NIGHT PATROLLING ROBOT WITH SOUND DETECTION FOR SECURITY USING IOT

Submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering Degree in Electronics and Communication Engineering

by

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of M. DEEPAK KUMAR (37130237) and B. SAI RAM (37130063) who carried out the project entitled **"NIGHT PATROLLING ROBOT WITH SOUND DETECTION FOR SECURITY USING IOT"** under our supervision from September 2020 to April 2021.

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Submitted for Viva voce examination held on _____

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DECLARATION

We, **M. DEEPAK KUMAR (37130237)** and **B. SAI RAM (37130063)** hereby declare that the Project Report entitled **"NIGHT PATROLLING ROBOT WITH SOUND DETECTION FOR SECURITY USING IOT"** done by us under the guidance of **Mr. L. JEGAN ANTONY MARCILIN, M.Tech.,** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

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ABSTRACT

Safety is the biggest priority in the world. Reconnaissance and observation of our homes have seen a developing need in arising times. By means of this paper, we put forward the Development of the night patrol robot that is used to find the sound waves in the surroundings, and security patrolling services. The robot records and begins to relay photographs of the situation immediately after detecting the sound. These captured images are sent to the respective email and cloud through the Internet of Things (IoT). The robot is able to perform security patrols during the night while functioning while at the same time working as a guide during the day. We designed and implemented a patrolling robot which provides security in our surrounding areas, and easy to assemble. Here we are using IoT technology to receive the captured images and also cloud system, which provides the warning messages to the user. Our Project suggests that the robot is user-friendly and pleasing to the people, it can perform security for human beings.

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CHAPTER 1

INTRODUCTION

In today's world, the use of technology is increasing day by day. Robotic machines are getting used in many places. Since technology is upgrading, we humans are designing different categories of robots and implementing different kinds of programmable functions for them. At present, robots are getting used in different types of industries like defense, research, security, etc. Each robot functions its own task efficiently and it requires less cost for implementing these types of robots.

These robots can be re-programmable and work faster when compared to humans and can perform in any kind of environmental condition. In this project, a patrolling robot is made for security purposes when and where a human can't monitor in their busy schedule. Generally, surveillance means monitoring our surroundings with our naked eyes. But, when it comes to machines, it's a kind of task that the robot has to perform according to the programmed functionality.

Here the robot is build up with a camera that can capture or record in different angles of view to identify the unknown object or an unknown person. This project's main functionality is to perform patrolling services at the night by using a sound sensor. The sound sensor is used to recognize the sound and perform accordingly. We are using a miniature size of patrolling robot so that it can travel to any kind of place in the building. The proposed system classified into two sections mainly a robotic section and a remote control section. The robotic section consists of the webcam, sound sensor, and also the heart of the project, raspberry pi which is connected together with the PCB containing motor-driven IC and voltage regulatory systems.

1.1 EMBEDDED SYSTEM

Generally, the combination of multiple hardware components that gets embedded with a software part. It is defined as hardware being embedded to a software. We use Embedded C language to code in the microprocessor or controller. It is a mixture of both hardware and software components. There are many advantages of using embedded systems, mainly we can customize freely and it is affordable accordingly in our range. This systems mainly consumes very less power.

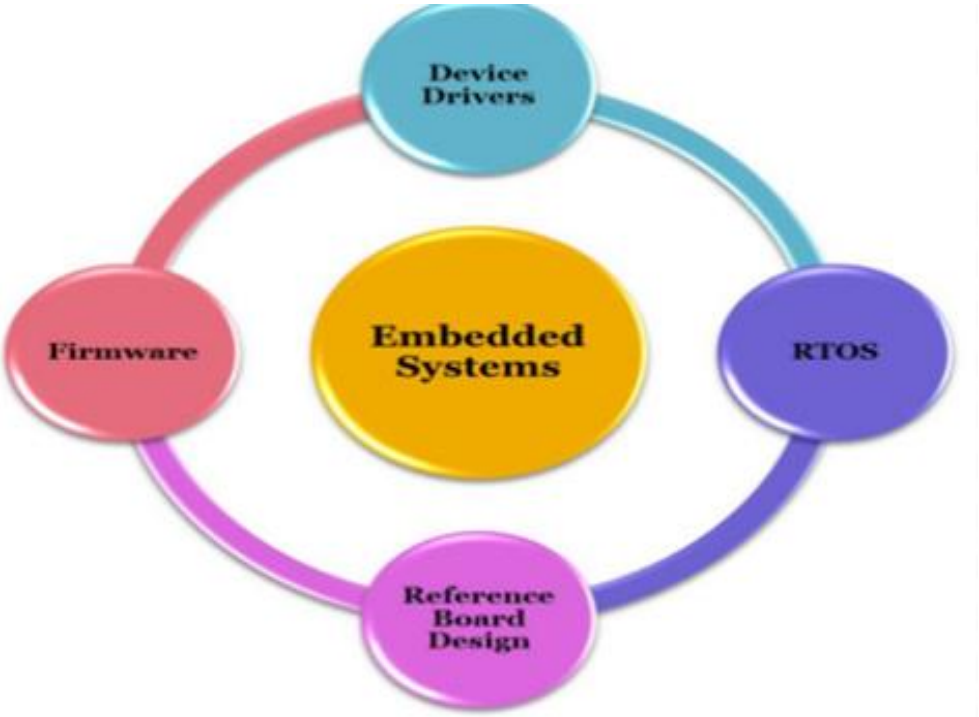

Fig: 1.1 : Embedded Cycle

Embedded system is an untied framework. It is a chip based microcontroller that is contemplate to play specific endeavor. With regards to this there are few disadvantages of using embedded system. The design of this kind of system has huge development effort.

1.2 COMPONENTS OF EMBEDDED SYSTEMS

It is classified into three major sectors.

- Embedded system software
- Embedded system hardware
- Operating system

The Embedded system software is designed to perform a particular functions or a particular tasks. Generally, there are many coding languages which contain their own specific syntax to execute a function and perform the task. This coding languages used are both high-level and mid-level. First we have to write and compile it in specific software and after successful then we can dump the code within the hardware device. For these we need certain specific processors for our like sufficient storage unit, high clock-speed to run the code.

The Embedded system hardware is designed to perform the specific operation practically.

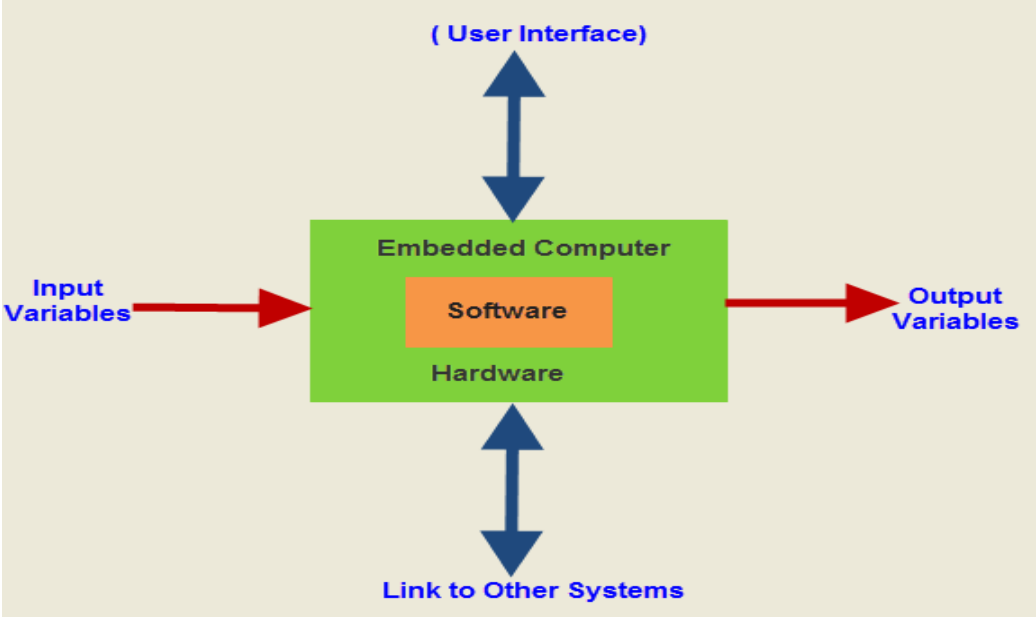

Fig: 1.2 : schematic interface of ES

This Hardware system require few elements like.

- Power source unit.
- Specific processor.
- Storage or memory element.
- Communication ports like input-output, user interface.
- Few devices contain display unit.

Emiliar systems are computer systems, but they face a particular challenge in distinguishing between various devices – from no UI to sophisticated user interfaces, as seen on mobile devices. Keys, LEDs, sensor tactiles, and other user interfaces are used. Remote user interfaces are also used by some applications.

1.3 APPLICATIONS OF EMBEDDED SYSTEMS

We can use embedded system based software's or devices in wide range of areas. Starting from our home appliances to telecommunication and military applications. There many kind of real-time projects or equipment's based on embedded systems. Here are the few major applications.

- We can embedded systems in our home appliances which are of both wired and wire-less devices.
    - We can control lights.
    - Can secure our premises.
    - We can audio or visual control using embedded devices.
- We can also see use of embedded in various medical applications.
- There are various real-time devices in industrial sector.

