are various applications of this domain system. The application is listed here.

Real Time Alerts: There are two types of alerts that can be generated by a smart surveillance system, user defined alerts and automatic unusual activity alerts.

User Defined Alerts: Here the system is required to recognize a variety of user defined events that occur in the monitored space and notify the user in real time, thus providing the user with an opportunity to evaluate the situation and take preventive action if necessary. Following are some typical events.

1. Generic Alerts**:** These are alerts which depend solely on the movement properties of objects within the monitored space. Following are a few common examples. 1. Motion Detection: This alert detects movement of any object within a specified zone. 2. Motion Characteristic Detection: These alerts detect a variety of motion properties of objects, including specific direction of object movement (entry through exit lane), object velocity bounds checking (object moving too fast). 3. Abandoned Object Alert: This detects objects which are abandoned, e.g., a piece of unattended baggage in an airport, or a car parked in a loading zone. 4. Object Removal: This detects movements of a user-specified object that is not expected to move, for example, a painting in a museum.

2. Class Specific Alerts**:** These are alerts which use the type of object in addition to the object's movement properties. Following are a few common examples. 1. Type Specific Movement Detection: Consider a camera that is monitoring runways at an airport. In such a scene,

the system could provide an alert 2 on the presence or movement of people on the tarmac but not those of aircrafts. 2. Statistics: Example applications include, alerts based on people counts (e.g., more than one person in security locker) or people densities (e.g., discotheque crowded beyond an acceptable level).

3. Behavioural Alerts: These alerts are generated based on adherence to, or deviation from, learnt models of motion patterns. Such models are typically trained by analyzing movement patterns over extended periods of time. These alerts tend to be very application specific and use a significant amount of context information, for example, 1. Detecting shopping groups at retail checkout counters, and alerting the store manager when the length of the queue at a counter exceeds a specified number. [8] 2. Detecting suspicious behaviour in parking lots, for example, a person stopping and trying to open multiple cars.

4. High Value Video Capture: This is an application which augments real time alerts by capturing selected clips of video based on pre-specified criteria. This becomes highly relevant in the context of smart camera networks which use wireless communication.

2.1.2 Automatic Unusual Activity Alerts: Unlike the user defined alerts, here the system generates alerts when it detects "activity that deviates from the norm". The smart surveillance system achieves this based on "learning" normal activity patterns [17]. For example, a smart surveillance system that is monitoring a street learns that "vehicles move about on the road" and "people move about on the side walk". Based on this pattern the system will provide an alert when a car drives on the side walk. Such unusual activity detection is the key to effective smart surveillance, as all the events of interest cannot be manually specified by the user.

2.2 Automatic Forensic Video Retrieval (AFVR): The capability to support forensic video retrieval is based on the rich video index generated by automatic tracking technology. This is a critical value-add from using smart surveillance technologies. Typically the index consists of such measurements as object shape, size and appearance information, temporal trajectories of objects over time, object type information, in some cases specific object identification information. In advanced systems, the index may contain object activity information. The Washington, DC sniper incident is a prime example of where AFVR could be a break-through technology. During the incident the investigative agencies had access to hundreds of hours of video surveillance footage drawn from a wide variety of surveillance cameras covering the areas in the vicinity of the various incidents. However, the task of manually sifting through hundreds of hours of video for investigative purposes is almost impossible. However if the collection of videos were indexed using visual analysis, it would enable the following ways of retrieving the video

1. SpatioTemporal Video Retrieval: An example query in this class would be, "Retrieve all clips of video where a "blue car" drove in front of the "7/11 Store on 23 rd street" between the "26th of July 2pm and 27th of July 9am" at "speeds > 25mph".

2. Surveillance Video Mining: In the case of the Washington sniper incident, the surveillance video mining application would attempt to present the users with a set of potential movement patterns of cars over a set of cameras covering multiple incident locations, this would enable the investigative agencies to answer questions like "Was there a single car that appeared in all of the incident locations?".

2.3 Situation Awareness: Ensuring total security at a facility requires systems that can perpetually track the identity, location and activity of people and vehicles within the monitored space. For example, the existing surveillance technology cannot answer questions such as: did a single person loiter around near a high security building on multiple occasions? Such perpetual tracking can be the basis for very high levels of security. Typically surveillance systems have focused on tracking location and activity, while biometrics systems have focused on identifying individuals. As smart surveillance technologies mature [7], it becomes possible to address all these three key challenges in a single unified frame work giving rise to, joint location identity and activity awareness, which when combined with the application context becomes the basis for situation awareness.

CONCLUSION

In this paper, the study of different domain techniques is presented. Thus, we have developed a smart surveillance camera that can be started using raspberry pi and is capable of providing face detection. Also the camera system is compact and can be implemented with low cost. The implemented face detection algorithm is very effective, with an accuracy of 88.9 percent which can be increased further by effectively improving the illumination of the area. However, this system is connected wirelessly to the laptop to communicate with the raspberry pi. This can be overcome by making the system wireless.

ACKNOWLEDGEMENT

We take this opportunity to thank all of those who have generously helped us to give a proper shape to our work and complete our BE project successfully. A successful project is fruitful culmination efforts by many people, some directly involved and some others indirectly, by providing support and encouragement." We would like to thank Dr.Sandeep Joshi, Principal, PCE, for providing excellent academic environment in the college. We would like to express our gratitude towards Dr.Avinash Vaidya , Professor & HOD, Dept of EXTC, PCE, who provided guidance and gave valuable suggestions regarding the project. We consider it a privilege and honour to express our sincere gratitude to our Internal Guide Mrs.Sonali Kathare, Asst. Professor, Department of Electronics Engineering, PCE, for her valuable guidance throughout the tenure of this project work.

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AWS IoT Platform based Remote Monitoring using Raspberry Pi

Prasanna Arun Umbarkar, Sofia Albert Pinto, Jay Uddhav Pawar, Prof. Ravi Biradar

***Abstract*- Rising incidents of affected lives due to unprecedented heart attacks and cardiovascular diseases are one of the major concerns. Remote medical care services based on IT are becoming increasing present in health systems. Health care application based on different services are gaining high popularity all over the world due to various features. To monitor the patient health status IoT makes medical equipment more efficient by allowing real time monitoring of patient's health. In the current scenario Internet of things patient's parameters get transmitted through medical devices via a gateway, where it is stored and analyzed. The significant challenges in the implementation of Internet of Things for healthcare applications is monitoring all patients from various places Thus, Internet of Things in the medical field brings out the solution for effective patient monitoring at reduced cost and also reduces the trade-off between patient outcome and disease management. Here we discuss about, monitoring patient's body temperature, ECG and Heart rate using Raspberry Pi board.**

***Keywords*- AWS cloud, Iot, Raspberry Pi, Remote sensing**

I. INTRODUCTION

The chapter represents the introduction to the topic of this project and explains why a Smart Health care monitoring system is a necessity, keeping in mind the current scenario of the world today. The basic approach for implementing the AWS IOT platform Remote Monitoring system has been introduced in this chapter which also includes the motivation behind this thesis report.

In the recent years, the emergence of wireless sensor networks in the healthcare systems has significantly increased mainly in the areas like remote health monitoring, medical data access, and communication with caregivers in emergency situations. Using WSN, we can easily design a simple but efficient system to monitor the conditions of patient continuously. Patients can be tracked and monitored in normal or in emergency conditions at their homes, hospital rooms and also in Intensive Care Units (ICUs).

Although present systems allow continuous monitoring of patient's vital signs, these systems require wired sensors attached to bedside monitors or PCs, and bound the patient to his bed. Mesh of wires around patient's bed creates an obstacle for staff for physical monitoring and annoyance to the patient.

With the use of WSN, patient not only can move around but can be monitored remotely.

II. LITERATURE SURVEY

A. Development and clinical evaluation of a Home Healthcare system

Daily monitoring of health condition at home is important for an effective scheme for early diagnosis, treatment, and prevention of lifestyle-related diseases such as adiposis, diabetes and cardiovascular diseases. While many commercially available devices for home health care monitoring are widely used, those are cumbersome in terms of self-attachment of biological sensors and self-operation of them. From this viewpoint, we have been developing a non-conscious physiological monitoring system without attachment of any sensors to the human body as well as any operations for the measurement. We developed some devices installed in a toilet, a bath, and a bed and showed their high measurement precision by comparison with simultaneous recordings of ordinary biological sensors directly attached to the body. To investigate that applicability to the health condition monitoring, we developed a monitoring system in combination with all the monitoring devices at hospital rooms and previously carried out the measurements of patients' health condition. Further, in this study, the health conditions were measured in 10 patients with cardiovascular disease or sleep disorder. From these results, the patients' health conditions such as the body and excretion weight in the toilet, the ECG during taking the bath and the pulse and respiration rate during sleeping were successfully monitored in the hospital room, demonstrating its usefulness for monitoring the health condition of the subjects with cardiovascular disease or sleep disorder

B. Intelligent wireless mobile patient monitoring system

Nowadays, Heart-related diseases are on the rise. Cardiac arrest is quoted as the major contributor to the sudden and unexpected death rate in the modern stress filled lifestyle around the globe. A system that warns the person about the onset of the disease earlier automatically will be a boon to the society. This is achievable by deploying advances in wireless technology to the existing patient monitoring system. This paper proposes the development of a module that provides mobility to the doctor and the patient, by adopting a simple and popular technique, detecting the abnormalities in the bio signal of the patient in advance and sending an SMS alert to the doctor through Global

System for Mobile (GSM) thereby taking suitable precautionary measures thus reducing the critical level of the patient. Worldwide surveys conducted by World Health Organization (WHO) have confirmed that the heart-related diseases are on the rise. Many of the cardiac-related problems are attributed to the modern lifestyles, food habits, obesity, smoking, tobacco chewing and lack of physical exercises etc. The post-operative patients can develop complications once they are discharged from the hospital. In some patients, the cardiac problems may reoccur, when they start doing their routine work. Hence the ECG of such patients needs to be monitored for some time after their treatment. This helps in diagnosing the improper functioning of the heart and take precautions. Some of these lives can often be saved if acute care and cardiac surgery is provided within the so-called golden hour. So, the need for advice on first-hand medical attention and promotion of good health by patient monitoring and follow-up becomes inevitable. Hence, patients who are at risk require that their cardiac health to be monitored frequently whether they are indoors or outdoors so that emergency treatment is possible. Telemedicine iswidely considered to be part of the inevitable future of the modern practice of medicine.

III. PROPOSED SYSTEM

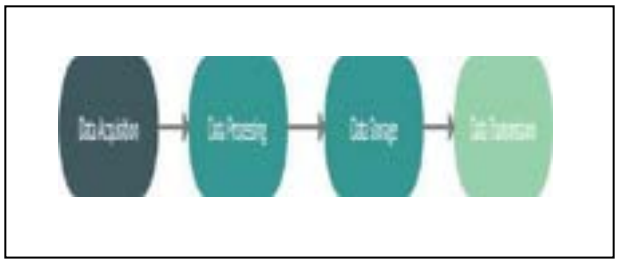

Fig.1: Basic work flow of system

In the proposed system, the raspberry pi is the main processor of the system. In A Secure IOT Based Modern Healthcare System, Internet of things is used to give flexibility and fast operational speed to get expected outcomes. In this, hardware elements are used that are Raspberry pi 3, heart beat sensor, Temperature sensor etc. and more sensors also can be used to detect various biological functionality. In this Hardware elements are integrated with software system that controls the hardware and report generation. Heart beat sensor is Easy pulse 1.1 is used and general temperature sensor is used to detect temperature. By using This System, we can detect abnormal conditions in human body at real time.

The Basic Work flow of proposed system consist of four stages Data Acquisition Data Processing Data Storage and Data Transmission.

A) Data Acquisition: first task is to collect data from the patient through sensors. Data here refers to the health parameters of temperature and heartbeat. Sensors used in this system is low power sensors. They collect the data from the patient on timely basis

B) Data Processing: Timely obtained data of patient then feed to raspberry pi and shown on LCD. Health condition is observed

C) Data Storage: All the data that have been acquired is sent to cloud or the server (AWS DynamoDB) for storage. where data is store and processed

D) Data Transmission: Data collected on the IoT server is stored for the reference of all peers in the systemand transmitted to these peers as and when required.

IV. IMPLEMENTATION DETAILS

Raspberry pi3 is device which is connected with sensors, sensors are connected with human bodies, and this raspberry pi3 is connected with software systems by using wireless connection. When all elements are connected together, sensor senses data from human body All the sensors take the reading from the Patient this collected data is forwarded to internet / Aws Server IOT is a platform enabling secure, bidirectional communication with Raspberry pi device and AWS cloud. Patient incoming data is checked in order to determine the next action to take.

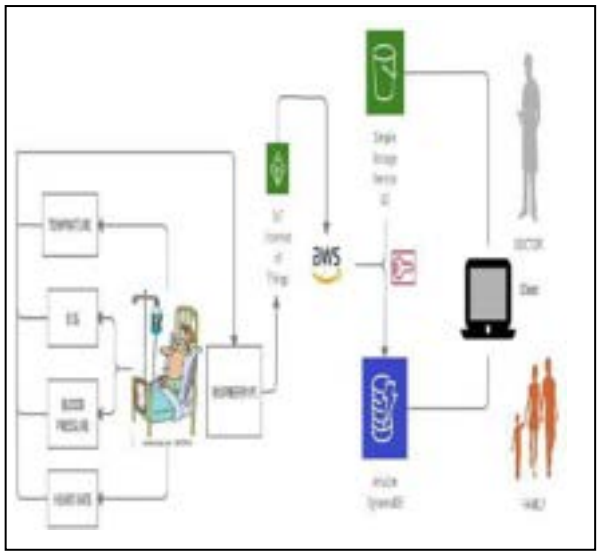

Fig.2: Block Diagram

Data is compares with standards values that are already stored in system. According to that normal and abnormal conditions checking is performs. And if there are any abnormalities are occurring that sends message immediately to doctor to avoid critical situations This alert uses Amazon SNS. In this System Administrator is there to control system, it can control new patient's entries and doctor's entries, when it will get data from sensors and stores in Dynamo-db and S3 Database. is displayed in separate UI page which periodically loaded and fetches data from database. This system allows health professional to be alerted in real time in case of

emergency, Is also allows for large medical database to be analyzed using artificial intelligence algorithm to extract useful information. All the data is in digital format so that it gives advantage on operational speed and digital processing is much more efficient than analog signal. For connectivity we are using PuTTY application to connect devices and software system that works like mediator

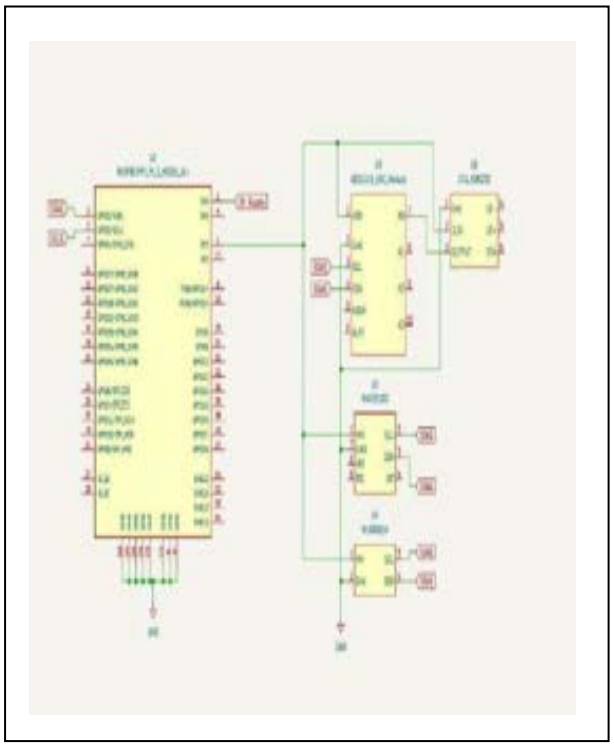

Fig.3: Circuit Diagram

V. CONCLUSION

The healthcare monitoring systems has emerged as one of the most vital systems and became technology oriented from the past decade. Humans are facing a problem of unexpected death due to various illnesswhich is because of lack of medical care to the patients at right time. The primary goal was to develop a reliablepatient monitoring system using IoT so that the healthcare professionals can monitor their patients, whoare either hospitalized or at home using an IoT based integrated healthcare system with the view of ensuring patients are cared for better.