1.4 THE INTERNET OF THINGS

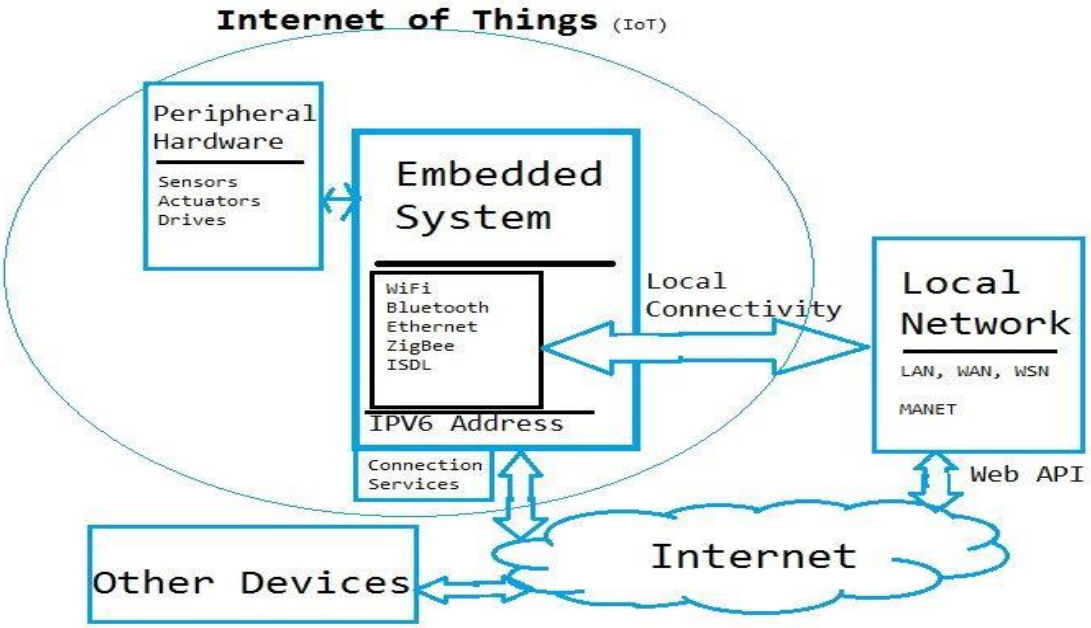

Fig: 1.3 : IoT

There are few embedded devices that are very simple and need for human is not necessary. Enlarge number of this devices either eliminate the need for human decision-making or have functionality beyond that of humans. Some aircraft, such as drones, can, for example, combine sensor data and operate faster than humans, allowing for new forms of functionality. This module examines the parts of both the equipment and programming segments in the framework. The elements of normal

equipment parts are depicted and the interface between the product and equipment through the microcontroller is clarified gadgets frequently utilize a working framework help the association between the product and the microcontroller. We will characterize the job of a working framework in a gadget and how a working framework contrasts from a standard one. There are many well-being advantage of using the internet of this which is displayed in below imge.

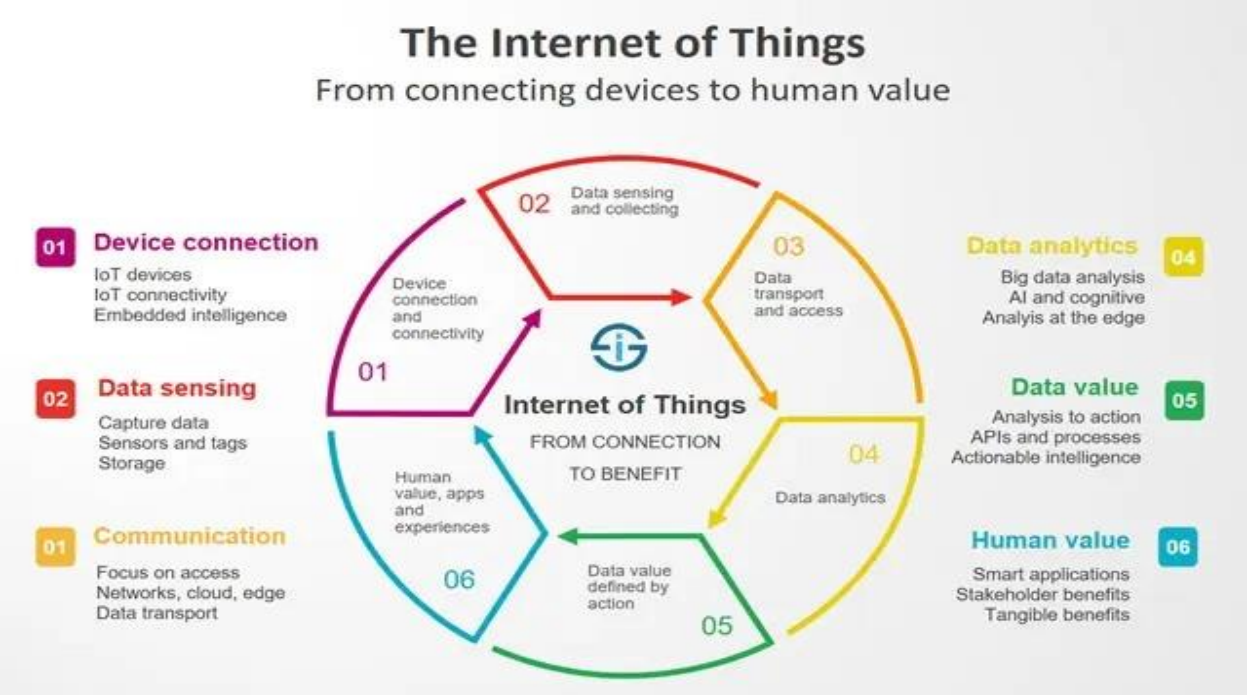

Fig : 1.4 Benefits of IOT

CHAPTER 2

LITERATURE SURVEY

Tahzib Mashrik, Hasib Zunair, Maofic Farhan Karin(2017)

Robots are widely utilized in various security and surveillance applications. Tahzib Mashrik, Hasib Zunair Maofic Farhan Karin proposed a surveillance robot that consists of a camera, Bluetooth, GSM module, and software application for mobile interface. The Robot is controlled manually by using Either Bluetooth or a GSM module and monitor through the camera. The robot is designed in such a way that there is no need for manpower at the location but to monitor and control manpower is needed. The main disadvantages are, the robot is not fully autonomous, and there is no cloud storage facility.

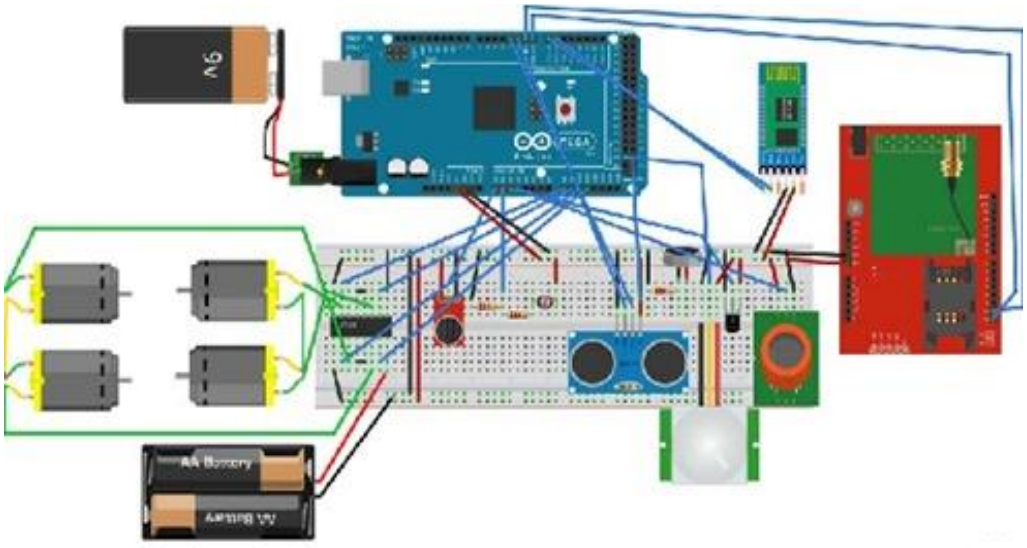

Fig : 2a : Demonstration of robot using android application

James Mount and Michael Milford(2016) proposed the domestic service robot in such a way that lawn mowing and vacuum cleaning robots exist today. Whereas there

are many robots for obstacle detection, but there is a chance that the robot will move or patrol in the same area. So, James Mount and Michael Milford designed the robot to 1D scan the environment. It works as an obstacle robot for the first run and makes its 1D scan and provides boundaries of every room. After the first run and 1D scan, the robot can patrol against any obstacles.

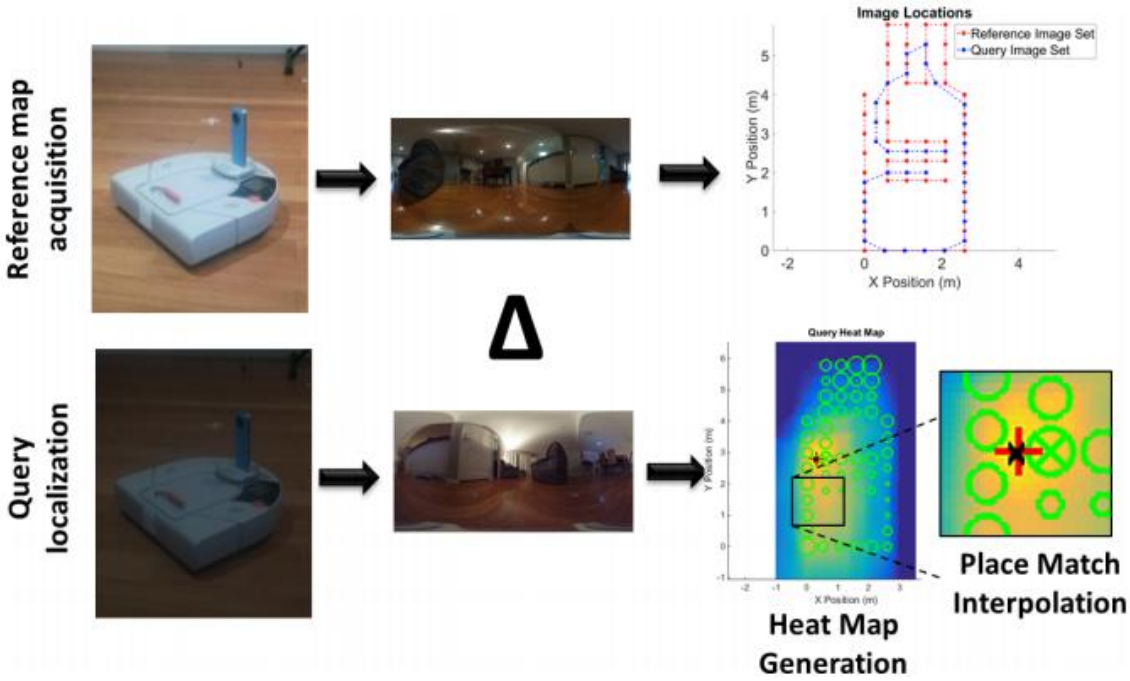

Fig : 2b : 2D-visual robotic system architecture

krik Mac Tavish, Michael Paton, Timothy D(2017) The Robot named Night Rider is proposed by krik Mac Tavish, Michael Paton, and Timothy D. Barfoot. The robot is mainly based on Visual Odometry where it detects the motion from a sequence of camera images. A couple of headlights are used as an alternate lighting source and the performance under all lighting conditions nearly 10km of driving over 30 hours.

Fig: 2c : Aerial image of VO

Fig : 2d : VO in night view using headlights

M. Bertozzi(2015) The Far IR camera are suitable for the detection of objects that are warmer compared to the background by using this theory M. Bertozzi proposed the robot which patrols and detects all living beings around captures them.

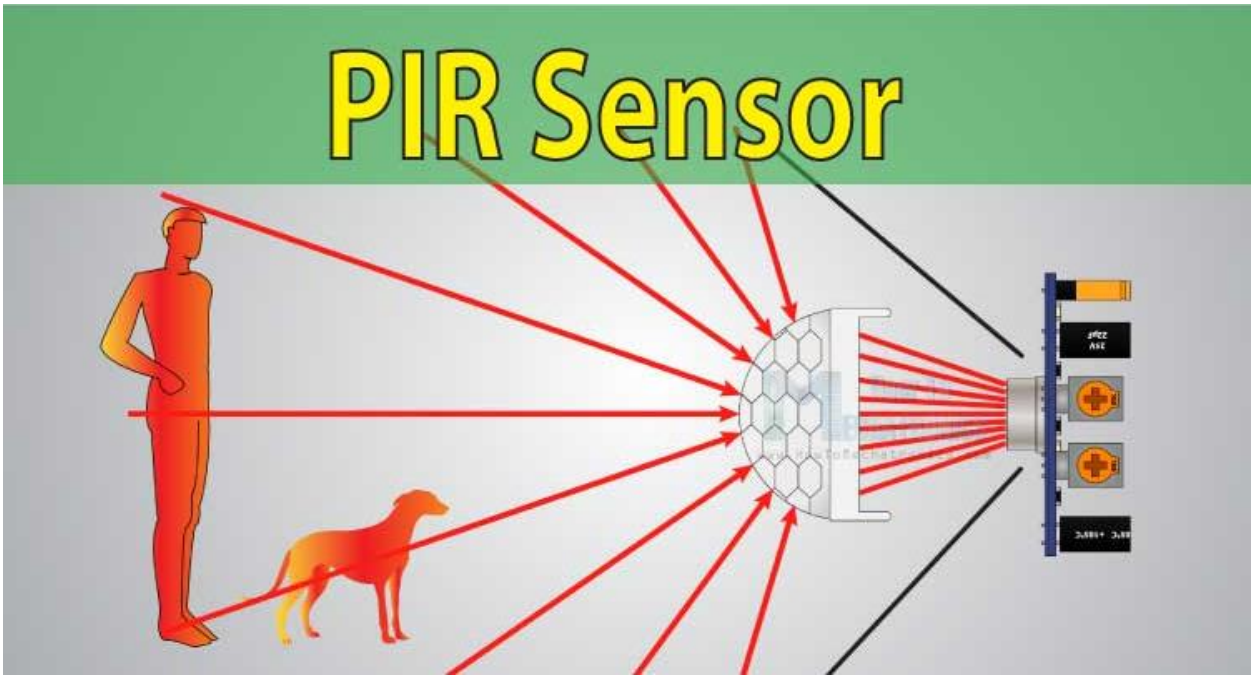

Fig : 2e: PIR sensor working

This proposed system captures every hot object compared to the background. Where it leads to the capture of unwanted information that is not related to security. If there are any two hot objects 180 degrees from each other when the robot camera has to turn around for every capture. But the advantages are it can detect the bodies that are on another side of the walls.

Sonu Kumar, Suraj Kumar, Shruti Shankar, Sakshi Saxona (2015) Shrowd Wireless Surveilance BOT with video checking and object staying away from the office. Worldwide Research Journal of Engineering and Technology (IRJET Robots these days assumes a significant part in the day by day mechanical tasks as well as are widely utilized in the territories of safeguard , ventures , clinical and home applications. They can complete diverse dangerous positions that are impossible by a human. This

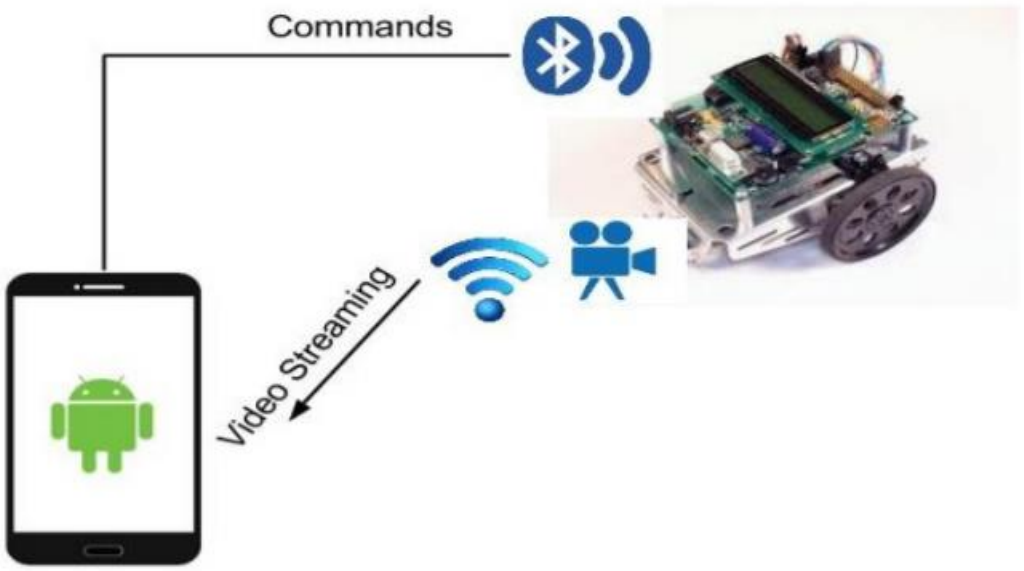

Fig: 2f : Demonstration LDR for night vision

paper presents a Surveillance robot that has its significance in protection and military reason. It proposes of the manners by which robots can be utilized in the future to perform troublesome undertakings by the utilization of different sensors like LDR sensor for night vision, fire location sensor with siphon engine to quench the sensors for pathfinding and hindrance evasion, dampness sensor. This paper, notwithstanding, presents just the utilization of article evasion office and a camera mounted on the highest point of to give constant visual checking. In the similar ways, various other facilities can also be incorporated into it by interfacing the corresponding sensors.

CHAPTER 3

AIM AND SCOPE OF THE INVESTIGATION

3.1 EXISTING SYSTEM

- In existing system, they used a sensor called PIR, This sensor detects the level of IR radiation from the lifeforms.
- We can’t monitor the sound.
- There is no facility of Internet of Things IOT.
- In existing camera is not available.

3.2 PROPOSED SYSTEM

- The proposed system can be used for securing whole area and protecting humans.
- The developed night patrol robot is used to find the sound waves in the surroundings, and provide security patrolling services.
- Sound sensor detects the sound and it will activate the camera to capture the image by using Raspberry Pi camera.
- The captured images are sent to the respective email id through IOT.
- An alert message which contains captured image time and date is sent to the respective cloud through IOT.
- Concerning this, the warning message which contains the captured image time and date will be saved in the cloud.

- This alert message provides extra information regarding the image date and time so that the user can use this for further proceedings.