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Raspberry Pi Based Android Controlled Home Surveillance Robot

Khagesh Chavan, Samruddha Chavan, Purvesh Bute, Late Aditya Janardhanan

***Abstract*— A 'Raspberry Pi Based Android Controlled Surveillance Robot' and the various methods of its development have been presented in this report. It is mainly designed to provide surveillance in highly sensitive areas in the house without having to risk human life. The code for the performance of robot is drafted in python. The robot is designed to either work automatically using ultrasonic sensor or manually by the user from an android application. The robot can be controlled in a limited area as it works on Wi-Fi as a channel. The webcam mounted over the robot is used to detect unknown humans around by recognising the person using a face recognition algorithm developed using machine learning and computer vision library called OpenCV. And if there is a unknown face recognised by the robot, it quickly sends a mail to the administrator user along with photograph of the unknown person**

***Keywords*— Robot, sensor, open CV, bandwidth**

I. INTRODUCTION

This is the internet of things (IOT) and Artificial Intelligence (AI) based project, where we particularly use the Raspberry Pi, USB web camera and six BO motors with Robot chassis to build this Robotic car setup. It has a web camera mounted over it, through which we will get live video feed and the interesting part here is that we can control and move this robot from an application over the internet. As it can be controlled using an application, it can also be controlled by using the other smart devices where we can control through the application. We built an application in Java which has Left, Right Forward Backward symbols, clicking on which we can move the robot in any direction. Also, it can work automatically and uses ultrasonic sensors to detect the obstacles. The webcam will capture live data with regards to its surroundings and then send it to a desired device through the internet. Here we use memory of Raspberry Pi to store the data such as images of family members and code is written in such a way that if an unknown person who doesn't match with any of the family members, then the user is immediately informed through notification with the photo of unknown.

II. LITERATURE SURVEY

2.1) Mayank Dharaskar, Vatan Gupta, Priyanka Kale, Reeta Chopade, Aayush Jaiswal's, IOT Based Surveillance Robotic Car Using Raspberry PI, IRJET Paper Published in 2018.
According to this paper, the robot runs on a web application. It is almost similar to the project made by us.In this project they used raspberry pi working on Raspbian OS. As the communication is done with the help of the internet so limitation of range of operation does not arise and thus they can monitor any remote areas. One can easily monitor as well as control the activity of the robotic unit.

2.2) Dr. Shanthi Mahesh, Neha Dixit, Preethi P, Shree Lakshmi Deshmukh's
It is concluded that a surveillance system using Raspberry pi capable of capturing video/image and transmitting through emails. Also this paper contains detailed information for controlling a robotic vehicle guided via the internet. All these techniques can be used in any conditions and areas where safety is important and mandatory for a secure place to live. It can monitor the areas and secures a place from the adversaries which can be done by surveillance robots all the time with great accuracy and high precision.

2.3) Ashish U. Bokade, V. R. Ratnaparkhe's Video Surveillance Robot Control using Smartphone and Raspberry Pi, IEEE Conference paper published in 2016
This paper proposes a method for controlling a wireless robot for surveillance using an application built on the Android platform. The Android application will open a web-page which has a video screen for surveillance and buttons to control the robot and camera. Android Smartphone and Raspberry pi board is connected to Wi-Fi. An Android Smartphone sends a wireless command which is received by the Raspberry pi board and accordingly the robot moves. The Video Streaming is done using MJPG streamer program that gets mjpeg data and sends it through a HTTP session. The Raspberry pi programming is done in python language. The experimental result shows that the video streamed up to 15 frames per second.

2.4) Saddam's DIY Web Controlled Raspberry Pi Surveillance Robotic Car published on circuit digest website in 2017.
It has a web camera mounted over it, through which we will get live video feed and the interesting part here is that they can control and move this robot from a web browser over the internet. As it can be controlled using a webpage, means it can also be controlled using a webpage in Mobile. We built a webpage in HTML which has Left, Right, Forward, Backward links, clicking on which we can move the robot in any direction. Here they used "Motion" for getting a live Video feed from a USB camera and used "Flask" for sending commands from webpage to Raspberry Pi using python to move the Robot, which are explained in detail in subsequent parts of this tutorial. You can check this article to install the Raspbian OS and getting started with Raspberry Pi.

III. PROPOSED SYSTEM

1. Raspberry Pi 4:

Raspberry Pi is the brain of the robot. It makes the whole robot wireless. The video is transmitted wirelessly to the mobile app through raspberry pi. The raspberry pi contains the instructions which when executed runs the robot. The raspberry pi needs 5V at 3A power supply, which is provided through power bank. It is a quad core processor with 1.5 GHz clock speed. The raspberry pi receives video data from the webcam and if faces are detected it checks within the library, if it can get any matches for the detected face. It is connected to ultrasonic sensor, which detects obstacles and send the information to the raspberry pi for next movements of the robot.

2. Motor Driver (L298N):

L289N motor driver consists of L289N IC, 78M05 voltage regulator, resistors, capacitors, LED and a 5V jumper on the integrated board. It can control two motors at maximum and one motor at minimum. The voltage regulator in the motor driver is used to control the speed of motors. It can provide voltage up to 46V at 2A. The raspberry pi sends commands to the PWM pins of the motor driver, which on receiving commands starts the rotation of motors. The direction of rotation of motors is decided by IN1, IN2, IN3 & IN4 pins of the motor driver, further it consists of four output pins OUT1, OUT2, OUT3 & OUT4 pins which are connected to the motors. It requires a power supply of 5V for the switching logic of L298N IC.

3. Servo Motor:

A servo motor is a motor which works as a linear/rotary actuator that allows great precision of angular/linear position. They are small in size, have built-in control circuitry and are quite powerful. They are also very energy efficient. These features permit them to be used in remote-controlled toy cars, robots etc. Servo motors have various applications such as industrial applications, robotics etc. They are also used in the pharmaceutical industry as the packaging systems which are used for bottling, labelling, and packaging are powered by high-end servo motors as the servo systems are simple, less prone to breakdown, and easier to clean.

There are two different types of servo motors that are as follows

1. AC Servo motor
2. DC Servo motor

AC servo motors tend to be used in industrial machinery as they can handle higher current surges and also it provides much better control over rotational motion and control over direction whereas DC servo motors cannot handle high current surges and are usually better suited for smaller applications like toy cars.

In addition to regular servos, there are servos that turn continuously. Servos by definition don't provide continuous rotation, though they can be found and frequently are modified for continuous rotation at the cost of forfeiting the position feedback mechanism. Some of the applications of servo motor are as follows:

[1] The servo motor is used in robotics to actuate movements by mounting servo motors in each and every joint of the robotic arm, giving the arm dexterity and precise control over its movements.

[2] The Servo motor is employed to start out, move and stop conveyor belts carrying the goods/materials in conjunction with several stages.

[3] A servo motor can also be employed for steering purposes, where you need a limited range in either direction with modest controllability.

4. BO Motor:

Battery Operated motor is a DC motor which supplies good torque and rpm at lower operational voltages, that is the biggest advantage of this motor. It is utilized in Robots, cars, and other DIY projects where movement is required. The DC motor takes in electricity from one end and converts it into rotational energy from the opposite end by rotating the shaft. The shaft can then be connected to another machine to make it rotate.

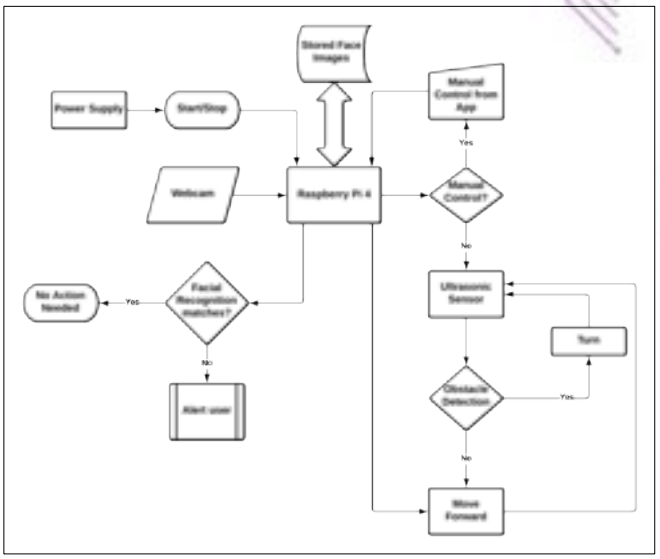

Fig 4.1. Block Diagram of Working Robot

5. Ultrasonic Sensor:

It is a sensor which uses ultrasonic waves to calculate the distance between two objects. An ultrasonic sensor uses a transducer to send and receive ultrasonic waves. Robots use this ultrasonic sensor to avoid the obstacles in route. The Ultrasonic Sensor gives output to the Raspberry Pi and, according to the program, the Raspberry Pi instructs the robot to change the direction in order to avoid collision. The frequency of ultrasonic waves used is generally 40kHz to 70 kHz. Range of the ultrasonic sensor is up to 11 m.

Fig.5.1. Proposed model

6. Webcam:

Web camera module is interfaced with the Raspberry Pi 4 using one of its USB ports. It captures every human face it detects and sends it to the raspberry pi memory. This webcam can also record the video if instructed by the Raspberry Pi. The quality of the image it captures is as high as 1080p. This

gives a really good benefit to Raspberry Pi to do the further work easily.

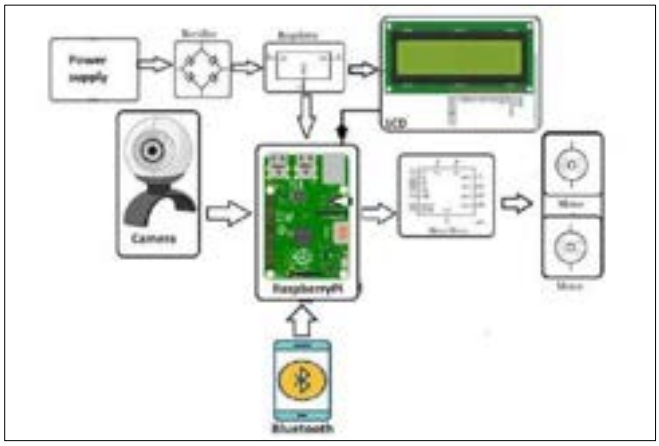

Fig. 6.1. Circuit Diagram

CONCLUSION

In this project, it is observed that the robot moves in forward and backward directions in manual and automatic mode. Also take a left and right turn. In automatic mode if there is an obstacle in front of the robot then it will move backward and take a turn. This will go on loop until there is no obstacle. Robot captures any human face in front of it through a webcam. If it recognizes some image captured by a webcam which is not stored in raspbian memory then it informs the administrator through an email.

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A Glove that Translates Sign Language into Text and Speech

Sharad Nair, Aebin Thomas, Devi Lal, Irfan Ansari

***Abstract*—Sign Language Recognition is one of the most important fields of research. Many new techniqueshave been developed recently in this area. The sign language is mainly used for communication of deaf/dumb people. The sign language we are tryingto recognize is the American Sign Language (ASL).American Sign Language is a complete, natural language that has the same linguistic properties asspoken languages, with grammar that differs fromEnglish.ASLisexpressesby movementsof thehand. It is one of the most commonly used signlanguage in North America and even in the world. The glove proposed in the project will help translate hand signs (ASL for now) to Text and speech. Ourpurpose is to offer a non-vision based extended ideathat will assist in removing or at least reducing the gap between the speech impaired and the able-bodied people. According to mute people every expression and gesture has a meaning, by recognizing these hand expressions and updating the system we can help the disabled have a better conversation and communication with other people as well. There are mainly two methods to this, first is to use the visual key present in real time using a camera, and the other method is using the sensors to convert physical movements and convert them intodigital inputs and get text and speech output fromthem. The technique we have implemented is thesecond one using flex sensors as we think it is the better one out of the two methods currently present.**

***Keywords*— American Sign language ,Raspberrypi3b, FlexSensors.**

I. Introduction

The deaf/mute people make up 72 million of the world's population according to a report published by the World Federation of the Deaf. These people learn sign language to communicate. Unfortunately, most of the average people don't understand their gestures and thus are unable to identify what they are trying to say. This paper is concerned with the solution to help those people having speech disability to have normal conversations in their daily lives. In this paper, different approaches of gesture recognition are discussed, design of a hand glove for gesture recognition into speech is proposed and the development phases of a complete, independent prototype of sensory glove are elaborated.

1.1 *Objective*

1. To learn all existing methods available for converting sign language into text and speech.
2. To help dumb/deaf people to better communicate with the people around them without everyone having to learn sign languages.
3. To help create a Single translator device which can be updated frequently and which will be able to understand any of the existing sign language in the future.

1.2 *American Sign Language*

It is the most well document edand mostwidely used language in the world. American Sign Language(ASL) is a complex visual-spatial language that isused by the Deaf community in the United States and English-speaking parts of Canada. It is a linguistically complete, natural language. It is thenative language of many Deaf men and women, as well as some hearing children born into Deaf families. ASL shares no grammatical similarities toEnglish and should not be considered in any way to be a broken, mimed, orgestural form of English.

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II. Litrature Review

Anin-depth literature review considering all available reports on this subject was done in this project. A various hand gestures were recognizedwith different methods by different researchers inwhichwere implemented indifferent fields. Therecognition of various hand gestures was done by vision-based approaches, data glove-based approaches.

Sign Language Recognition System, Sign languagerecognition is an important application of gesture recognition. Sign language recognition has two different approaches.

1. Vision based approaches
2. Non-vision-based approaches.

2.1 *Vision based approaches*

Image processing algorithms are used in Vision based technique to detect and track hand signs andfacial expressions of the signer. This technique iseasiertothesignersincethereisnoneedtowearanyextrahardware.However,there are accuracy problems related to image processing algorithms and these problems are yet to be modified. The vision-based techniques utilize a web camera and markersfor sign detection. For gesture recognition, where in the sign ersoruser's gesture need to be detected and localize dinpicture frames.Here the detection require adequate lighting for the gesture to be capture accurately.

2.2 *Non-vision-based approaches*

In this category requires signers to wear a sensor glove or a colored glove. The task will be simplified. During segmentation process by wearing glove. Non-vision technique as it is progressively useful ingesture recognition which includes the utilization ofextraordinarilystructuredsensorglovewhichcreatesasignrelatingtothehandsign.

III. Proposed system

Fig 3.1 ASL

The proposed system aim satreducing the communication barrier between the speech impaired and normal people thus assisting them for effective communication and easing their difficulties. Our prototype involves Raspberry pi, A/D converter which are interfaced with flex sensors and accelerometer for reading the hand gestures, speaker module, OLED, hand glove and a power supply of5v. When a specific sign is made, the flex sensorsget bended and unique values are generated. These values are stored in the database and when the sign is made the microcontroller matches the values with the stored values and the output is made available in the form of text on the OLED and an audio from the speaker which are connected to the raspberrypi3B.

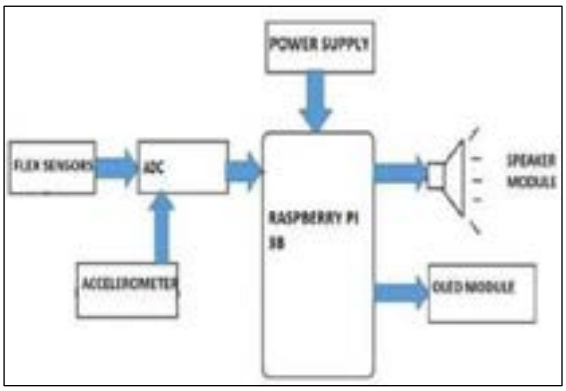

Fig 3.2 Block Diagram

IV. Hardware Specification

4.1 Accelerometer:
Accelerometers are devices that measure acceleration, which is the rate of change of the velocity of an object. It measures the acceleration of a gesture in three axes and thegives theoutputtotheA/Dconverter.

4.2 Flex sensors:
Flex sensor is basically a variable resistor whose terminal resistance increases when thesensor is bent. These sensors are incorporatedon the fingers and whenever a sign is made the fingers get bent and a specific value is then send along with the accelerometer values to the A/D converter.

4.3 A/D Converter:
The operation of the A/D converter is to convert the analog signal coming from the Flex sensors and Accelerometer to digital signals. These digital signals are then send to the Raspberry pi3Basinputs.

4.4 Raspberrypi3B:
The raspberry pi is an extremely sleek and tinycomputer board. It is about the size of a normal credit card, and run on Linux based operating system called the Raspbian. It is the heart of our project which processes the input data and give the output in text and speech using the OLED and speaker module respectively.

4.5 OLED:
An Organic Light Emitting Diode (OLED) is a display device which has self light-emitting technology. It is connected to the Raspberry Pi3B and it displays the sign detected in the form of text.

4.5 Speaker:
The speaker module used here consists of a3.5mmjackwhichisconnectedtotheraspberrypiandaUSBcablefor powersupply. It uses a text to speech conversion(TTS) block for audio output.

Fig 4.3 Model

4.6 Software Specifications

Python
Raspberry pi 3b is programmable in the python language. Python is a powerful programming language which is easy to use (easy to read and write) and with R-Pi enables to connect your project with the real world. Python syntax is very clean, with an emphasis on readability and uses standard English.

V. Applications

5.1 Social Applications

Social Applications mainly only include helping further communication and improve understanding between dumb/deaf people and other able-bodied people. These gloves help these disabled people to have a much more comfortable way for communicating with strangers on the streets or with those who don't understand the Sign languages.

5.2 Technical Applications

We were able to develop an efficient gesture recognition system that did not utilize any markers and camera hence making it more user and cost-friendly. The flex sensors in combination with the Accelerometer, A/D converter, and Raspberry pi is successfully and accurately able to translate ASL to text and speech. By mounting these sensors on a glove, a very convenient to use wearable is made which is not only efficient but also comfortable to use in our daily lives. It provides an efficient method of alleviating the problems of the speech-impaired community. It empowers such people with the power of speech and all ows them to express themselves better. It can be concluded that the existing methods assisted in the development of our prototype but the inclusion of new technology will surely lay a major impacting this field.

5.3 Future Scope

In the near future, more sensors can be embedded to recognize full sign language with more perfection and accuracy and most of the unit scan be embedded together on a single board resulting in a compact model. The system can also be designed such that it can translate words from one language to another. In the future, the accuracy can be improved and more gestures can be added to implement more functions.

Acknowledgment

We would like to take this opportunity to record our sincere thanks and deep sense of gratitude to all those individuals who have helped in visualizing this project. We are grateful to our principal Dr. Sandeep Joshi for providing us with an environment to complete our project successfully. We would like to express our sincere thanks to our H.O.D. Dr. Avinash Vaidya for giving us valuable guidance and constant encouragement while performing the project work and imposing his full confidence in us. We would like to thank Prof. Suchitra Patil who was also our project guide for giving us valuable, helpful guidance and timely suggestion. Last but not least we would like to thank all the members of EXTC Department who helped us directly or indirectly in our project. We are very thankful to all those well-wishers who contributes in our project work; who gives us strength, time, knowledge, faith, and support.

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Intelligent Wearable Jacket for Miners.

Divya Gadhvi, Neha Kamath, Nikhil Koli.

***Abstract*— Happiness is an endless theme of the mining industry. Due to the complex geographical and poor formation conditions of the mine, working underground in the mine is a high occupational risk. Ensuring the safety of miners' lives and accurately locating miners in real time is an important task. In this paper, we design smart wearable devices for miners. This proposed system not only informs workers of the presence of toxic gases and dangerous environmental conditions, but also helps track them in the event of an accident. The project uses a GPS system to track in real time and a single board computer called a Raspberry Pi to read values from sensors and GPS systems and communicate with the server. Therefore, you can easily monitor the worker's condition from the base camp. The system not only identifies the miner's exact depth and GPS position, but also continuously updates the miner's heart rate. This system thus helps rescue teams dig up the right place at the right depth and bring miners back to the ground. The IoT can help you create a database and communicate with your nearest hospital if you need help.**

Keywords— miners, communication, server.

I. INTRODUCTION

HIS chapter has been included in this report to give an overview of project. The "Smart Wearable Jacket" is a prototype jacket with various components such as a GPS module and various sensors for tracking and monitoring the safety of miners. This prototype records various health-related parameters. H. The presence of dangerous gases, the miner's heart rate, updated temperature / humidity, altitude, sound level, and the global position of the miner. All of these parameters are sent to the dynamic internet protocol via the WiFi shield. In this way, you can monitor all miners working in the mine. Therefore, if someone digs a mine in the event of a disaster, you can set priorities to maximize the life of the mine. Normally, in the event of a disaster or emergency, civil protection agencies will begin excavating the entire site, which can be time consuming. Rescue teams often cannot save many lives simply because they cannot correctly identify the victim with the correct heart rate. Intelligent wearable jackets solve this problem by enabling real-time tracking and monitoring. The GPS module, of course, plays a major role in this, reading the coordinates of a particular worker and communicating with the Raspberry Pi. The Raspberry Pi then sends the values from the sensor and GPS module to the web server, which displays them in a viewable format. Below is a list of the various components involved in the project.

II. LITERATURE SUVERY

A. Safety of Workers in Indian Mines: Study, Analysis, and Prediction

1) Shikha Verma, Sharad Chaudhari (2017), 'Safety of Workers in Indian Mines: Study, Analysis, and Prediction', https://www.sciencedirect.com/science/journal/20937911

Current work focuses on analysis of human factors such as unsafe behaviours, a prerequisite-based system (FRA) developed to predict accident probability in manganese mines in India , using an analysis of factors such as age, worker's experience, job change, etc. where the safety and health of workers is always the top concern. Mining safety has always attracted the attention of researchers working in the field of health and safety. Manganese has raised concerns about the safety scenario of these mines.

B. Intelligent Wearable Device for Coal Miners

1) Ghulam E Mustafa Abro , Ghulam Abid, Shoaib Ahmed Shaikh, Kundan Kumar, Safeeullah, Fiaz Ahmed, 'Prototyping IOT Based Smart Wearable Jacket Design for Securing the life of Coal Miners', Department of Electronic Engineering Hamdard Institute of Engineering & Technology HIET, Sindh, Pakistan mustafa.abro@hamdard.edu.pk

This prototype captures various health related parameters. H. Presence of toxic gas, miner's heart rate, updated temperature/humidity, exact depth location and miner's overall location. All these parameters are sent to Dynamic Internet Protocol through Wi-Fi shield. In this way, all workers working in the mine can be monitored and the lives of miners can be immediately guaranteed in the event of a disaster. This recommended on-board cellular system not only sends the latest GPS location to a specific IP address, but also sends a continuous update on the miner's heart rate detected by the heart rate sensor. Therefore, if someone is mining disaster, you can set the priority to maximize the lifetime of the mine.

C. ZigBee Based Intelligent Helmet for Coal Miners

This research paper is authored by Hong Zhang and XuHui Liu. In this paper, a remote mine monitoring structure based on ZigBee is presented. This arrangement uses ingenious head guards as voice terminals and extra-low control centers for remote sensor classification. Engineers received ZigBee telemetry advancement to create remote sensing frameworks that record continuous awareness with early warning information about methane, temperature, adhesion in the mining area. exploit and use correspondence discourse to reduce potential health problems in coal production. Additional items that can be incorporated are

remote location utilities that can provide the exact location of miners.

D. Intelligent Wearable Device for Coal Miners

This is developed by P.Prabhu, Umang, Jyothi Jayakumar, ChPhanindra Kumar. In this paper, the authors have designed a smart wearable device for coal miners. This proposed system not only helps workers report toxic gases present, but also tracks them in the event of an accident. The device is equipped with methane and carbon monoxide sensors. It provides IoT (Internet of Things) based monitoring. Using IoT helps us to create a database and helps us contact the nearest hospital if we need help.

III. Proposed System

3.1 Hardware Requirement

3.1.1 Raspberry Pi: a single board computer

Raspberry Pi is a series of small single-board computers (SBCs), widely used in many areas, such as for weather monitoring, because of its low cost, modularity, and open design. It is typically used by computer and electronic hobbyists, due to its adoption of HDMI and USB devices.

3.1.2 GPS module: Neo 6m

The Global Positioning System (GPS) is a satellite based navigation system that provides location and time information. The system is freely accessible to anyone with a GPS receiver and unobstructed line of sight to at least four of GPS satellites. A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites. These GPS modules are compatible with Arduino and Raspberry Pi.

3.1.3 ADC: MCP3208 and ADS1115

Analogue-to-Digital Converters, (ADCs) allow micro-processor controlled circuits, Arduinos, Raspberry Pi, and other such digital logic circuits to communicate with the real world.

3.1.4 Temperature Sensor: LM 35

LM35 is an integrated analog temperature sensor whose electrical output is proportional to Degree Centigrade. LM35 Sensor does not require any external calibration or trimming to provide typical accuracies. The LM35 device is rated to operate over a −55°C to 150°C temperature range, while the LM35C device is rated for a −40°C to 110°C range (−10° with improved accuracy).

3.1.5 Gas Sensor: MQ135

The MQ-135 Gas sensor can detect gases like Ammonia (NH3), sulfur (S), Benzene (C6H6), CO2, and other harmful gases and smoke. Similar to other MQ series gas sensor, this sensor also has a digital and analog output pin. The MQ135 air quality sensor module operates at 5V and consumes around 150mA.

3.1.6 BME280

The BMP280 is an absolute barometric pressure sensor, which is especially feasible for mobile applications. Its small dimensions and its low power consumption allow for the implementation in battery-powered devices such as mobile phones, GPS modules or watches.

3.1.7 Sound Sensor: LM386

A sound sensor is defined as a module that detects sound waves through its intensity and converting it to electrical signals. sound sensor consists of an in-built capacitive microphone, peak detector and an amplifier (LM386, LM393, etc.) that's highly sensitive to sound.

3.1.8 7805 Voltage Regulator

The 7805 Voltage Regulator IC is a commonly used voltage regulator that finds its application in most of the electronics projects. It provides a constant +5V output voltage for a variable input voltage supply.

3.1.9 LCD

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.

3.1.10 9V Battery

Power supply A 9V battery acts as a power supply, so as to fulfill the power requirement for the system.

3.2 Expected Outcome

Miners` vests include gas sensors, GPS, temperature and humidity sensors, sound sensors, GPS, and LED warning lights (which light up if they're in a danger zone). Gas sensors are used to detect the presence of various gases such as methane, CO2 inside a coal mine. GPS is used for tracking purposes and it also helps in tracking miners in case they get lost inside the mine. These ADCs convert the analog data output from the sensors into a digital signal and transmit it to the Raspberry Pi. Since these values are in digital form, they must be converted to measurement values. The temperature sensor value is obtained by converting the LM35 sensor value to voltage and then converting it to the corresponding temperature. In emergencies such as caving, caving, exposure to toxic gases, excavators can be found and promptly rescued.

III. Conclusion

In this report, research on the importance of "Smart Wearable Jackets" is presented. The provided GPSassisted system can detect many factors that affect the health and well-being of miners. After giving an introduction that covered certain key fundamental terms about the project, we performed a literature review; Review several research papers for analysis and discuss their features, advantages and disadvantages. The proposed systems chapter highlights

important features and aspects of our project. This includes flowcharts, circuit diagrams and methodology. The project thus highlights the value of a "Smart" jacket that can be used by any miner. With the help of this project, we are able to understand the importance of IoT based technology and its useful and life saving applications in various fields, as in the case of the project this case. We can and can at any time increase the number of sensors to detect more environmental/health factors in this project, because interfacing them with Raspberry Pi is not a problem great. In summary, this project is very useful for various mining applications. If implemented successfully, it could fully monitor the health of minors.

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Voice Controlled Robotic Vehicle

Rushabh Kshirsagar, Kanojiya Abhijeet, Rishabh V Joshi, Acharya Rahul Krishnan and Prof. Deepti Nair

***Abstract*--Voice controlled robotic framework is exceptionally helpful in territories where there is high hazard for people to enter. Voice controlled robotic framework is controlled through voice orders got by means of android gadget. Here, we used the Bluetooth module to catch and read the voice summons. Android application is used for giving & processing voice commands in hex code. There are certain digits which can be sent directly to the Bluetooth module and automatically the digit is converted into its hex code. These digits are pre-programmed in micro controller. The micro controller used is AT89S52, to give the instructions to the robot for its operation. Robotic vehicle is on edge to take the technology on next level. It can be used in various field from industries to personal use. Voice controlled vehicle can be made using raspberry pi as controller and web can be used to control the vehicle. But we have used microcontroller (AT89S52) which is cheaper as compared to raspberry pi and can be accessed using application. This robotic vehicle can be able to avoid vehicle collision, obstacle collision and it is very secure and more accurate.**

***Keywords*--Microcontroller, Motor driver, Raspberry pi 3, dc- step up converter.**

I. INTRODUCTION

The development of automation introduces robots into the industries to perform risky jobs which cannot be done by the human. The Internet-based robotic system is implemented to control a robot using voice commands which also detects any obstacles in its path i.e., collision detection. The robot can be easily controlled by using a personal computer or a smartphone. This way we can perform critical tasks or tasks that need little to no human involvement. In this we control the movements of the vehicle using voice commands from the user. These commands will be issued by the Android Application from the user's phone which is connected to the robotic vehicle using a Bluetooth Module. The goal of Voice Controlled Robotic Vehicle is to listen and act on the commands received from the user. Problems caused due to the existed vehicles are not useful to the disabled persons, Obstacle collision, no security to the vehicles, control complexity can be overcome by this project. For further modification can be done by making it fully AI based automatic vehicle.

II. SYSTEM OVERVIEW

This section discusses the block diagram as well as some basic information regarding the components used in the proposed system's architecture. It depicts the proposed model's overall block diagram.

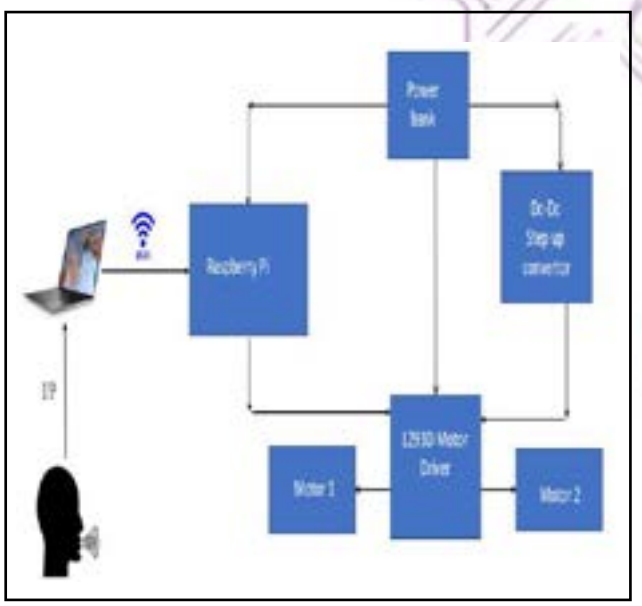

Fig. 1.1: Overall Block Diagram

2.1 Raspberry pi 3

RASPBERRY PI 3 is a development board in PI series. It can be considered as a single board computer that works on LINUX operating system. The board not only has tons of features it also has terrific processing speed making it suitable for advanced applications. PI board is specifically designed for hobbyist and engineers who are interested in LINUX systems and IOT. It also has dedicated camera port so one can connect camera without any hassle to the PI board. Where wireless connectivity is needed. It has wireless LAN and Bluetooth facility by which you can setup WIFI HOTSPOT for internet connectivity.

2.2 L293D motor driver

The L293D is a popular 16-Pin Motor Driver IC. As the name suggests it is mainly used to drive motors. A single L293D IC is capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently. So, if you have motors which has operating voltage less than 36V and operating current less than 600mA, which are to be controlled by digital circuits like Op-Amp, 555 timers, digital gates or even Microcontrollers like Arduino, PIC, ARM etc. this IC will be the right choice for you.

2.3 Mt3608 dc-dc step up converter

The MT3608 2A Max DC-DC Step Up Power Module Booster Power Module is a low-cost module that can step-up a 2 to 24V input voltage up to a 5 to 28V output at up to 2A. DC-DC boost converters step up the input voltage to a higher voltage while also stepping down the available current since the module can't output more power than its inputs. Since it is a boost converter, the input voltage must be lower than the output voltage.

2.4 DC Motors

A motor is a kind of electrical system that converts electrical energy into mechanical energy. A rotor, stator, bearings, conduit case, enclosure, and eye bolt are all used in the engine. Electric motors are used in a wide range of applications, from simple devices to the most sophisticated computers. As opposed to pneumatic or hydraulic equivalents, these engines are capable of performing the tasks. These motors are used to commute or relay power to the wheels, causing them to spin. For the base's use, two DC motors with a voltage of 12V and a speed of 300 rpm were used in this prototype.