ADVANTAGES:

- By using IOT, we can monitor our surroundings from anywhere.
- Though we security cameras in our premises, this proposed system provides extra security where our security camera range exceeds.

3.3 BLOCK DIAGRAM OF PROPOSED SYSTEM

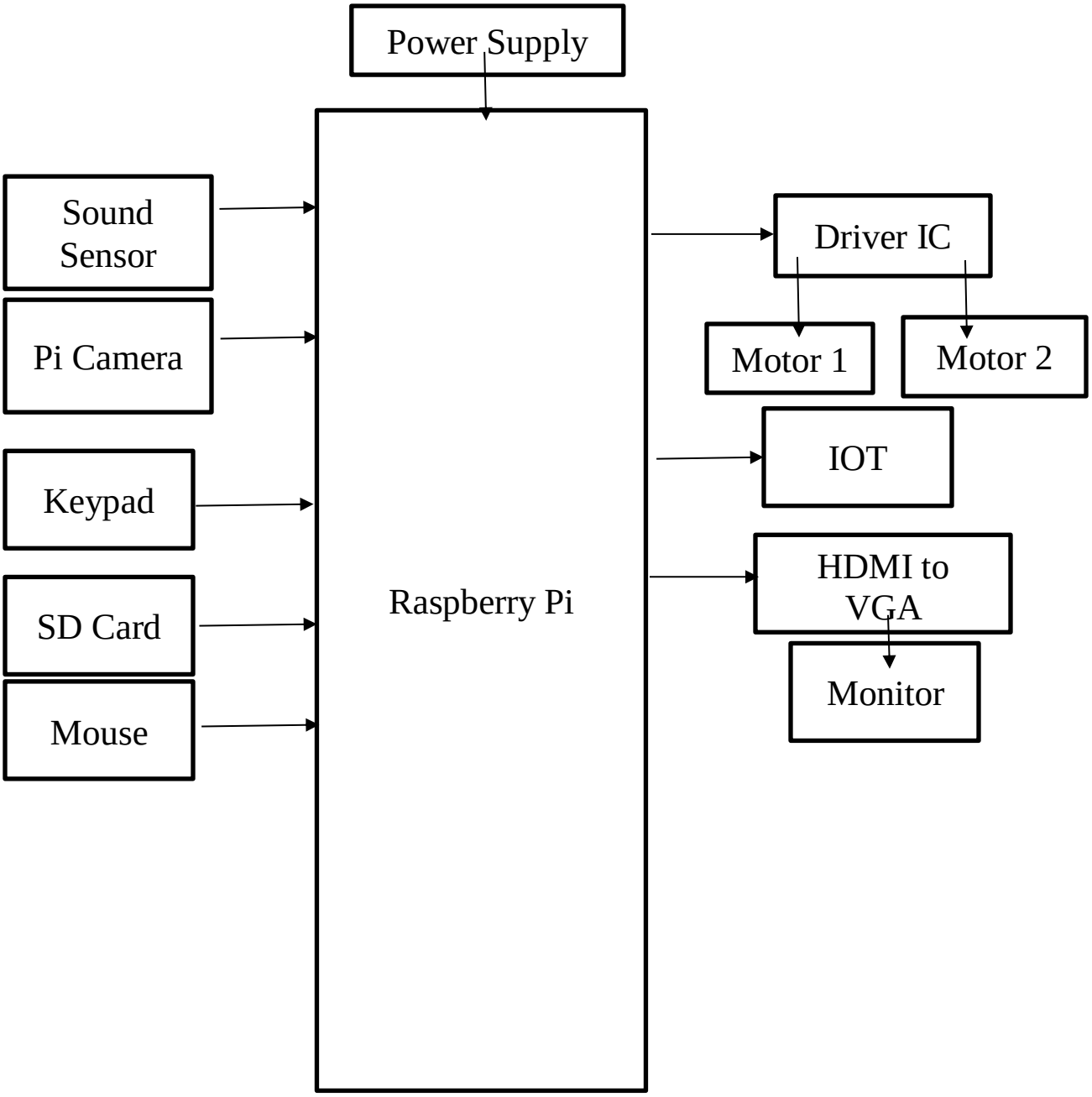

Fig: 3.3 : Block Diagram of proposed System

CHAPTER 4

MATERIALS AND METHODS USED

4.1 HARDWARE REQUIREMENTS

- Raspberry Pi
- Sound Sensor.
- Motor.
- Driver IC.
- Pi Camera.
- SD Card.
- HDMI to VGA Converter.
- Monitor.
- Keypad.
- Mouse.

4.1.1 RASPBERRY PI

The Raspberry Pi development negligible of a single-board made in the UK by the Raspberry Pi Foundation to move the educating of basic programming in education institutes and in horticultural countries.

Raspberry pi describes into different models with different features. Each model has different categories of storage units and USB ports which is stated briefly in the below table. The can be selected based on the mode of usage and budget. The Raspberry with high Random access memory (RAM) will perform better compare to other versions. The high storage unit can make it more flexible to store more data collected from the output unit.

	Model B+	Model B	Model A
Chip	Broadcom BCM2835 SoC full HD Multimedia Applications Processor	Broadcom BCM2835 SoC full HD Multimedia Applications Processor	Broadcom BCM2835 SoC full HD Multimedia Applications Processor
RAM	512 MB SD RAM @ 400MHz	512 MB SD RAM @ 400MHz	256 MB SD RAM @ 400MHz
Storage	Micro SD	SDCard	SDCard
USB 2.0	4 × USB Ports	2 × USB Ports	1 × USB Ports
Power Draw/Voltage	600mA upto 1.8A @ 5V	750mA upto 1.8A @ 5V	600mA upto 1.8A @ 5V
GPIO	40	26	26

Fig : 4.1.1a : classification of raspberry pi

We are using is model B+ raspberry pi in our project, where it consists of four USB ports 4.1 version of Bluetooth, 3.5mm headphone jack to earphones or speakers, HDMI to monitor port, 2.5 micro USB power port, A SD micro card.

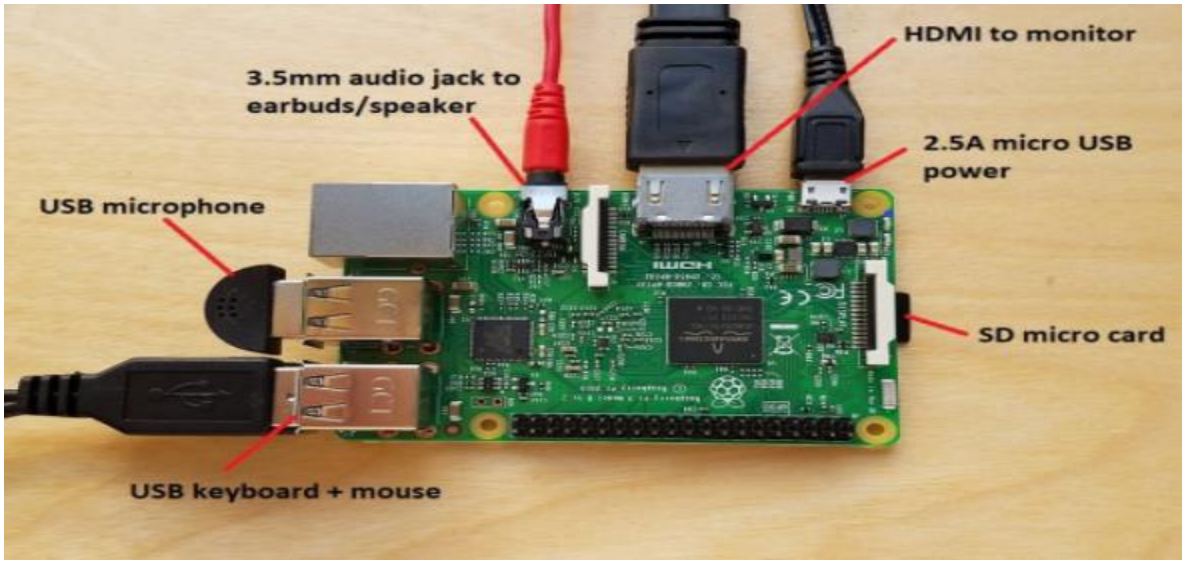

Fig : 4.1.1b : Raspberry pi board

HARDWARE

The Raspberry Pi chip contains an advanced feature for few forms which include various categories in storage limit and fringe mechanism support.