2.5 Algorithm

This part is all about the robot's algorithm and the direction it takes to get there. When the robot is powered up, it has an algorithm that keeps repeating itself in a loop. It's a really easy algorithm to adopt since the robot's architecture is based on it. The algorithm for following is as follows:

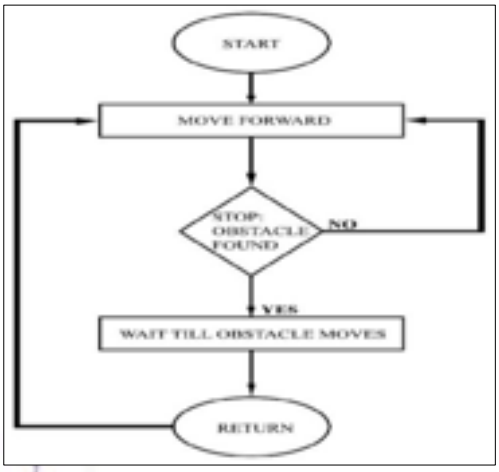

Fig.2.5.1: Algorithm steps

III. IMPLEMENTATION

The working of this voice controlled robotic vehicle is using Wi-Fi. The laptop and rover are connected to same Wi-Fi over the internet. The laptop will take voice commands for which we are going to use web speech API. Web speech API is a programming interface that will enable the web browser to take to take speech input & give output as text feature. It will be embedded in the browser. Using this API, we can access audio stream from device microphone & convert into text in real time. In Rover, webserver is running in raspberry Pi to generate a web page with speech recognition capability. The web page will be accessed through laptop. The API will start capturing audio string through microphone. Captured audio will be send to web server over the internet to gets its corresponding text. This transcript will be made available to laptop. Then it will simply send to server for further processing. In server, php file will look for keywords to identify as valid commands. After identifying commands, code will call necessary function to move rover in the commanded direction. Once the command is processed the acknowledgement will be sent to webpage on the laptop/phone.

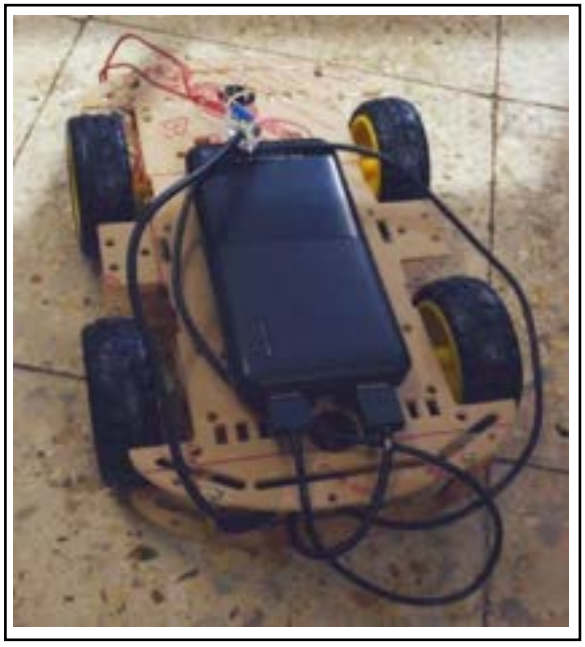

Fig. 3.1: External View of Robot

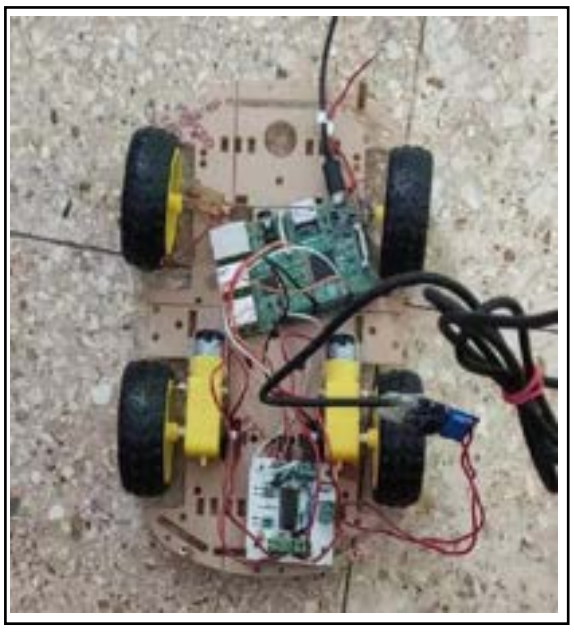

Fig. 3.2: Internal View of Robot

Fig. 3.3: Controlling of Robot

IV. CONCLUSION AND FUTURE WORK

The key goal was to develop a robotic vehicle using Raspberry Pi that could work as per our voice commands via WIFI through a webpage. The suggested prototype in this paper was introduced successfully. The future potential of this vehicle can be improved by allowing it to detect and avoid obstacles in its path using IR sensors, thus alerting us to stop as soon as you detect any obstacle in the vehicles path.

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Smart Card Technology-Based Security System

Janhvi Kapse, Pranaya Nair,Piyush Dhole, Rohit Paspunatu

***Abstract*— Security has been a very significant concern in human society. Providing a security system for houses has become vital research in which the latest technologies are being adopted to serve this purpose. The wireless network is one of the technologies that have been used to provide remote monitoring and control for the home doors and gates, wireless security-based applications have drastically increased due to the growth in modern technologies. The aim of this paper is to design and implement affordable, low power consumption, flexible, and fast monitoring security system based on ATmega32 and RFID (Radio Frequency Identification) technology to provide essential security to home or office and associated control.**

I. INTRODUCTION

A smart card reader is provided to read data from the card assigned to the authorized personnel. A smart card is a plastic card embedded with a computer chip that stores and transmits data between users. The card data is transferred through a reader that is part of a computing system. Smart-card enhanced security systems are in use today through various applications including healthcare, banking, entertainment, and transportation. To various degrees, all applications can get benefitted from the added features and security that smart cards provide.

The growth of technology has been rapidly increased. Since technology has been developed greatly it can contribute to society in several ways. This project is designed to gain access to an area by using a valid smart card only. The main objective of this research paper is to design and implement a low power consume, affordable, flexible, and fast monitoring home security system that includes features such as emailing notification, door-status sensor.. The system is to be based on the ATmega32 microcontroller. The security of any organization is the topmost priority for the concerned authorities. For this reason, only the authorized person with a valid smart card is allowed to operate the device to access an area. Earlier, human supervision was required to monitor all these parameters, but with this advanced system, no supervision is required as only authorized persons are provided with valid smart cards to operate devices.

II. SMART CARD

A Smart Card is a piece of plastic the size of a credit card that has a computer chip embedded on or in it. The card can be programmed to store data as well as to perform specific tasks. Smart cards have greater use than their relatives the magnetic stripe cards; they are designed to do greater things. Smart cards can be programmed to be used in more than one area e.g, as an identification card and cash card while magnetic strips mostly have one use in addition to that smart card can. he used in multiple industries. Although smart card's main use is the same as a magnetic stripe card they have certain advantages over them, these are: Disposable and reusable More reliable than a magnetic stripe card Can store hundred ‘times more information than a magnetic stripe card More secure or higher security Multiple functions over a wide range of industries Compatible with many consumer electronics.

III. LIST OF COMPONENTS

a) ATMega 32A
b) EM-18 RFID Module
c) LCD 16X2
d) Servo Motor
e) LM7805
f) Buzzer
g) LED
h) Crystal Oscillator
i) Pushbuttons
j) Jumper Wires

1. ATMEGA 32A

The low-power, high-performance Microchip 8-bit AVR® RISC-based microcontroller featuring 32 KB self-programming Flash program memory, 2 KB SRAM, 1 KB EEPROM, 8-channel 10-bit A/D converter, and JTAG interface for on-chip-debug. The device achieves 16 MIPS throughput 16 MHz at 2.7-5.5V operation.

Features:

a. 131 Powerful Instructions - Most Single-clock Cycle Execution

b. 32 × 8 General Purpose Working Registers
c. Fully Static Operation
d. Up to 16 MIPS Throughput at 16 MHz
e. On-Chip Two-Cycle Multiplier
f. 32 KB of In-System Self-programmable Flash program memory
g. 1 KB EEPROM
h. 2 KB Internal SRAM
i. Write / Erase cycles: 10,000 Flash/100,000 EEPROM
j. Data Retention: 20 years at 85°C/100 years at 25°C
k. In-System Programming by On-chip Boot Program
l. True Read-While-Write Operation

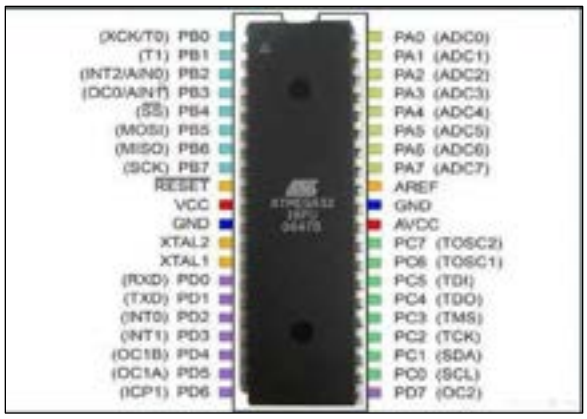

Fig 3.1. ATMEGA 32A

2. EM-18 RFID Module

EM18 is an RFID reader which is used to read RFID tags of frequency 125 kHz. After reading tags, it transmits unique ID serially to the PC or microcontroller using UART communication or Wiegand format on respective pins. EM18 RFID reader reads the data from RFID tags which contains stored ID which is of 12 bytes.

Features:

a. Operating voltage of EM-18 +4.5V to +5.5V
b. Current consumption 50mA
c. Can operate on LOW power
d. Operating temperature 0C to +80C
e. Operating frequency 125 kHz
f. Communication parameter 9600bps
g. Reading distance 10cm, depending on TAG
h. Integrated Antenna

Fig 3.2. EM-18 RFID Module

3. LCD 16X2

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is a very basic component and is very commonly used in various devices and circuits. As it can display 16 characters per line and there are 2 such lines because of which it is being called 16x2 LCD. In this LCD every character is being displayed in a 5x7 pixel matrix. The 16x2 intelligent Alphanumeric dot matrix display is capable of displaying 224 various characters and symbols. This LCD has two registers, Command and Data.

Fig 3.3. LCD 16X2

4. *Servo Motor*

A servomotor (or servo motor) is a rotary actuator that allows for precise control of angular or linear position, velocity, and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Fig 3.4. Servo Motor

5. LM7805

The LM7805 is a voltage regulator that outputs +5 volts. Like other regulators in the market, it is a three-pin IC, the input pin is used for accepting incoming DC voltage, the ground pin for establishing the ground for the regulator, and the output pin that supplies the positive 5 volts.

Features:

a. 3-Terminal Regulators
b. Output Current up to 1.5A
c. Internal Thermal-Overload Protection
d. High Power-Dissipation Capability

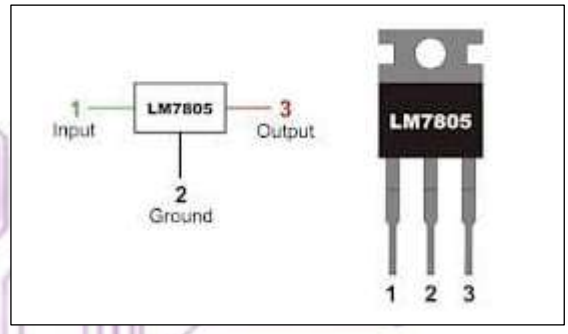

Fig 3.5. LM7805

6. Buzzer

The buzzer is a sounding device that can convert audio signals into sound signals. It is usually powered by DC voltage. It is used in alarms, computers, printers, and other electronic products as sound devices. A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

Fig 3.6. Buzzer

7. LED

Light-emitting diodes (LEDs) are versatile, energy-efficient, and durable. It's no surprise they're gaining popularity among a variety of products on the market today. You might be wondering how the LED lights that you see in your kitchen light fixture can possibly be the same lights like the ones that make up your digital signage application.

Fig 3.7. LED

8. Crystal Oscillator

A crystal oscillator is an electric oscillator-type circuit that uses a piezoelectric resonator, a crystal, as its frequency-determining element. Crystal is the common term used in electronics for the frequency-determining component, a wafer of quartz crystal or ceramic with electrodes connected to it. A more

accurate term for it is a piezoelectric resonator. Crystals are also used in other types of electronic circuits such as crystal filters. Piezoelectric resonators are sold as separate components for crystal oscillator circuits. The example is shown in the picture. They are also often incorporated in a single package with the crystal oscillator circuit shown on the righthand side.

Fig 3.8. Crystal Oscillator

9. Push Buttons

The push-button switch is usually used to turn on and off the control circuit, and it is a kind of control switch appliance that is widely used. It is used in electrical automatic control circuits to send control signals to control contactors, relays, electromagnetic starters, etc. Its characteristic is that it is installed in the machine and instrument in the process of work, most of the time is in the initial free state position, and only when needed, it is converted to the second state (position) under the action of external force. Once the external force is removed, due to the action of the spring, the switch returns to the initial position. The push-button switch can complete basic controls such as start, stop, forward and reverse rotation, speed change, and interlock.

Fig 3.9.Push Buttons

IV. BLOCK DIAGRAM

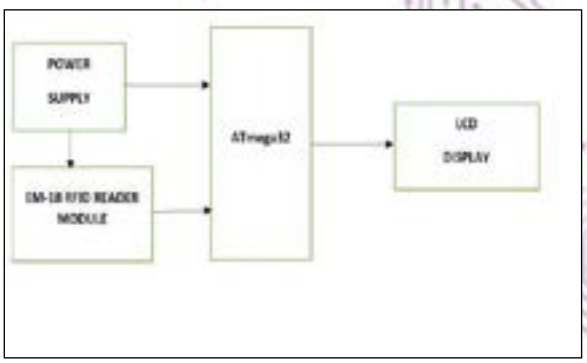

Fig 4.1. Block Diagram

Radiofrequency Identification (RFID) is a wireless identification technology that uses radio waves to identify the presence of RFID tags. RFID is used in many applications such as attendance systems in which every person will have their separate RFID tag i.e UID (Unique Identifier) which will help identify the person and their attendance. RFID is used in many companies to provide access to their authorized employees. EM18 is an RFID reader which is used to read RFID tags of frequency 125 kHz. After reading tags, it transmits unique ID serially to the PC or microcontroller using UART communication on respective pins. EM18 RFID reader reads the data from RFID tags which contains stored ID which is of 12 bytes. EM18 RFID reader doesn't require line-of-sight. Also, it has an identification range that is short i.e in a few centimeters. The ATMEGA32A-AU is an 8-bit low power, high-performance AVR RISC-based Microcontroller Unit featuring 32kb self-programming flash program memory, 2kB SRAM, 1kB EEPROM, 8 channel.

V. WORKING

Input voltage is 12V DC but we need a 5V supply so we use LM7805 Voltage Regulator Circuit to convert the input voltage of 12v DC to 5V AC. Atmega32 is

the controller of the system which will control the whole system. LCD(16x2) will first display 'Welcome' then it will display 'Please scan'.We are using EM-18 RFID Module for scanning purposes. After scanning the card, if the card data is stored in the controller then it will give access to the person. Gate will open and the buzzer will beep once. If the card data is not stored in the controller then it won't give access to the person. Gate will not open and the buzzer will beep for long. Here we are using the master card which can add or remove the data stored in the controller. Servo motor is used to open and close the gate.

VI. CONCLUSION

In this paper we presented a flexible design approach, using a standard Atmega32A to combine EM-18 RFID module .From the implementation and study for this Smart Card Based Security system, we can see the advantages in the application of RFID network technology and controller to tackle the limitations of the traditional door by not giving them access to enter the unauthorized person by avoiding less human contact and enhances the security level.

When a person tries to enter the system without a smart card door won't be open. The smart card of the RFID EM-18 Module has UID if it gets matched with a UID which is stored in the controller the person will get to access it, with the help of a buzzer when a UID doesn't match we will keep hearing a long beep sound. The owner has access to add or remove the authorization of a person with the help of a master card.

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Ventilator using Raspberry Pi with Blood Oxygen Sensing for Covid-19

Shail Jyala, Aanchal Gowda, Yash Kadam, Nimesh Khatri

***Abstract*— With the advancement of time, technological advances are also growing rapidly day by day. In 2020, we happened to witness the widespread of a very new, dangerous, and infectious disease of coronavirus. This pandemic has affected the healthcare system globally on a very high note. As a result, the medical healthcare systems' functionalities too declined rapidly. Due to the pandemic, breathing causalities arose across the world, which led to researchers, students and learners developing one of the most important instruments required, i.e., Ventilators.**

***Index Terms*—Breathing Circuit, Oximetry, Portability Pumping Mechanism**

I. INTRODUCTION

Respiratory system failures/attacks and many other respiratory diseases caused by different kinds of injuries is a source of great stress in the worlds of advanced and technologically improvised countries as well as backward and semi-advanced, developing countries these days. The Coronavirus Disease (COVID-19) is an infectious disease that spread predominantly across the globe in 2020. The medical infrastructure at the regional level declined gradually since the coronavirus started to peak its effects on human-beings since 2020, resulting in a spike in death rates because of the unavailability of proper medical equipment, most importantly the equipment/instruments related to breathing processes like Ventilators. The need for patients to have access to hospitals with ventilators became important due to the breathing causalities patients face when encountered by coronavirus which requires them to fetch oxygen for themselves through exterior mechanisms like ventilator systems. The problem meets the issues of the demand and supply of portable and effective ventilators. The ventilators in existence today have many shortcomings that should be addressed, these parameters are: size, weight, cost, and complexity of current ventilators confines users to stay in a medical facility whilst being monitored by professionals. This increases not only the risk the user has of contracting other diseases but also increases the cost to operate a ventilator. Therefore, there is a necessity to create a ventilator that is smaller and also more accessible than what we currently have. Thankfully, with the advent of the development of technology and its widespread, we have abundant resources available to access and prepare the required technology systems even in a more advanced way. So, the need for customized and profoundly curated ventilators that overcome the physical and economic constraints too can be matched by developing such ventilators right from top to bottom. With the deployment of small-scale manufacturing technologies like RepRap-class, 3-D printers, and open-source microcontrollers, etc. across the world on a large scale basis, mass distributed manufacturing of ventilators has the potential to overcome medical supply shortages. With the focus mainly on the ongoing COVID – 19 pandemic, the scope of this project can also be extended to other patients who also need breathing assistance. The ventilator would include i2c communication and a portable power system which would allow consumers to relocate the ventilator as needed and have backup power in the event of a power outage. The coronavirus is another case wherein the symptoms of respiratory casualties are seen. In most cases, the presence of viscous mucus in the lungs makes the patients unable to breathe properly, which later arises severe complications which require the aid of breathing through mechanical ventilators.

A ventilator is a machine/instrument that supports breathing system. It is also known as a breathing machine or respirator. These respiratory machines are widely used in hospitals. Ventilators will get oxygen into the lungs, remove carbon dioxide from the body, and help the patient breathe more easily. Ventilators help to breathe for people who have lost all ability to breathe on their own. A ventilator is often used for short periods, such as during surgery when you're under general anesthesia or during treatment for serious lung disease or other condition that affects normal breathing. Some people may suffer from a condition where they need to use ventilators for a long period or even for the rest of their lives.

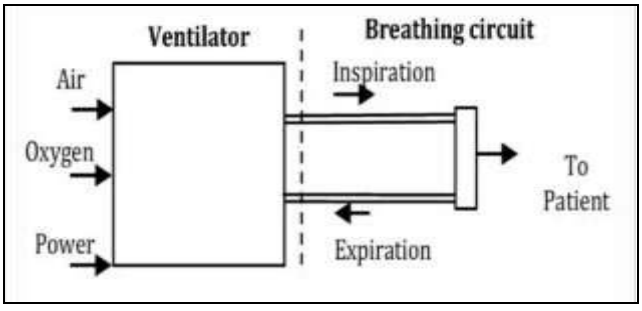

Fig 1.1: Schematic of Mechanical Ventilator

The Ventilator is typically connected to the patient through the breathing circuit as shown in Fig 1.1.

The ventilator machine takes the input parameters air/oxygen and power supply and gets interfaced along with the breathing circuit which undergoes the process of respiration and reaches the concerned patient.

II. LITERATURE REVIEW

The relevant techniques in the literature were reviewed. It describes various techniques used in the proposed system. Three papers of different domains were reviewed. The following survey contains the various methodologies used by each paper, along with its advantages and disadvantages, and how it differs from our system. Based on the analysis of these three papers, we have decided which method will be the most feasible for the implementation. Summary of the literature review is presented here.

Sr No.	Paper	Advantages and Disadvantages
1.	Paper 1	Portability is one main aspect of the project. This instrument can be used in ambulances, health centers, or distantly remote areas. The main parameters of the implemented device can be adjusted directly by the operator or remotely by a specialist.
2.	Paper 2	Here, the automation of the compressing procedure of a bag valve mask (BVM) as the working concept is utilized. by automating the BVM compression process, it was expected that ventilation results will be consistent and reproducible as compared with manual operation that can be very tiring and skill-dependent.
3.	Paper 3	The main objective here was to build a low cost system that would benefit everyone. In distant, deprived areas, such kinds of facilities are still missing, and as a result there is lag of such ventilators in these outlying areas. Based upon these circumstances it is empirical to have such a low cost and efficient ventilator.

Table 2.1 Summary of Literature Survey

III. PROPOSED SYSTEM AND METHODOLOGY

3.1 Overview

After reviewing few papers on an already developed system, we have come forth to propose our own ventilator system which would have a flow described in Fig 3.1 This system helps user to provide a basic, economic-friendly ventilation system required in cases of emergencies. Based on above problems of researchers, recommendation techniques, this project will have great influence in all aspects of our life.

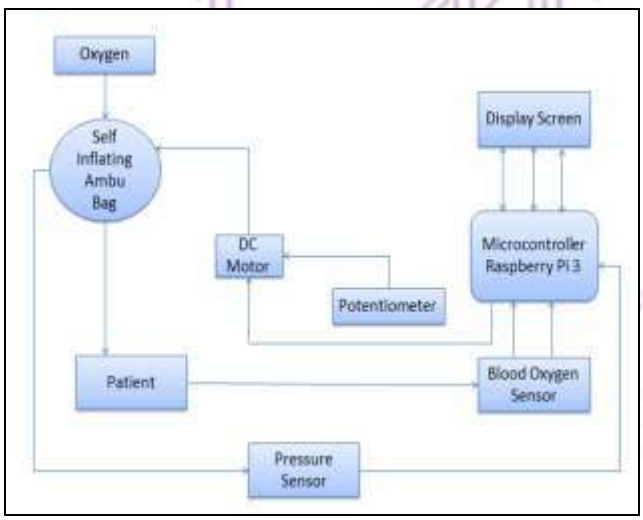

Fig 3.1: Basic block diagram of Ventilator System

3.2 Hardware and Software Specifications

The experiment setup is carried out on a hardware setup along with a suitable computer system. The different hardware and software specifications are as given in Table 3.2 and Table 3.3 respectively.

Microcontroller	Raspberry Pi
Sensors	Blood Oxygen Sensor – MAX30100 Pressure Sensor – BMP280
Motor requirements	DC Motor – 12 V Potentiometer
Main, basic components for the system	Air Breather Bag Breather Mask 16 x 2 LCD Screen i2c

Table 3.2.1: Hardware details

A. RASPBERRY PI 3B+

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. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games. The powerful CPU coupled with Wireless LAN and Bluetooth 4.1 radio makes it an ideal candidate for IoT projects, because multiple sensors can be connected to it simultaneously. In addition, the Raspberry Pi has a 40-pin GPIO (General Purpose I/O) connector for interfacing with external sensors.

The Raspberry Pi Zero is the smallest Raspberry Pi ever made, and although it doesn't have a processor that's as powerful as the Pi 3, its small size is especially suited for embedded projects (such as wearable, etc.), where space is a premium. The basic use of The Raspberry Pi is for educational purpose, it is being used by hardware enthusiasts, teachers, hobbyist, professors, universities etc and also by high school students for their projects related to computer science.

B. MAX30100

Oximetry is a noninvasive method for monitoring a person's oxygen saturation. Peripheral oxygen saturation (SpO2) readings are typically within 2% accuracy (within 4% accuracy in 95% of cases) of the more accurate (and invasive) reading of arterial oxygen saturation (SaO2) from arterial blood gas analysis.[1] But the two are correlated well enough that the safe, convenient, noninvasive, inexpensive pulse oximetry method is valuable for measuring oxygen saturation in clinical use.

C. *BMP280*

The BMP280 module comes with the BMP280 sensor, a temperature sensor, and a barometric pressure sensor that is the next generation upgrade to the BMP085/BMP180/BMP183 sensor. This sensor is great for all kinds of weather sensing and can even be used in both I2C and SPI applications. This precision sensor is the best low cost, precision sensing solution for measuring barometric pressure with ±1 hPa absolute accuracy and temperature with ±1.0°C accuracy. Because pressure changes with altitude and pressure measurements are so good, it can also be used as an altimeter with ±1 meter accuracy.

D. SELF INFLATING BAG AND MASK

A bag valve mask (BVM), sometimes known by the proprietary name Ambu bag or generically as a manual resuscitator or "self-inflating bag", is a hand-held device commonly used to provide positive pressure ventilation to patients who are not breathing or not breathing adequately. The device is a required part of resuscitation kits for trained professionals in out-of-hospital settings (such as ambulance crews) and is also frequently used in hospitals as part of standard equipment found on a crash cart, in emergency rooms or other critical care settings. This device is a bag made of plastic materials that re-expand after being manually collapsed. It has Oxygen inlet nipple, Air intake valve, Oxygen reservoir with two one way valves. Reservoir is at least the volume of the bag. Oxygen flow rate equal to, or higher than, the minute volume of the patient allows 100% oxygen to be delivered. Inlet valve allows room air to enter if fresh gas flow is inadequate and an outlet valve allows oxygen to flow out if pressure is excessive. Non-rebreathing valve that directs fresh flow of oxygen to the patient and prevents exhaled gas re-entering the bag.

E. DC MOTOR

A DC motor is an electrical machine that converts electrical energy into mechanical energy. It is an electric motor that runs on direct current power. In an electric motor, the operation is dependent upon simple electromagnetism. A current-carrying conductor generates a magnetic field, when this is then placed in an external magnetic field, it will encounter a force proportional to the current in the conductor and to the strength of the external magnetic field. It is a device that converts electrical energy to mechanical energy. It works on the fact that a current-carrying conductor placed in a magnetic field experiences a force that causes it to rotate with respect to its original position. Practical DC Motor consists of field windings to provide the magnetic flux and armature which acts as the conductor.

F. POTENTIOMETER

A potentiometer (also known as a pot or pot meter) is defined as a 3 terminal variable resistor in which the resistance is manually varied to control the flow of electric current. A potentiometer acts as an adjustable voltage divider. A potentiometer is a passive electronic component. Potentiometers work by varying the position of a sliding contact across a uniform resistance. In a potentiometer, the entire input voltage is applied across the whole length of the resistor, and the output voltage is the voltage drop between the fixed and sliding contact.

G. 16x2 LCD SCREEN

An electronic device that is used to display data and the message is known as LCD 16×2. Just as the name suggests, it includes 16 Columns & 2 Rows, hence it can display 32 characters(16×2=32) in total and every character will be made with 5×8 (40) Pixel Dots. So the total pixels within this LCD can be calculated as 32 x 40 otherwise 1280 pixels. 16 X2 displays mostly depend on multi-segment LEDs. This LCD screen is further interfaced with I2C module which makes both the program as well as the hardware complexity quite simple.

Operating System	Raspberry Pi OS – Raspberry Pi imager v1.6
Programming Language	Python 3

Table 3.2.2: Software details

3.3 Working Mechanism

BMP280 is used to detect the pressure of the breather bag. It is connected to the Raspberry pi, the readings of the pressure sensor are displayed in the 16x2 LCD screen. The blood oxygen sensing senor, that is MAX30100, is used to detect the patient's blood oxygen level and SpO2 levels, the readings detected by this sensor also gets displayed in the LCD screen. Thus, communication within the sensors and the microcontroller plays an important role in this system. Pumping of the air breather mask is done by a DC Motor integrated piston. The two most important aspects of this project are communication between the microcontroller and the sensors, and the pumping mechanism of the air breather bag.

A. I2C Communication

The process of communication in the system is done by using the I2C Communication Protocol as it is very convenient and it also reduces the complexity of the final circuitry of the system because of very few pins it has. The full form of I2C is Inter-Integrated Circuit. It is a bus interface connection protocol incorporated into devices for serial communication. It was originally designed by Philips Semiconductor in 1982. Recently, it is a widely used protocol for short-distance communication. It is also predominantly known as Two Wired Interface(TWI). It uses only 2 bi-directional open-drain lines for data communication called SDA and SCL. Both of these pin lines are pulled high. In Serial Data (SDA), transfer of data takes place through this pin. Serial Clock (SCL) carries the clock signal.

I2C operates in 2 modes – Master mode and Slave mode. I2C is a combination of the best features of SPI and UART protocols. With I2C, you can connect multiple slaves to a single master (like SPI) and you can have multiple masters controlling single, or multiple slaves.

B. Pumping Mechanism of Air Breather Mask

Manual resuscitators cause the gas inside the inflatable bag portion to be force-fed to the patient via a one-way valve when compressed by the rescuer; the gas is then ideally delivered through a mask and into the patient's trachea, bronchus and into the lungs of the human body. In order to be effective, a bag valve mask must deliver between 500 and 600 milliliters of air to a normal male adult patient's lungs, but if supplemental oxygen is provided 400 ml may still be adequate. Squeezing the bag once every 5 to 6 seconds for an adult or once every 3 seconds for an infant or child provides an adequate respiratory rate (10–12 respirations per minute in an adult and 20 per minute in a child or infant).

In order to pump the AMBU Bag, a piston is created so that the pumping becomes easy and is non-manual. For this project, the implementation of Slider and Crank model run by DC Motor is used. A slider-crank linkage mechanism is a four-link mechanism which has three revolute joints and one prismatic or sliding joint. The rotation of the crank drives the linear movement required of the slider, or the expansion of gases against a sliding piston in a cylinder can also drive the rotation of the crank

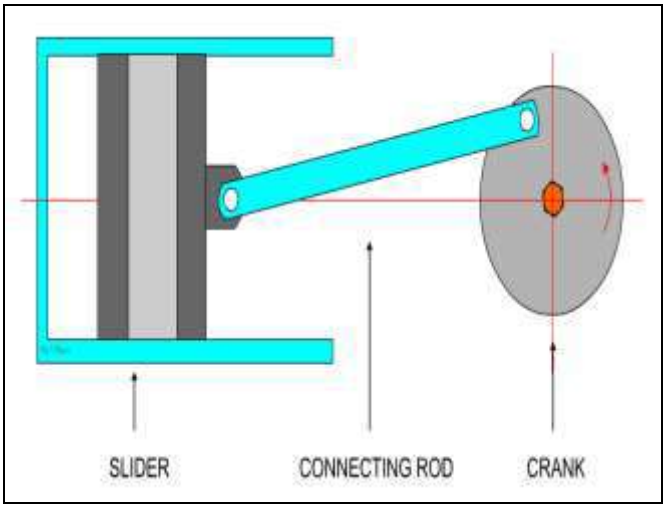

Fig 3.3: Basic representation of Slider and Crank Mechanism

IV. FUTURE SCOPE

Future Scope of Ventilator System involves making the system smarter. Further testing can be done for more effective usage of alarms. Alarms can be implemented in this project, using either an alarm screen or speakers, like the ones that alert clinicians when the pressure reaches some threshold values. It can be used for power-loss indication system, loss of breathing circuit integrity and low respiration rate indication too. The system can be made more compatible and portable with further software and hardware modifications. The system can further be implemented along with a simple mobile application too, which would require patient‘s details and monitor respiratory parameters in the app itself instead of a LCD screen. This would also help to keep a track of patient‘s wellness graph and maintain history records for current time and future references.