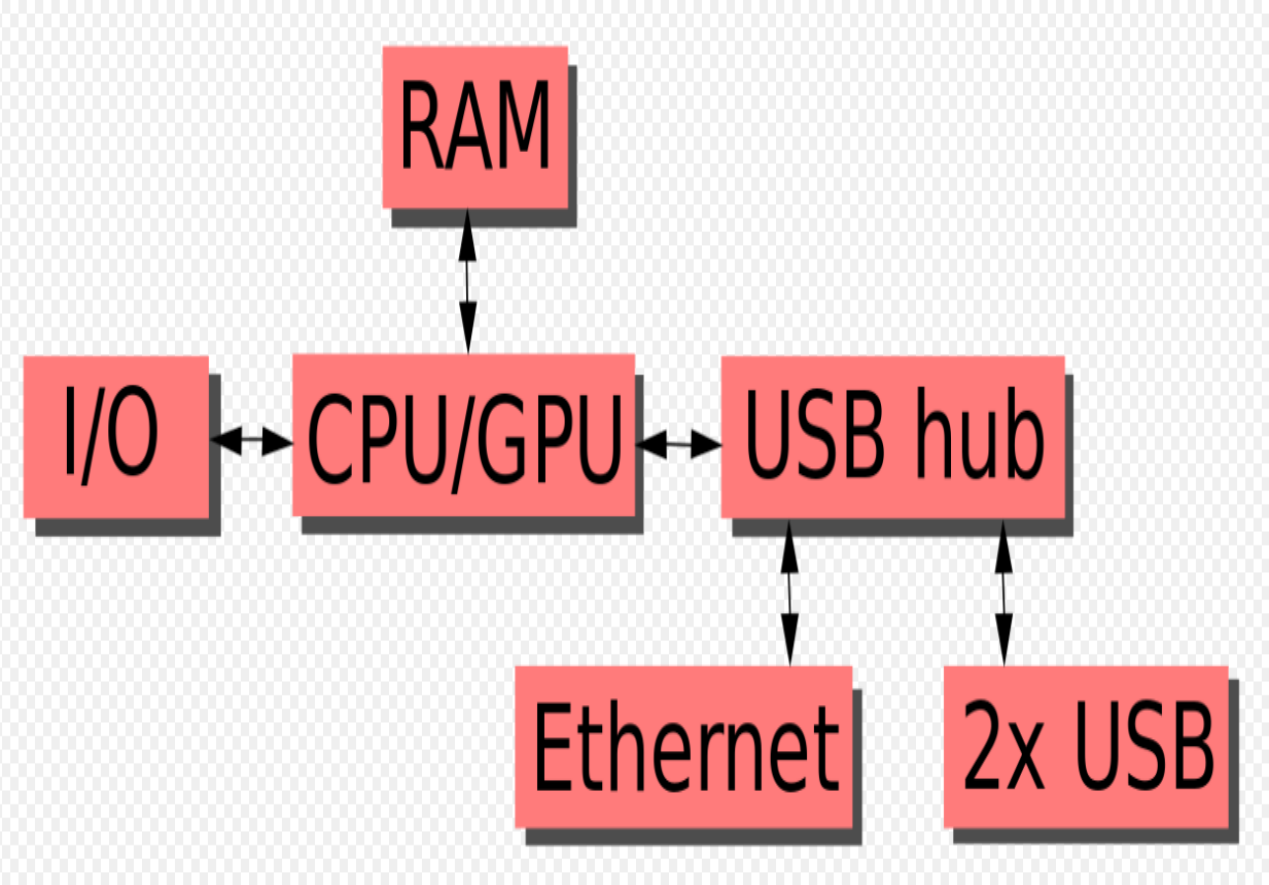

Fig 4.1.1c Raspberry pi overview

This graph portrays all three Models starting from model A to the latest B+ model. Thus both Ethernet and USB center point partition are not comparative. But, when it comes model A+ and A, Both USB port and pi zero is associated with the framework on SOC chip.

4.1.2 WEB CAMERA

The Raspberry pi camera we used here is a 5mp camera. It is capable of capturing still images with fixed focus and it can capture high-definition video. The pi camera is attached to Raspberry pi. The images captured are sent to mail through IOT module.

Microphone

Check if the webcam has an implicit amplifier. How solid of a mic you require will rely upon the sort of videoing you'll be doing. Most video visiting (like Skype) should be possible sufficiently with a webcam's underlying mic. Webcam amplifiers have progressed a lot as of late. Check for highlights like double amplifiers and omnidirectional mics that can record sound from each bearing. Truly top-notch recording for webisodes or other higher-tech movies will in any case require a redesign. For those circumstances, you might need to put resources into an outside mouthpiece.

Video Effects

Do you like to use images or remarkable establishments while recording? A couple of models go with programming that grants you to get silly with your filmmaking

Lens

A very good quality webcam will have a glass focal point while an all the more respectably valued model will have a plastic focal point. Similarly as with amplifiers, regardless of whether this distinction matters will rely upon the sort of recording you'll be doing. Most plastic focal points are totally satisfactory for Skype and other video visit programming. For more expert video creation, think about putting resources into glass.

WEB CAMERA

Fig:4.1.2a : Web Camera

A few other visit programs likewise work with webcams, permitting clients to set up video talk meetings with companions. Since real time video over the Internet requires a ton of transmission capacity, the video transfer is regularly compacted to diminish the "roughness" of the video. The greatest resolution of a webcam is likewise lower than most handheld camcorders, since higher goals would be decreased in any case. Hence, webcams are moderately modest contrasted with most camcorders. And keeping in mind that they may not be ideal for recording a film, webcams are extraordinary for video visit meetings with companions.

FUNCTIONS

A webcam is a little camera joined to a PC. They fill an assortment of needs, from taking actually pictures to sending a live video over phone calls. Numerous workstations have a webcam worked in to the PC screen, yet outside webcams are additionally sold. In the event that you buy an outside webcam for use, you may likewise have to get an amplifier in the event that you plan on utilizing the camera for either caught or live video.

Fig : 4.1.2b camera inner view

Still Images

A webcam can work as an advanced camera, snapping still pictures. By and large, when a webcam is enacted, and the picture it is pointed at shows up on your PC screen, an image is taken by hitting a particular key on the console or clicking a catch on the screen. When a pictures is caught, it is saved to the PC hard drive

Videos

Webcams can likewise record short video messages. Like taking actually pictures, recordings are caught by tapping on an assigned catch on the PC screen. In contrast to in any case pictures, recordings require the demonstration of beginning and afterward halting the camera. The beginning and stop catches are typically something very similar and have a red flickering circle when the camera is recording. A video is saved to the PC's hard drive.

4.1.3 SOUND SENSOR

As the name indicates, sound or noise sensor senses the sound using sound waves. This sensor finds intensity of the sound waves and then decides the operation based wave resulted. The operation is pretty simple that it detects the intensity of the sound and convert it in to electrical signals. Check if the webcam has an implicit amplifier. How solid of a mic you require will rely upon the sort of videoing you'll be doing. Most video visiting (like Skype) should be possible sufficiently with a webcam's underlying mic. Webcam amplifiers have progressed a lot as of late. Check for highlights like double amplifiers and omnidirectional mics that can record sound from each bearing. Truly top-notch recording for webisodes or other higher-tech movies will in any case require a redesign. For those circumstances, you might need to put resources into an outside mouthpiece.

Sound Sensor Pin Configuration

This sensor includes three pins which include the following.

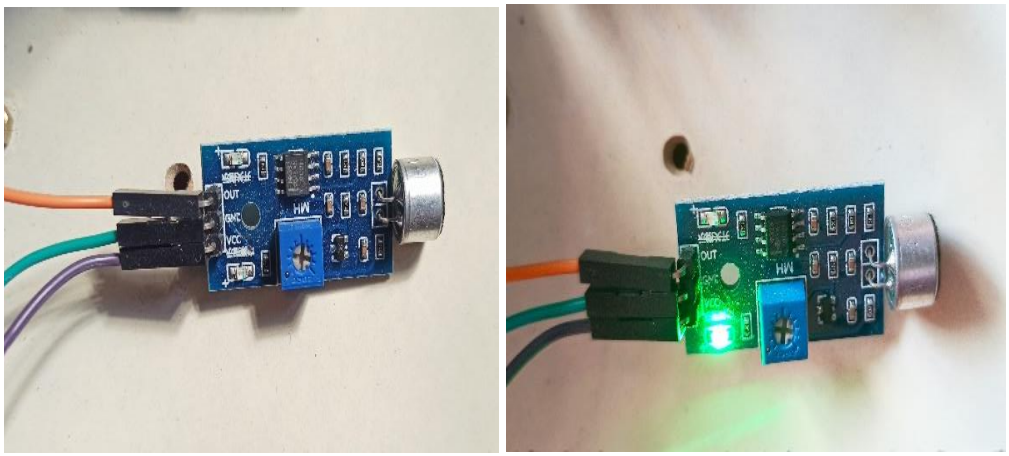

Fig: 4.1.3 : Sound Sensor

Pin Configuration

- Pin1 (VCC): 3.1V DC – 5.1V DC.
- Pin2 (GND): Ground pin
- Pin3 (DO): Output pin

Specifications

- Current : 4~5 mA
- Voltage gain : 26 dB
- Sensitivity of microphone : 52-48 dB
- Frequency of microphone : 16-20 kHz
- S/N ratio: 53 dB

Working Principle

The functioning guideline of the sensor is identified with living beings ears. Since the natural incorporates a stomach and primary capacity of stomach is, it utilizes waves and turn it into signals. Though this sensor, it utilizes a receiver and the fundamental capacity of this is, it utilizes the waves and differences into current in any case voltage. By and large, it incorporates a stomach which is planned with magnets curved with wire. At the point if sound signs collide the stomach, at that point magnets inside the sensor vibrates and all the while current can be animated from the curls.

4.1.4 DC MOTOR

A motor is a mechanical device that produces an output DC Motor is an electric powered machine that runs on direct current. It runs on the principle of electromagnetism. It follows basic electromagnetism principle which states that when the current is supplied the electromagnetic field is created outside the motor which makes the motor to rotate.