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Smart Shopping Cart With Automated Billing System

Dhanwantari Patil, Shraddha Patil, Manjiri Borkar

***Abstract*— In today's cities, shopping and seeking for products at shopping malls has become a daily routine. On holidays and weekends, we will witness a large number of people shopping at malls. When there are exceptional offers and discounts, there is a rush. People buy a wide range of items and put them in a cart. After making a complete purchase, go to the billing counter to get billed and make payments. The cashier prepares the bill victimisation code reader at the billing counter, which can be a time-consuming process that results in long lines at billing counters. In order to solve such issues, a smart shopping cart with a billing system would be effective in reducing the queue at the billing counter. The smart shopping cart does the same function. The smart shopping cart accomplishes the same feat by presenting the total price of all items in the cart. In this manner, the buyer can directly pay the number on the billing counter and leave with the goods they have purchased. Additionally, using this technique, the consumer will know the total amount due. As a result, the buyer may only plan his shopping by purchasing needed items based on his savings. Because RFID is used throughout the billing process, it significantly decreases the risk of human error.**

***Index Terms*— RFID,RFID Tag, RFID Reader,Raspberry pi, Pi Camera, Smart shopping cart, Sensors.**

I. INTRODUCTION

The primary goal of supermarkets is to make all products available to customers while also saving them time. However, customers can become frustrated while waiting in line at the billing counter, and they can also become confused when comparing the total price of all products to the budget in their pocket prior to billing. To solve these issues, we created a smart trolley with automated billing system.

The main aim of this system is to provide a technology oriented, low-cost, easily scalable RFID system for shopping. This project uses the security system application in the shopping trolley. If the product is put into the trolley then it will display the amount and also the total amount.. Customer can be aware of the total bill amount during the time of purchase. Reduces time spent at billing counter and increases customer satisfaction. Local server can save all the data which can be useful for inventory management. Customer can view their transactions which are did before.

II. LITERATURE SURVEY

A. Automated Billing for Smart Shopping System Using IOT (2019) (By Author: Priyanka S. Sahare , Anup Gade , Jayant Rohankar) : In this paper, they have done the system is also

B. giving it to anti-theft controlling where the system doesn't let any consumer take non-billed items. The word smart is trending lately in the field of Internet Of Things . The exaggerated Shopping trolley System assistances the consumers in reducing the substantial amount of time those consumers used to expend in shopping. This project gives an idea to develop a system in shopping malls to solve the above problem.

C. *Shopping Trolley System Using Raspberry Pi Device (2018 (By Author: Ravindra Jogekar, Ruchita Ghodeswar, Payal Kadu):* In this paper, they have used Barcode Scanner, Raspberry Pi, LCD Display. It provides the facility to customer to self-scan the products which the customer wants to purchase. The result of their project is seems to be beneficial to all the people who decides a budget for purchasing the products also it will help to consume time and the increasing manpower will become less at the billing section.

D. Smart Cart Using Arduino and RFID (2018) (By Author: Sarika S. Pandey, Soumya R. Gupta, Meenaz M. Shaikh, Komal M. Rawa): In this paper, they have done Smart cart using Arduino and RFID is a new advancement in the field of Supply Chain Optimization. This system shall not only eliminate the long queues in supermarkets and malls but also save a lot of time for the customers. The system also helps the customer in money and time management.

III. BLOCK DIAGRAM

Smart Shopping Cart is proposed which consists of Radio Frequency Identification (RFID) sensors, Raspberry pi controller. One part is the RFID tag attached to each product and the other is RFID reader that reads the product information. Each product information shows in the display. shopping information sends to the controller and automatically generates billing. .The RFID tag attached to each product and the RFID reader that reads the product information efficiently are one and the same.

Following that, each product's information appears in the display. Then shopping information sends to the controller and automatically generates billing. This proposed prototype is designed to eliminate time-consuming shopping process and quality of services issues. The proposed system can easily be implemented and tested at a commercial scale under the real scenario in the future. That is why the proposed model is more competitive as compared to others. The system also includes a feature to delete the scanned products by customers to further optimize the shopping experience .It creates a better shopping experience for the customers by saving their time. It reduces the man-power required at the shopping mall .

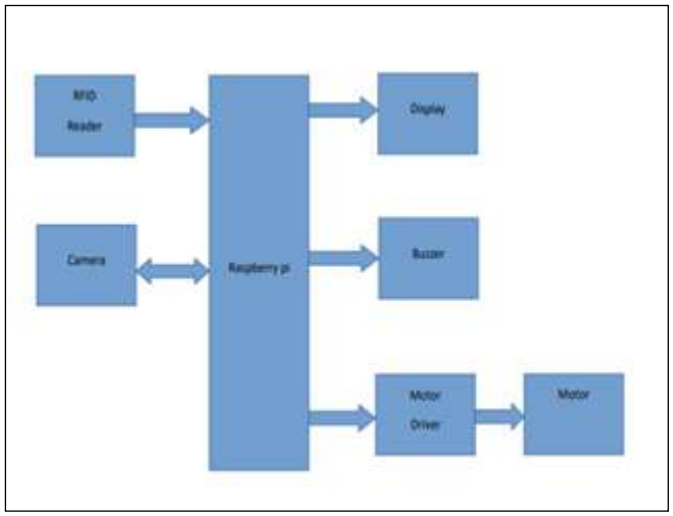

Fig.3.1 Block Diagram

IV. RESULTS

Fig.4.1 Overall Circuit

Fig.4.2 Output

V. CONCLUSION

The human life-style has changed due to the large growth of technology. Now-a-days, time is money all of us. There are two types of buying: in which have to go in mart physically and the other is online shopping. During vacations and festive seasons people visit in large numbers and after purchasing they have to be stand in long queues for the billing. The billing process takes a lot of time for scanning the barcode. This process is time consuming. To make this a simple one we format a smart trolley. So we have used RFID technology to overcome this problem. Customers can still pay their bill via credit or debit cards as their bought product information is transmitted to the central billing system. The proposed work is highly accurate, authentic, deserving of confidence and time-efficient .

ACKNOWLEDGEMENT

We would like to thank our project guide Prof .Ajit saraf who have helped us throughout the project and during the time of need .Inspite of their busy schedules it was very kind of them to spare some of their precious time and give us some valuable suggestions which form heart of this report .Dr.Avinash Vaidya (H.O.D of Electronics and Telecommunication)was a great source of inspiration for us .I also extend our thanks to our department professors for their valuable guidance .I would also thank our entire Electronics and Telecommunication Department for supporting and guiding us .And at last I would like to thank our Principal Dr. Sandeep Joshi for outstanding encouragement .

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Color Sensor Based Object Sorting Robot

Divesh Rai, Ruchi Rai, Pranay Raikwar and Sairaj Shetty

***Abstract*— The project embraces an sensor based object handling system. It focuses on sorting the coloured objects which are in front of the robot by picking and placing the objects in its designated place. There by decreasing the ponderous work done by human, achieving accuracy and rapidity in the work. The project consists of colour sensors that senses the object's color and guides the signal to the raspberry pi. The raspberry pi guides signal to the motor driving circuit which drives the different motors of the robotic arm to grab the object and place it in the correct place. Depending upon the colour sensed the robotic arm moves towards the correct location to release the object and comes back to the normal position.**

***Index Terms*— sensors, robotic arm, raspberry pi, servo motors.**

I. INTRODUCTION

Robots are computer-generated machine-controlled agents. This is usually an electromechanical motor controlled by a work station or microelectronics software design, so it can complete the task on its own. The collective feature of the alternative is that the robot often provides the action logic determined by it through the presence of that action. Although the existence and capabilities of robots vary greatly, the characteristic segments of all robots are automatic and these wearable systems are controlled in some way. This guides the robot to three separate functions called processing, action, and phase perception. In public places, the sensor attached to the robot is the preceptor, the on-board microcontroller or processor is the main processing unit, and the action is performed using a motor or additional mechanical elements. Here we introduce a new project called Object Classification Robot by recognizing different colors of objects. This robot helps to collect objects in a moving conveyor space and distribute them in different colors and in the right places. Since many production areas are dangerous for people to work with, the use of this robot is intended to reduce dangerous work, wasted time, and work constraints. It consists of simple electronic devices such as a microcontroller for processing, a DC motor for action, and a color sensor for detecting objects of different colors.

II. LITERATURE REVIEW

A. Color sorting robot

a. Vindhya D et.at:
Proposed "Design and Development of Object Recognition and Sorting Robots for Material Handling in the Packaging and Logistics Industry". In this proposal, MATLAB code is written for the algorithm that performs the operation. The algorithm is executed to identify the object and send the appropriate command to the microcontroller using serial communication for the robot to perform the sort operation.

b. Lim Jie Shen, Irda Hassan:
"Design And Development of Colour Sorting Robot" This gave us the knowledge of how a robot is used for the sorting process and no manual help or labour was needed .

B. Color sensors

a. Geda:
"Real Time Industrial Color Shape and Size Detection System Using Signal Board". Akriti Kaushik and Aastha Sharama in their paper explain. about color sensor. Color sensor register stuff by contrast, true color, or clear index. True color sensors are based on the one of the color models, most commonly the RGB model (red, green, blue).

b. Karthik Kumar and S. Kayalvizhi :
Introduced a project about the detection of color, shape and size of various object at real time. The design of system is accomplished using a raspberry pi as at system of a chip, along with camera, display unit and mechanism such as conveyor belt use for the transport of object in the industrial environment. The main purpose of design of this particular system is to identify the color, shape and size as well as the number of objects moving with the help of conveyor belt.

III. PROPOSED SYSTEM

A. Working

The working model of the project is divided into different parts such as detection part, control part and mechanical assembly part. Various mechanisms can be used for object detection. For project testing, color-based detection was selected. Since optical sensors are used without much input processing, detection is performed at a faster rate. The color sensor itself provides a direct signal to the microcontroller after detecting the object. The main operation of the Raspberry Pi is limited to servo motor control, and the overall response should be better. In this project we use TCS3200 color sensor to detect colors and we use 3D printed robotic arm to select and place objects.

B. Hardware

a. RGB Color sensor:
This part is used to detect the color of the sorted object. Many color detection integrated circuits exist today. In different ICs, different properties like color discrimination, output format, price, speed, resolution, etc. In this project, TCS3200 is

selected.

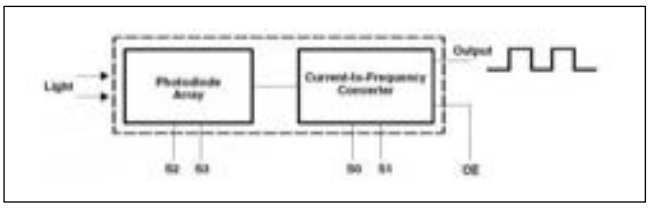

Figure.3.1: TCS3200 block diagram

The TCS3200 contains four types of filters: red filter, green filter, blue filter, and transparent without filter. When the sensor is illuminated with a beam, the filter types (blue, green, red or clear) that the device uses can be selected by two logic inputs, S2 and S3. The TCS3200s generates a square wave (50% duty cycle) with a frequency proportional to light intensity and color, and frequency proportional to light intensity.

S2	S3	FILTER TYPE
L	L	RED
L	H	BLUE
H	L	CLEAR (NO FILTER)
H	H	GREEN

Table 3.2 Relationship between S2, S3 and filter type.

b. Robotic Arm

A robotic arm is a programmable mechanical arm that functions similarly to a human arm. The links of the robot arm are interconnected by joints that allow translational or rotational motion. The robot arm has three parts, namely the base, the elbow and the grip. Each segment has one degree of freedom, meaning it will have six moves. Motors will be used to move the robot arm and will be located at each joint of the robot arm.

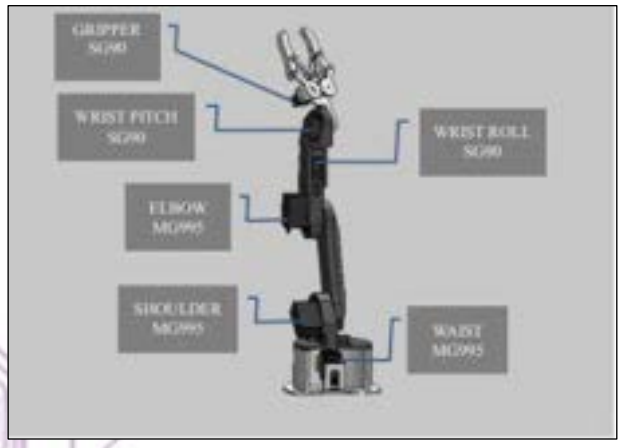

Fig. 3.3 Robotic arm

c. Servomotors engine

Servo motor is not a stationary motor. Servo motors are also known as control motors. They are used in the feedback control system as output actuators and are not used to convert DC power. The principle of the servo motor is similar to other electromagnetic motors, but the construction and operation are different. Their wattage varies from a fraction of a watt to several hundred watts.

Fig3.4 servo motor

d. Raspberry pi

Raspberry Pi 3 is powered by a Broadcom BCM2837 ARM CortexA53 64-bit SoC quad-core 1.2GHz, making it about 50% more powerful than the Pi 2.

Fig 3.5 Raspberry pi

IV. CIRCUIT DIAGRAM

Following the circuit diagram of our project model along with its actual implementation.

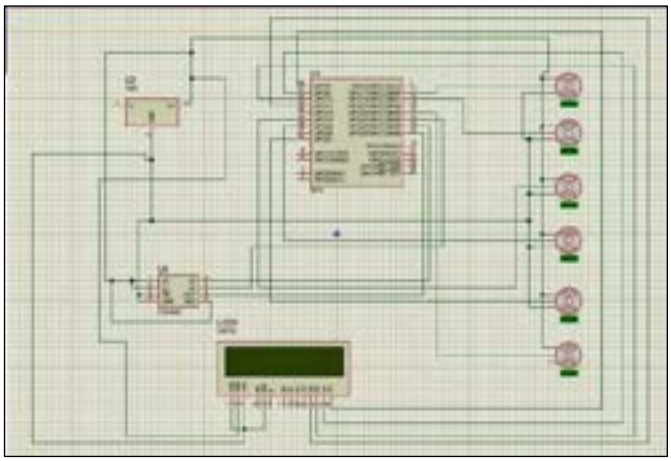

Fig 4.1 circuit representation on proteus

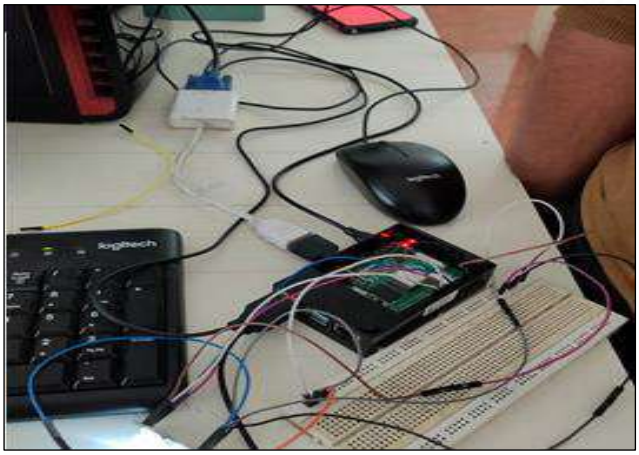

Fig 4.2 TCS3200 connections

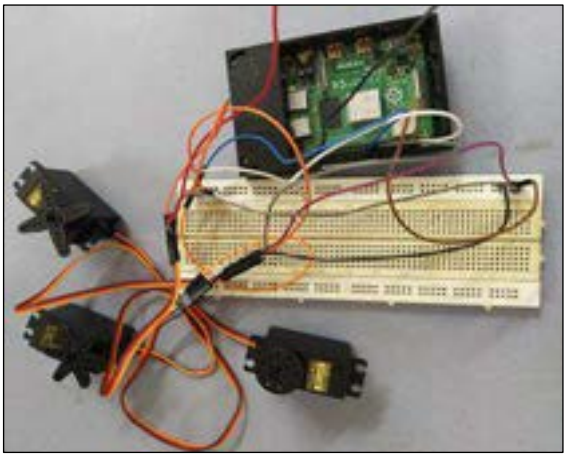

Fig 4.3 servo motors connection

CONCLUSION

This project is effectively designed to meet the required challenges. It detects a specific color of an object, captures it, and uses the RGB color sensor to place it in the desired area as desired by the user to detect the color of the object. The two main tasks performed by the sensor section are:
a. object detection. b. color perception. This system is fully controlled by a control unit, allowing you to select objects and place them in the appropriate area. This economical device is designed with a simple concept to ensure consistent and reliable operation without human error. These sorting devices are very useful in industrial facilities and in various types of economic activities. Thus, a pick-and-place automated robot with color sensing and identification characteristics is successfully achieved. The system can be used in industry for efficient selection and placement of objects as well as monitoring. By interfacing all components on a single board, we were able to make the system compact by reducing its size and making it more compact.

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Arecanut Tree Climber and Pesticide Sprayer

Priyam More, Shriyan Pagadala, Neeraj Mishra and Nitin Rajbhar

***Abstract*— This paper presents a compact, cost-friendly Arecanut Tree climber and Pesticide Sprayer with a spraying mechanism for spraying pesticides. The movement is offered by claws made of lightweight and recycled material fitted with four 5V DC motors and IR sensors. The central control is provided by Raspberry Pi 3 with a pump for the spraying mechanism. The system is powered by an onboard battery and is autonomous with a display screen allowing the user to control the robot wherever necessary.**

***Index Terms*— Arecanut, Raspberry Pi, Claws, Robot**

I. INTRODUCTION

Arecanut farming being one of the most important agricultural practices in India forms the financial backbone of a lot of farm families. India has the largest areca nut production in the world. India's climatic conditions are ideal for Arecanut plantations. However, large-scale Arecanut farming needs a substantial amount of manures and pesticides for a good yield. Arecanut trees live over 60 years and can grow as tall as 70 feet with a trunk diameter of 15-20 cm.

Arecanut farming is one of the most labor-intensive processes and requires skilled farmers throughout production. However, labour shortage has become a challenge for Arecanut farmers. Processes in Arecanut farming include climbing the trees several times a year for pesticide spraying to prevent various diseases such as Bud-rot, fungal diseases, etc, especially in high rainfall regions. This can cause a great reduction in the Arecanut harvest. To protect Arecanut trees from these diseases as well as pests and insects, regular pesticide spraying is essential. In the traditional method, a farmer is required to climb the tree up to the top in order to spray the pesticides, and jump to the other tree posing a huge risk to the labourer's life, especially as the labourers or farmers do not tend to be medically insured. Furthermore, exposure to these pesticides can cause severe damage to humans ranging from skin irritation to death. Even with the use of mechanical or electrical pumps for spraying pesticides, the farmer is required to climb halfway before spraying the Arecanut bushes with a nozzle. This turns out to be a waste of time and pesticide as not all of it reaches the bushes. The prototype presented here solves the problem of labour shortage as well as prevents risk to the lives of farmers. The farmers are not required to climb to a dangerous height and are not risked exposure to pesticides. The Arecanut Tree Climber and sprayer with claws for moving up and down trees delivers pesticide directly to the bushes while the farmer can safely look over the process from the ground.

The objectives of this system are:
To design a compact tree climber.
To reduce the labour of tree climbing farmers.
To make sure the tree receives organic manures and chemical fertilizers from time to time for a healthy harvest. To spray the fertilizers without human labour.

II. LITERATURE REVIEW

Several attempts at designing tree climbing robots were reviewed for developing this system, a few of which are described below:

1. The tree climbing robot presented by M.I. Nor Faizal et al. [1] is a simple, compact, and low-cost system with a pole-like structure developed using a modular mechanism. However, the robot is unable to avoid any obstacles because there is no obstacle avoidance function installed.
2. Maneuverability of the design proposed by *Shrivathsan Narayanan et al.* [2] surpasses the state-of-the-art tree climbing robots. In practice, the continuum manipulator is limited by the length of the springs. The springs need to be kept at a constant distance throughout the manipulator to keep a uniform shape.
3. In the system designed by *Y. Li et al.* [3], the robot motion analysis proves the feasibility of the design. It is found that alternate movement of the robot claws is not perfect because of the claws being too rigid. This also limits flexibility.
4. In the system presented by *P. S. Devang et al.* [4], the authors have created a design that is capable of adjusting for varying diameters without an intelligent monitoring system. The system has a reduced cost of implementation, is lightweight, and is featured with minimal power consumption.

III. PROPOSED SYSTEM

1. IR Sensor Module

Infared (IR) Sensor Module has a pair transmitter and receiver LED's, which is infrared in nature. Our module is connected to a 5v supply which is connected to a resistor which will allow limited current to pass through the Sensor Module. on it.

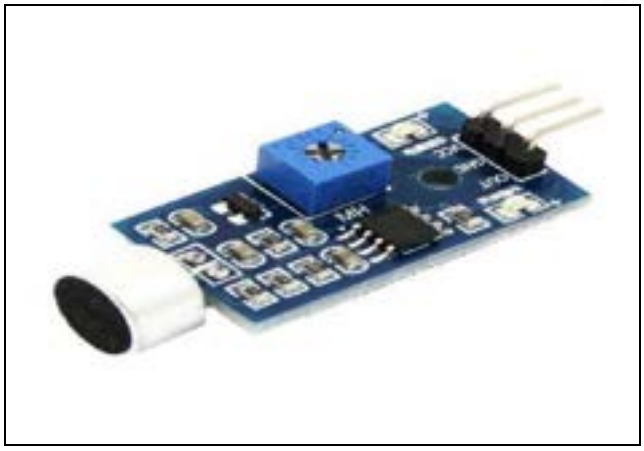

Figure 1-: IR Sensor Module **(**LM353**)**

The Sensor module (LM353) has 3pins. Vcc, GND, and Output which indicates connection, transmission and receiving data through an indicator mounted on the top
Features of IR Sensor Module:

1. Temperature Operation range-(-55* to 150*C)
2. Detection range- (1-5 meters)
3. Light weight
4. Indicator
5. Less complicate

2. DC Motor

A direct current motor is a small motor that converts electrical energy into mechanical energy. DC motors make mechanical rotation power through direct current.
.Dc motors are used in many fields . in our project it is used to spin the Gear module. It rotates in the speed of 10rpm, fit for our Gears.

Figure 2: DC Motor ESC-208 DC3-6V(SUBMERSIBLE)

Large DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills.

3. Rack And Pinion

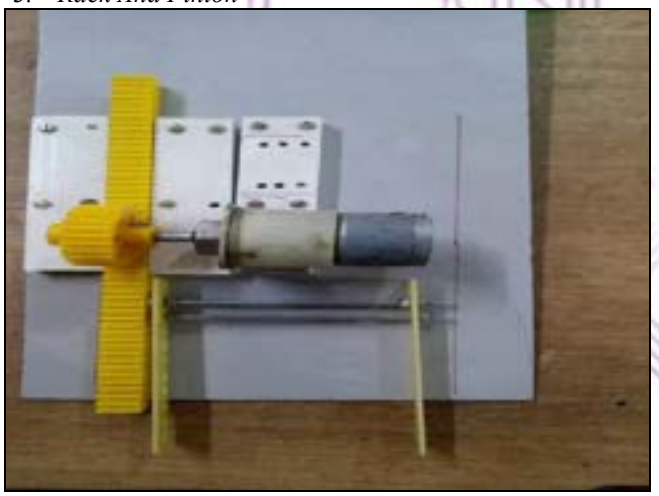

Figure 3: Rack and Pinion

Rack and Pinion come in 3 types:

- Straight teeth
- Helical teeth
- Roller pinion

In the above diagram **[**Figure 3**]** we have used Straight teeth Rack and Pinion. Rack and Pinion gears are used to convert rotation into linear motion. The flat, toothed part is the rand and the gear is known as Pinion.
Working: The Rack and Pinion is responsible for the movement of our robot. It is connected in such a way that it is capable of taking the robot upward and downward with the help of mechanical claws attached to it. It has partial upward movement, using the claw to grip onto the tree. Our robot will climb like a Sloth.

4. Rasberry Pi

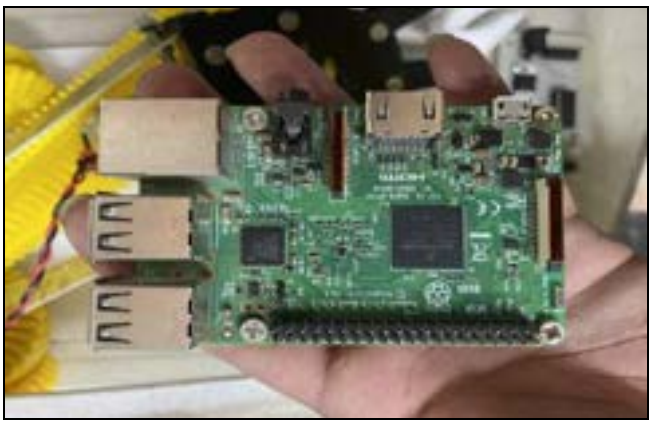

Figure 4: Raspberry pi 3

Raspberry-Pi 3 model .This module uses wireless LAN, Bluetooth 4,2. We have used it as it is known for its reliability.

It also has a full size HDMI slot, and 4 USB slots which will drive our DC motor.

```
C: > Users > Nitin > Downloads > DisplayFunction.py
from signal import signal, SIGTERM, SIGHUP, pause
from rpi_lcd import LCD
lcd = LCD()
def safe_exit(signum, frame):
    exit(1)
try:
    signal(SIGTERM, safe_exit)
    signal(SIGHUP, safe_exit)
    lcd.text("Hello,", 1)
    lcd.text("Raspberry Pi!", 2)
    pause()
except KeyboardInterrupt:
    pass
finally:
    lcd.clear()
```

Figure 5: Raspberry Pi 3 Code Display Function

The code is implemented on the computer for which we Have used Python installed on PC. We simulated and compiled our program for error checking. After removing of several compiling error the program was converted into machine language i.e Intel hex format

```
C: > Users > Nitin > Downloads > pin_control.py
import RPi.GPIO as GPIO
import time

GPIO.setmode(GPIO.BOARD)
GPIO.setwarnings(False)
motorOpen_output = 31
motorClose_output = 33
spray_output = 35
buzzer=37
person_input=32
hand_input=36
gateOpen_input=38
gateClose_input=40


GPIO.setup(gateOpen_input, GPIO.IN)
GPIO.setup(gateClose_input, GPIO.IN)
GPIO.setup(person_input, GPIO.IN)
GPIO.setup(hand_input, GPIO.IN)

GPIO.setup(buzzer, GPIO.OUT)
GPIO.setup(motorOpen_output, GPIO.OUT)
GPIO.setup(motorClose_output, GPIO.OUT)
GPIO.setup(spray_output, GPIO.OUT)

def CloseGate():
    print("Closing Gate")
    while GPIO.input(gateClose_input):
        GPIO.output(motorClose_output,True)
        GPIO.output(motorClose_output,False)

```

Figure 6: Raspberry pi **3** Code pin control

```
C: > Users > Nitin > Downloads > pin_control.py
def OpenGate():
    print("Opening Gate")
    while GPIO.input(gateOpen_input):
        GPIO.output(motorOpen_output,True)
        GPIO.output(motorOpen_output,False)

def SpraySanitizer(delay):
    GPIO.output(spray_output,True)
    GPIO.output(spray_output,False)
    print("SANITIZING")

def startBuzzer():
    GPIO.output(buzzer,True)

def stopBuzzer():
    GPIO.output(buzzer,False)


def runBuzzer(delay):
    startBuzzer()
    time.sleep(delay)
    stopBuzzer()



def ifPerson():
    if not GPIO.input(person_input):
        return True
```

Figure 6.1

```
from signal import signal, SIGTERM, SIGHUP, pause
from rpi_lcd import LCD
import time

lcd = LCD()
def safe_exit(signum, frame):


def showData(line1, line2 , clear_flag,delay):
    try:
        if clear_flag:
        #signal(SIGTERM, safe_exit)
        #signal(SIGHUP, safe_exit)
        lcd.text(line1, 1)
        time.sleep(delay)
        #pause()
    except :
        pass
    finally:
        pass
        #lcd.clear()
```

Figure 7: Raspberry pi 3 LCD Function

5. Voltage Divider

Voltage divider is current limiting assembly for our project. One voltage divider can run upmost 2 DC motors at one time. A collection of 2 such voltage dividers can help in the operation of 4 DC motors.

It consists of a 5v power supply, a control system to control the rotation of the Dc motor, a voltage limiter so that excess current doesn't seep through. 4LED indicators to indicate, and a voltage regulator.

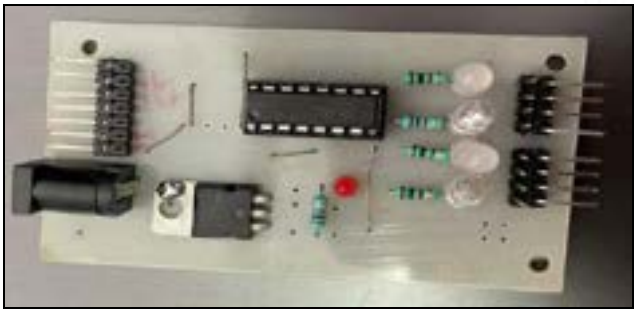

Figure 8: Voltage Regulator

6. Claw Arms

The claw arms are the most important aspect of the tree climber. The claw arms are equipped with Saw Teeth, which helps it grip and un-grip on the bark of a tree. With this mechanism the robot will slowly climb the tree.

Figure 9: Claw Arms

The claw consists of Saw Teeth, Worm Gear, a Dc motor for the claw mechanism movement. The command for the claw to grip and un-grip would be given by Raspberry-Pi. Two claws of same type are needed for the project.

IV. METHODOLOGY

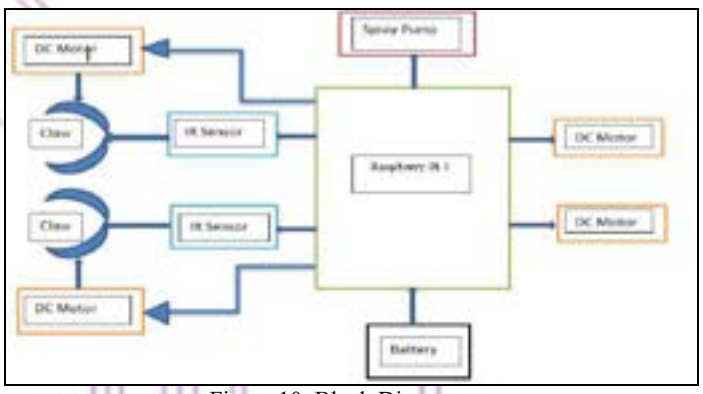

Figure 10: Block Diagram

Agriculture is one of the major sectors in Indian economy. The Arecanut Tree Climber unit has been designed to reduce human effort. The frame of the tree climber consists of 2 claws for gripping the tree. This command is controlled by a remote control/ mobile app, through Raspberry-Pi. The input control for the project which is given by the mobile app/remote is first received by the IR sensors on the claws of the robot. The model is placed the the bottom of the tree. It starts by gripping the first claw, then pulling the main body upwards using gear movement. As the body reaches the initial claws location, the second claw starts to grip and frees the initial claw pushing it upwards and climbing higher. As the model makes its way to the top, the sprayer module comes in working. The sprayer will empty its cartridge disinfecting the Arecanut and slowly making its way back down using the same mechanism movement.

V. CONCLUSION

The design and development of an autonomous Arecanut tree climbing and pesticide spraying robot has been presented in this paper. This prototype is intended to be an optimal solution for the huge demand for manual tree climbers. This system uses an alternate movement mechanism using claws and uses a pump for pesticide spraying without a complicated monitoring system. Thus this design stands out from any predecessors as it has a reduced implementation cost, is user friendly, is light in weight, and consumes minimal power.

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Virtual Telepresence Robot Using Raspberry Pi

Pratiksha Gadge, Prajwal Gaikwad, Avinash Gupta, Abha Jadhav

***Abstract*—Telepresence is a necessity in today's world as it can be used for variety of reasons when some person is not available. This telepresence robot is a remote-controlled device and has a wheels, display to enable video streaming which allows people to view remote locations as if they are present there. Every movement of this device is controlled by different controllers, like, movement of robot is controlled by an application in a phone, the motion of camera is controlled by accelerometer and magnetometer data processed by Raspberry pi and motion of wheels are controlled by servometer.**

***Index Terms*—Remote controlled, Raspberry Pi, Telepresence robot, Video streamimg.**

I. INTRODUCTION

Fundamentals:- Telepresence refers to a set of technologies which gives a person the effect/appearance of being present at a place other than their true location. It gives the user the sense of being present in some another location. In this case, the person who is using the device can see all the things that are happening in the remote location. The target of this project is to extend the ability of a person with disabilities to see whatever they want in the neighbourhood or for military use to locate the bombs or terrorists.

Objectives:- 1. The main objective is to create a virtual reality robot which gives the user a real-time experience as if he is present where the robot is located. 2. The system allows the camera to move in the direction the user needs to locate the surrounding. 3. The same above concept to be implemented for motion of the robot moving front, behind left and right.