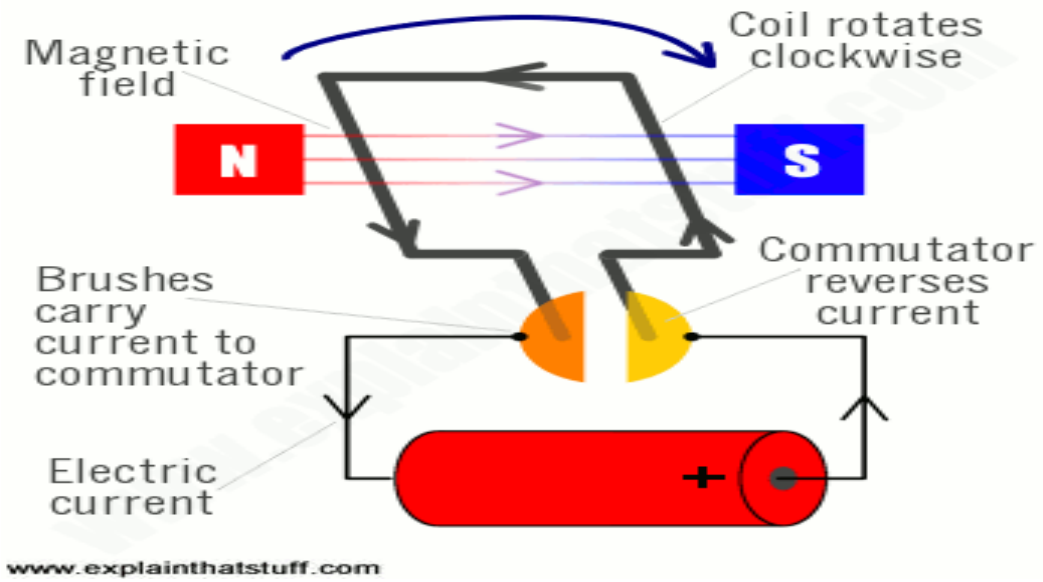

Fig:4.1.4a : DC Motor

The engine works in the following manner: It is possible to use an alternate current that alternates its direction on a regular basis (AC) Tiny battery motors, such as those found around the house, are the safest way to connect a switch to the coil's ends. It's not like commuting; this out-of-date word is unprepared for the technique's meaningless name.

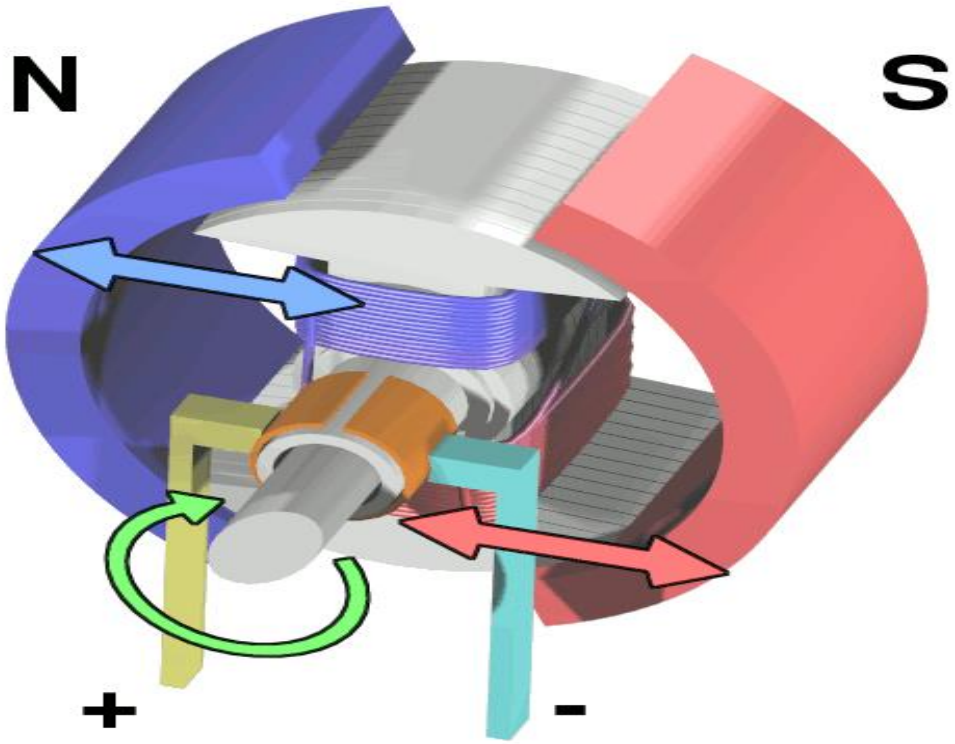

Fig : 4.1.4b DC motor internal view

When the belt rotates around Its, the switch a -half metal ring with the job of adjusting the electric current in the belt. Hall of the switch will be attached to one end of the spindle. The motor's electric terminals are attached to the power supply. The switch is regulated by a few loose connectors called graphite brushes, which are springy, thin metal lengths that are "brown on the switch, as the name Implies When the switch is pressed, the spindle rotates continuously along the path of the circuit's electricity flow.

Advantages

- Cost efficient
- High Reliability

4.1.5 L293D MOTOR DRIVER

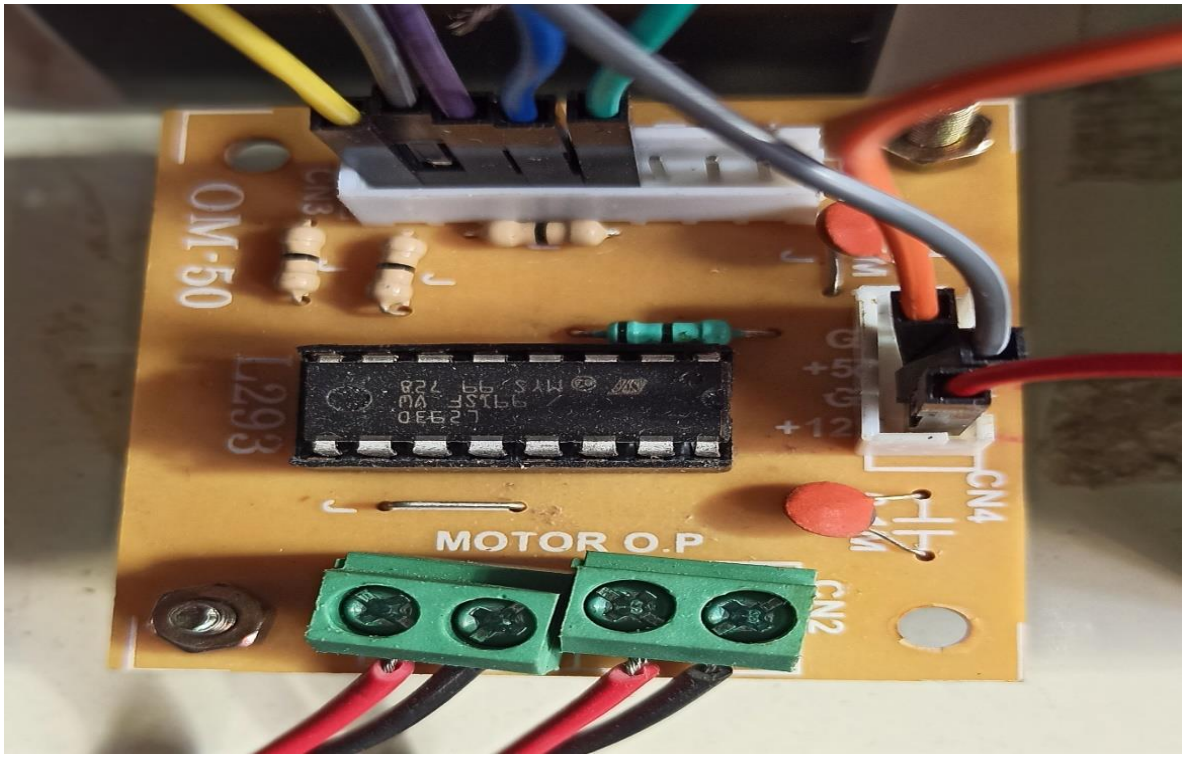

Fig: 4.1.5a : Driver IC

L293D circuit is a very popular 16-Pin Motor Driver IC. Which is used for making so many IoT Hardware projects. As the name suggests that it is used for driving the motors, these motor drivers are used where the DC Motors are used. The working of this driver is very simple, for the automobiles which has less than 36 volts as the operating voltage can be managed by the virtual circuits like Op-Amp, Timer circuits Arduino, PIC etc.,

Working Principle

Using L293D Motor driver is quite simple. There is an IC that is embedded onto the circuit and it works on Half H-Bridge.A H bridge is a set up used to drive the motors

each in both clock wise direction and viz. This IC is used to wake up the vehicles in the automobile industries.