Scope:-This project deals with a new technology like virtual telepresence robot that can be used in defence as well as for educational purposes and life threatening jobs like mining. Compared to humans, robots can survive the dangerous atmosphere of mining and defence. Here the robot is continuously controlled by the application in the mobile phone which gives the user real time experience by the video streaming, as if the user is present in that location. In 1985, Ralph Mosher, an engineer working for general elutric, created a telepresence called Handiman. It had only two fingers but had three joints that can wrap around any object to hold. These robots are strong enough to work in any environment and atmosphere and it can also be convenient in other dangerous conditions. This robots captures the images and videos will regularly be streaming to the user and it will be working according to the commands given by the user through smartphone or remote system.

II. LITERATURE SURVEY

Telepresence robot can be controlled independently by the user which means the user can explore and look around as he or she desires. These robots are the intersection of physical and social presence, called copresence. Our research focuses on the people with special needs take active role of operating the robots. There are various researches already done by some people.

1. In this paper [1], they created a robot that function in the classroom when operated by a remote located student. The four designers conducted a field session and operated the robot in a real K-12 classroom. Using the results, they identify the challenges they faced and presented the design to the HRI community and robot designers.

2. In this paper [2], their target was to create a mini rover which is low cost and gives real time footage and roam around area which we want to observe. They wanted to use hardware that was low of cost and easily available.

3. In this paper [3], they found out the issues related to mobile telepresence robots. They found this problem from three perspectives: (a) designing for the user who is in remote location. (b) designing for the people near the robot, who are interacting with the user, and (c) designing so that the video is not hampered by the technology. They identified and review various telepresence robots and discussed the areas for future research and development.

In this paper [4], they created a robot that directed on the basis of speech and facial expressions of the user. They examined it by conducting video conferencing session in two separate rooms and it went very smoothly. These results suggest that the attention directed robot can enhance social telepresence.

III. CIRCUIT AND WORKING

Raspberry Pi is the brain of the system. It receives input from the mobile application via wi-fi and then sends controlling signal to the servo motors to move the RPi camera. The motor driver and geared motors are connected at the end of the navigation circuit. The commands to run the robot can be sent via Bluetooth or RF module from the smartphone. In this project, Bluetooth module is used. The project has following sections: 12V charger, 8V power supply, Raspberry Pi board, servo motors, DC geared motors and Bluetooth module. We also require android smartphone with relevant applications, Python and PHP codes for Raspberry Pi.

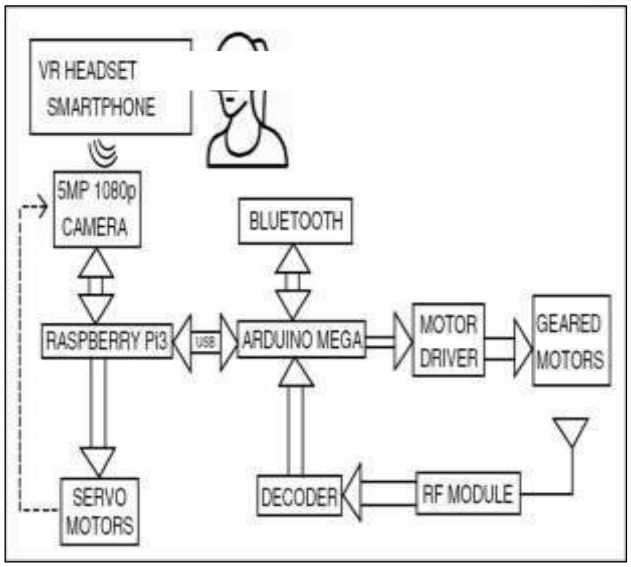

Fig 4.1. Block Diagram

IV. TECHNIQUE AND IMPLEMENTATION

1. Power supply

The first stage of the circuit is a 12V charger for charging rechargeable batteries. Four lead-acid rechargeable batteries, each of 4V, 1Ah, are arranged in series and parallel combination to provide 8V power supply. If the batteries are connected in series, the final voltage gets added up and current remains the same. If the batteries are connected in parallel, current adds up and voltage remains the same. Thus, you get 8V, 2Ah power supply by connecting two each in series and then the two sets in parallel.

Diode D1 is used to block discharging of the battery through LED1 and capacitor C1. The diode also makes the circuit stable and controls temperature while charging.

The 8V power supply is used to power the arduino, motor driver IC and other modules. When switch S1 is open, the battery supply to servos is cut off. Three series diodes (D2 through D4) reduce the voltage to around 6V for safe operation of servo motors.

A 5V power bank is used to power the Raspberry Pi.

2. Navigation

The navigation circuit controls movement of the robot. It consists of Arduino Mega 2560 board (Board2), HC-05 Bluetooth module, L293D motor driver (IC1), and two DC geared motors M3 and M4.

Directional data or command from the smartphone is sent to the navigation circuit through HC-05 Bluetooth module. It is processed by the Arduino and then fed to the motor driver IC, which drives the geared motor in the required direction. Commands are given to the Bluetooth Electronics app installed in the smartphone.

First, you need to open the Bluetooth Electronics app and pair with the HC-05 module as shown in Fig. Once the two devices are paired, the buttons are edited in the app and configured with English alphabet characters. Each direction (forward, backward, right and left) is assigned a character. Four buttons are used as shown in Fig. When these buttons are pressed, the corresponding characters get transmitted.

Fig 5.1. Pairing with Bluetooth module

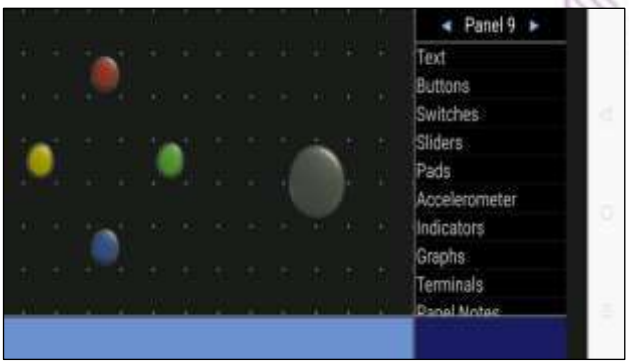

Fig 5.2. Configuring the buttons

HC-05 Bluetooth module receives the characters and sends these to the Arduino pins (transmitter and receiver). The Arduino processes this data and compares with the Arduino program. The corresponding digital values are sent to input pins of L293D IC. The driver IC provides more current in order to make the motor move in the required direction.

Depending on the data received from the Bluetooth module, the motor moves in forward or backward direction.

There are four wires connected to the geared motors from Board2 having ATmega2560 microcontroller (MCU). Arduino Mega is used because it has 16 analogue channels and can be used to connect different sensors. The flow-chart (Fig. 6) depicts the algorithm used in the navigation program (arduino_bluetooth.ino) burnt into the MCU of Arduino.

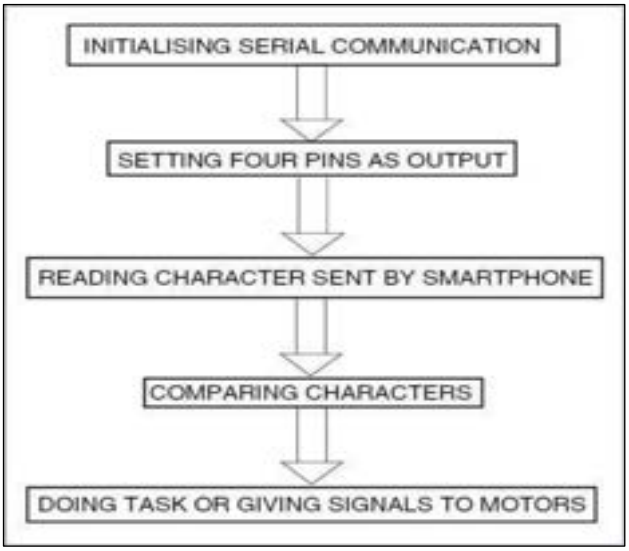

Fig 5.1. Flowchart

3. Arduino Mega 2560

Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analogue inputs, four UARTs (hardware serial ports), a 16MHz crystal oscillator, 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 an AC-to-DC adaptor or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno. It is an update to the Arduino Mega.

The Arduino board acts as the directional processor of the virtual telepresence robot. Commands to drive the virtual telepresence robot in the specified direction are processed and given by the Arduino to a driver IC, which, in turn, causes the motors to run. The Mega 2560 board can be programmed with the Arduino software (IDE). ATmega2560 on the board comes pre-programmed with a bootloader that allows you to upload new code to it without using an external hardware programmer.

The Mega 2560 board can be powered via USB connection or with an external power supply.

4. Geared motor

Geared motors are a specific type of electrical motors that produce a high torque while maintaining a low-horsepower or low-speed motor output. These can be either AC (alternating current) or DC (direct current). They also have two different speed specifications—normal speed and stall-speed torque. DC geared motors are primarily used to reduce speed in a series of gears, which, in turn, creates more torque. This is accomplished by an integrated series of gears or a gear box attached to the main motor rotor and shaft via a second reduction shaft. The second shaft is then connected to the series of gears or gearbox to create what is known as a series of reduction gears. Two DC geared motors are used in this project.

5. Servo motor

Servo motor is a rotatory actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with the servo motors. It is not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed loop control system. Two servo motors are used in this project.

6. Bluetooth module

HC-05 module is an easy-to-use Bluetooth SPP (serial port protocol) module designed for transparent wireless serial connection setup. Serial port Bluetooth module is a fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps modulator with complete 2.4GHz radio transceiver and baseband.

7. L239D motor driver

L293D is a typical motor driver IC that allows DC motor to drive in either direction. L293D is a 16-pin IC that can control a set of two DC motors simultaneously in any direction. It means you can control two DC motors with a single L293D
IC.

8. Camera module

A camera module is an image sensor integrated with a lens, control electronics and an interface like CSI, Ethernet or plain raw low-voltage differential signalling. The Raspberry Pi camera module can be used to take high-definition videos as well as still photographs. The module has a five megapixel fixed-focus camera that supports 1080p30, 720p60 and VGA90 video modes as well as stills capture. It attaches via a 15cm ribbon cable to the CSI port on the Raspberry Pi.

9. Raspberry Pi and video configurations

RPi is used in this project because it allows easy video transmission over Wi-Fi. The RPi is considered as the CPU of the virtual telepresence robot. The Raspberry Pi 3 (RPi 3) Model B used here is the third-generation RPi. This powerful credit-card sized single-board computer can be used for many applications. RPi 3 Model B released in February 2016 is bundled with on-board Wi-Fi, Bluetooth and USB boot capabilities. The RPi 3 uses a Broadcom BCM2837 SoC with a 1.2GHz 64-bit quad-core ARM Cortex-A53 processor, with 512kB shared L2 cache.

The next main step is the setting up of the RPi .

After initial configuration of RPi is done, the RPi board is connected to Wi-Fi. An IP address is programmed and setup is linked to the RPi. The video captured by the RPi camera is sent over the Wi-Fi modem. This video can be viewed in your smartphone by connecting to the same Wi-Fi connection and IP address of the RPi.

10. Software

Apache web server Apache is used in this project to configure RPi as server. Apache is a popular web server application that you can install on the RPi to allow it to serve web pages. Apache can serve HTML files over HTTP, and with additional modules it can serve dynamic web pages using scripting languages such as PHP.

Python- Python is a widely used high-level programming language for general-purpose programming. Python programs don't need to be compiled before running them. However, the Python interpreter must be installed on the computer to run them. The Python interpreter is a program that reads Python files and executes the code. The python_camera.py code is used in the RPi board to control the servo motors.

11. Wireless IMU app

This app measures and reports a body's specific force, angular rate and sometimes the magnetic field surrounding the body, using a combination of accelerometers and gyroscopes, and sometimes magnetometers. An inertial measurement unit (IMU) works by detecting the current rate of acceleration using one or more accelerometers, and

detects changes in rotational attributes like pitch, roll and yaw using one or more gyroscopes. And some also include a magnetometer, mostly to assist calibration against orientation drift. The accelerometers are placed such that their measuring axes are orthogonal to each other. Three gyroscopes are placed in a similar orthogonal pattern, measuring rotational position in reference to an arbitrarily chosen coordinate system. Magnetometers allow better performance for dynamic orientation calculation in attitude and heading reference systems.

V. CONTRUCTION AND TESTING:

Mount the components on the PCB, connect the boards and the four batteries. Use a suitable chassis for the virtual telepresence robot. Fix all the batteries underneath the chassis. Mount the PCB and boards on top of the chassis. Connect servo motors M1 and M2. Attach the RPi camera on these two motors for horizontal and vertical movements.

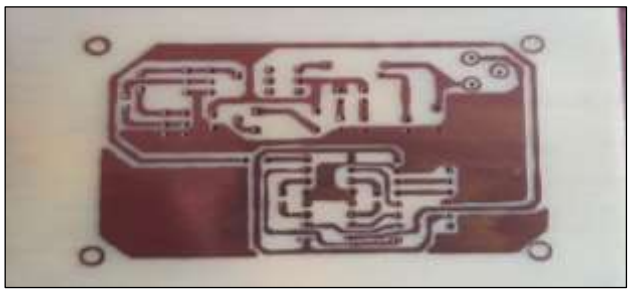

Fig 6.1. PCB

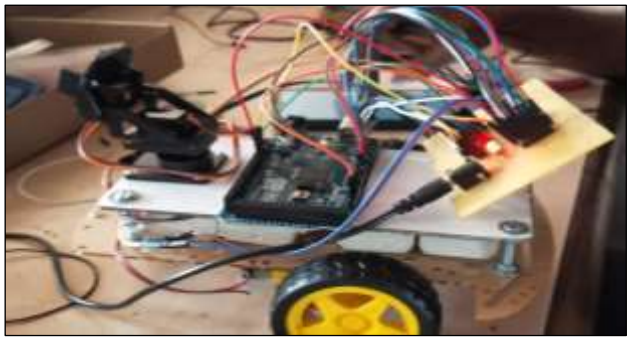

Fig 6.2. Final prototype

VI. APPLICATIONS

There are various applications of this domain system. The application is listed here.

Surveillance robot - This robot can be used as a surveillance robot. In situations where the house owner needs to keep an eye of what the servant is up to at home.

Medical - In the Medical case, at times when the doctor is not able to go on rounds, the robot can be used to check the state of the patient.

Military - Just like for space exploration, military applications include reckon missions. Gathering information about an enemy is a very common task for a military operation. Of course, the reckon missions are also the riskiest. In order to avoid the loss of humans, teleoperated reckon vehicles have been deployed. Different kinds of environments have led to build a large variety of teleoperated vehicles, both air and ground vehicles. Military vehicle

Telerobotics in Forestry and Mining - The use of heavy equipments in forestry and mining and the hazards of falling trees, rough terrain and caving in mine galleries have imposed the use of teleoperated robots. The Helsinki University of Technology has produced Work Partner, a robot which can perform forestry tasks. It is a dedicated centauroid (centaur-like) which a very well-developed human-machine interface. A vast range of tests have been done on this platform to identify also the operator's response from a psychologic point of view.

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EVOLUTION OF TELECOMMUNICATION

1876

MARCH 10

Alexander Graham Bell conducted a successful experiment with the telephone.

1935-1943

FIRST AUTOMATIC ANSWERING MACHINE

Willy Müller invented the first automatic answering machine.

THEORY OF COMMUNICATION

Dr. Claude Shannon first theorised his Mathematical Theory of Communication, which introduced the concept of using binary code (0 and 1).

1968

THE INTERNET

Initially developed by the US Defence Department in 1968 for military reasons. The internet is basically a global network of computers.

1973-1984

FIRST MOBILE PHONE CALL

Martin Cooper made the first mobile phone call

FIRST MOBILE PHONE SOLD

The Motorola DynaTAC 8000X is the first mobile phone that was available commercially.

1995

SMS (SHORT MESSAGE SERVICE)

The 'Special' Nokia tone for receiving SMS text messages is Morse code for 'SMS'

FIRST INTERNET PHONE SERVICE

The first Internet Phone Service was created by the Israeli company VocalTec.

2000 AND BEYOND

INFORMATION APPLIANCES

'Information Appliances' make Internet mobile, wireless "Web to Go", voice activated dialling, phone numbers for life, phone calls and Internet on your TV, TV via wireless phones, and much more.

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M.E. in Electronics & Telecommunication Engineering
M.E. in Computer Engineering
M.E. in IT(Information & Cyber Warfare)
M.E. in Civil Engineering (Construction & Management)
M.E. in Computer Engineering (Computer Network & Information Security)

PhD (Technology)

Civil Engineering
Computer Engineering

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