PINDIAGRAM

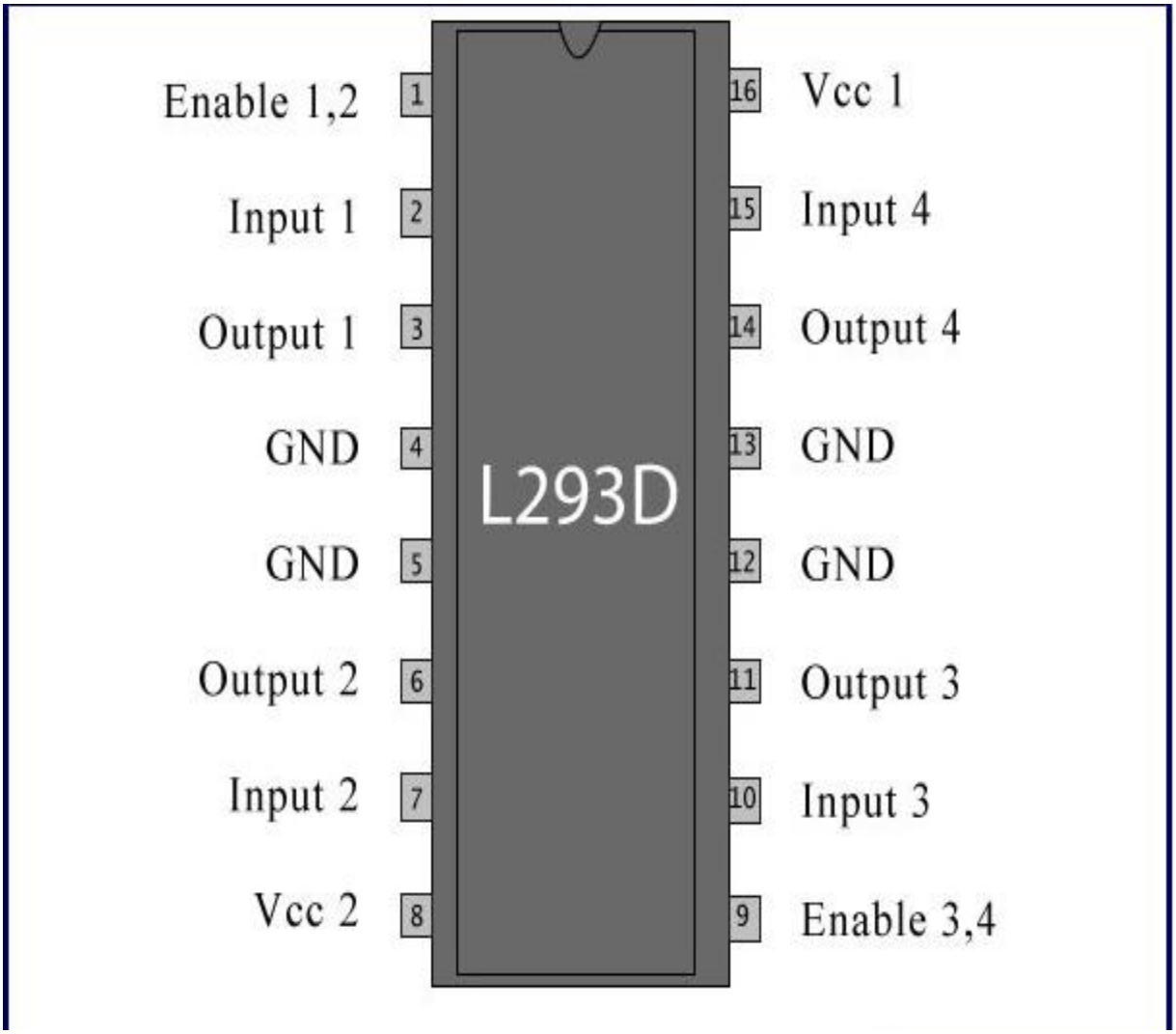

Fig: 4.1.5b : Pin Diagram

The above diagram is the PIN configuration of the L293D Motor Driver, there are 16 pins. 16th pin is the Vcc Pin and the Ground pins are at the positions (4,5,12,13).The above diagram is the schematic view of the working of the Motor driver. The three main components that are required to run a vehicle is Microcontroller, Motor driver, DC Motor. Motor driver generally needs Microcontroller and a DC Motor for the machiene to run.

4.1.6 Bluetooth Module

The ESP8266 provides a full and independent wireless Internet solution for hosting or discharging all Wi-Fi networking functions from another application processor. If the ESP8266 programmer is the only programme on the computer, it can boot from an external flash drive, The cache has been used to increase device capacity and reduce memory requirements in these applications.

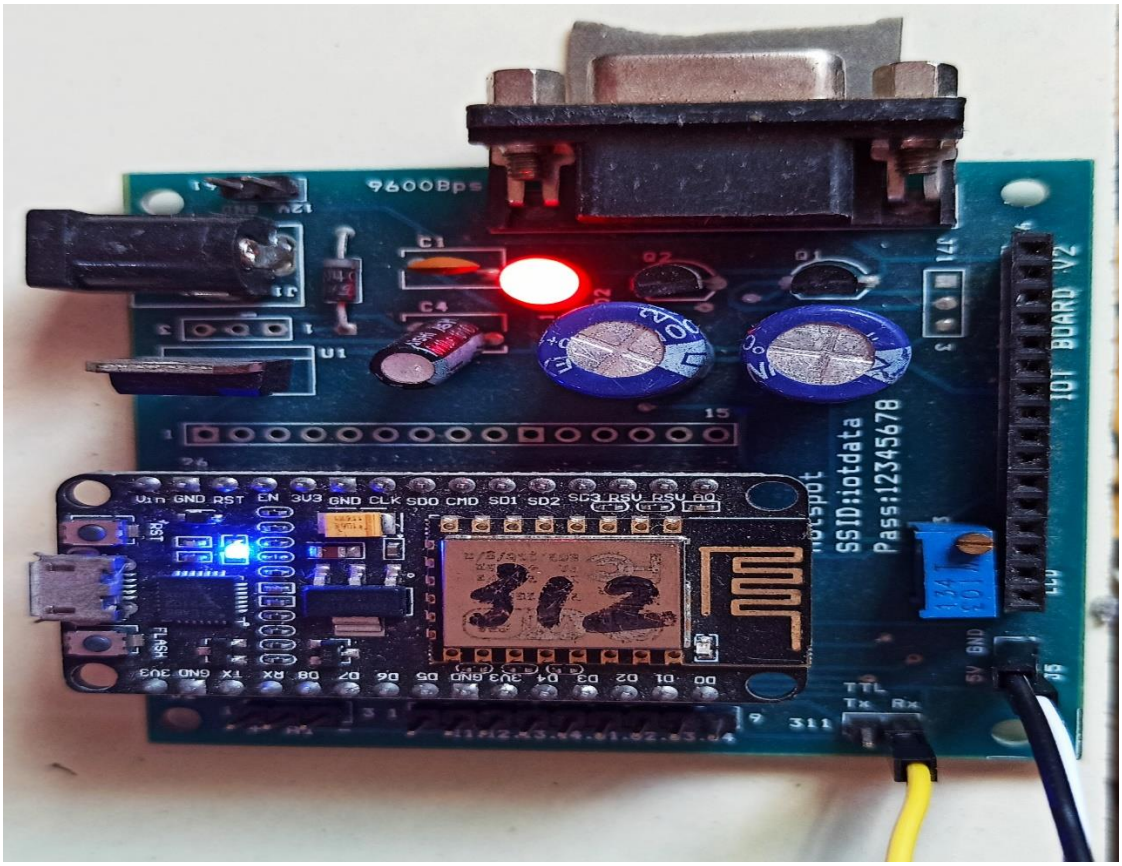

Fig: 4.1.6: ESP module

Any design based on a microcontroller will benefit from the use of the UART or CPU AHB bridge interface as a Wi- Fi adapter ESP8266 can be integrated into sensors and other applications through its GPIOs , with minimal upfront formation and low load during operation , thanks to its on - board processing and storage ability. It only requires a few external connections and is designed to cover a small PCB region, including an antenna switch baluna, a power management converter and a complete solution, including the front-end module, with a high degree of on-chip integration.

4.1.7 PI CAMERA

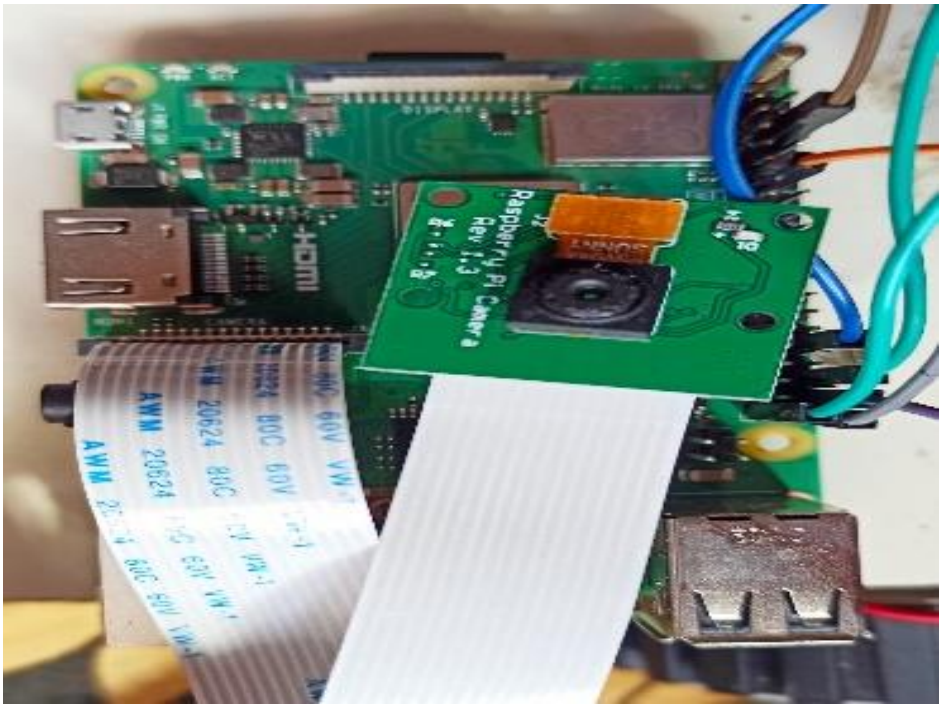

Fig: 4.1.7 : PI Camera

The Raspberry pi camera we used here is a 5mp camera. It is capable of capturing still images with fixed focus and it can capture high-definition video. The pi camera is attached to Raspberry pi. The images captured are sent to mail through IOT module.

PiCam Features

- Raspberry Pi camera module with 5MP without microphone
- Ominivision 5647 Camera Module.

Applications

- We can use in surveillance projects
- We can record Time-lapse video

4.2 SOFTWARE REQUIREMENTS

- Raspbian OS
- Python
- Cloud

4.2.1 RASPBIAN OS

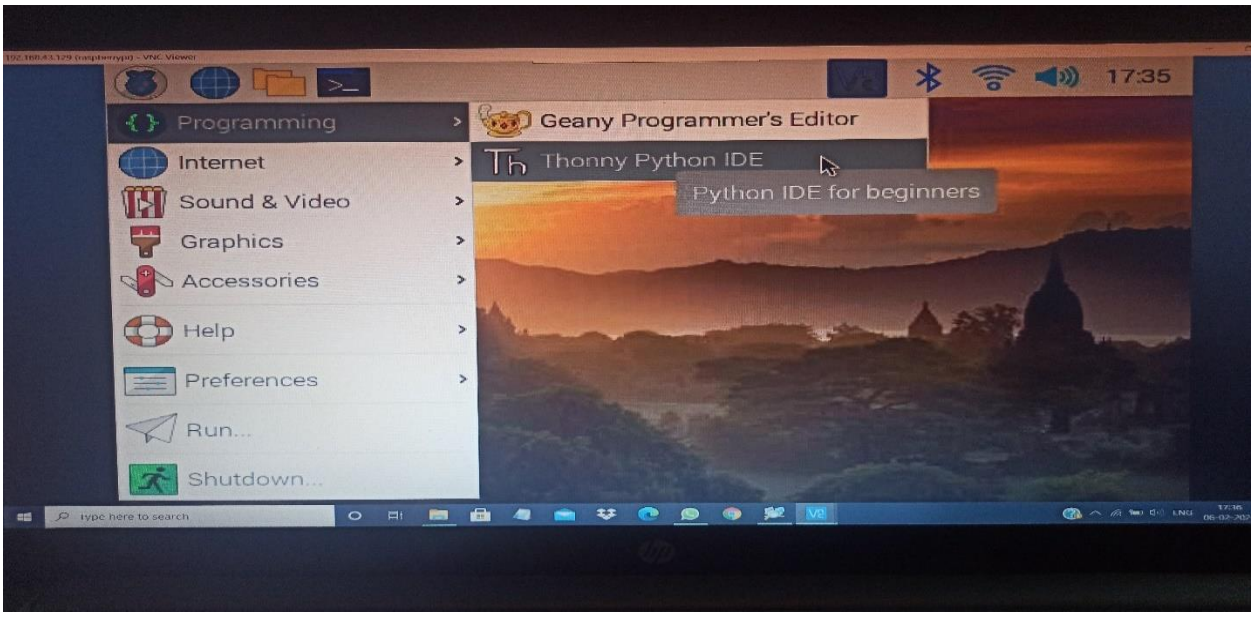

Fig: 4.2.1a : Raspbian OS

In the proposed system, we are using raspberry pi as the main component. So for executing any code through raspberry pi, first we need to install Raspbian OS on our monitor. We have to follow certain steps before installing the Raspbian OS on the computer.

For this, we need an HDMI to VGA converter, a micro SD card, a keyboard, and a mouse. We can't install this operating system on our laptop, since they are built-in with windows or mac operating systems. So it will be time-consuming and we can't carry our

computers everywhere. To overcome this we are connecting Raspberry Pi to our laptop by using our smartphone's hotspot and by using few applications like VNC viewer, Etcher, Putty, and Advanced IP scanner. Let me explain in detail, how to connect raspberry pi to the laptop without any HDMI cable or Ethernet cable.

- The things you will require for this is are a Raspberry pi model B+, a Micro SD card, a smartphone for making a hotspot, SD card adapter for connecting it to the laptop.

- In the hotspot network, we will bring both raspberry pi and laptop on the same network.

- First download Raspbian OS from the official site of Raspberry pi and in the meantime format the micro SD card using SD card formatter.

- As mentioned we need to install few applications on our laptop. The things we require

  i.Etcher: We will write the operating system into an SD card using Etcher.
  ii.Advance IP Scanner: We will scan the IP address of the raspberry pi using this.

  iii.Putty: We will use putty for doing SSH.

  iv.VNC viewer: We will use this to see the raspberry pi desktop.

- After installing these applications, dump the installed Raspbian OS into the micro SD card using Etcher. Open Etcher, the first thing is to select the zip file we have downloaded Raspbian OS and flash it.

- Now open the boot file on your laptop and create a new text file and save it as SSH.

- Go ahead to our smartphone and turn on the hotspot. Note down the hotspot's name and password.

- Now copy a file to the SD card, which contains a code to connect the raspberry pi to our phone's hotspot. Before copying the file, make sure to name the username and password of our hotspot.

- Remove the SD card from the laptop and insert it into a raspberry pi. Now give power supply to the raspberry pi by connecting the USB cable to the laptop or any power bank.

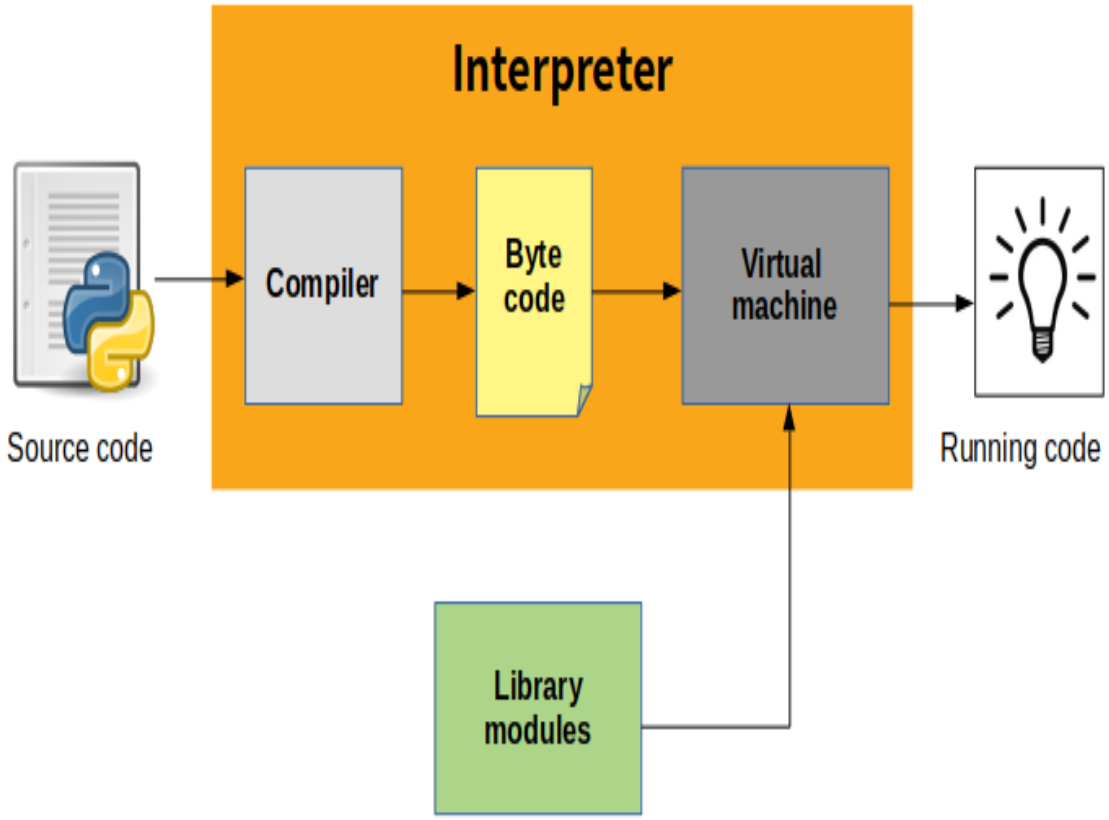

Fig: 4.2.1b : Python Interpreter

- Open an advanced IP scanner and run as administrator. Before running this application, connect your laptop to the hotspot you created with your smartphone. This is important that we need to bring our laptop and the raspberry pi into the same network.

- Know your laptop's IP address and search for the base IP address. Now scan the IP address mapping from 1to the base address in the Advanced IP.

- Scanner. The IP address of raspberry pi will be identified. Copy this IP address.

- Open the Putty and paste the IP address of the raspberry pi, select SSH and click open. Set the default username and password in Putty. Now enable few configuration tools like VNC viewer, etc., and click finish.

- Head over to the VNC viewer and paste the IP address of raspberry pi. Since we have enabled the VNC server, we will be able to connect to a raspberry pi. Click on enter and there you are. We got the desktop of the raspberry pi.

- Now change the default settings, select the country, and set a new username and password.

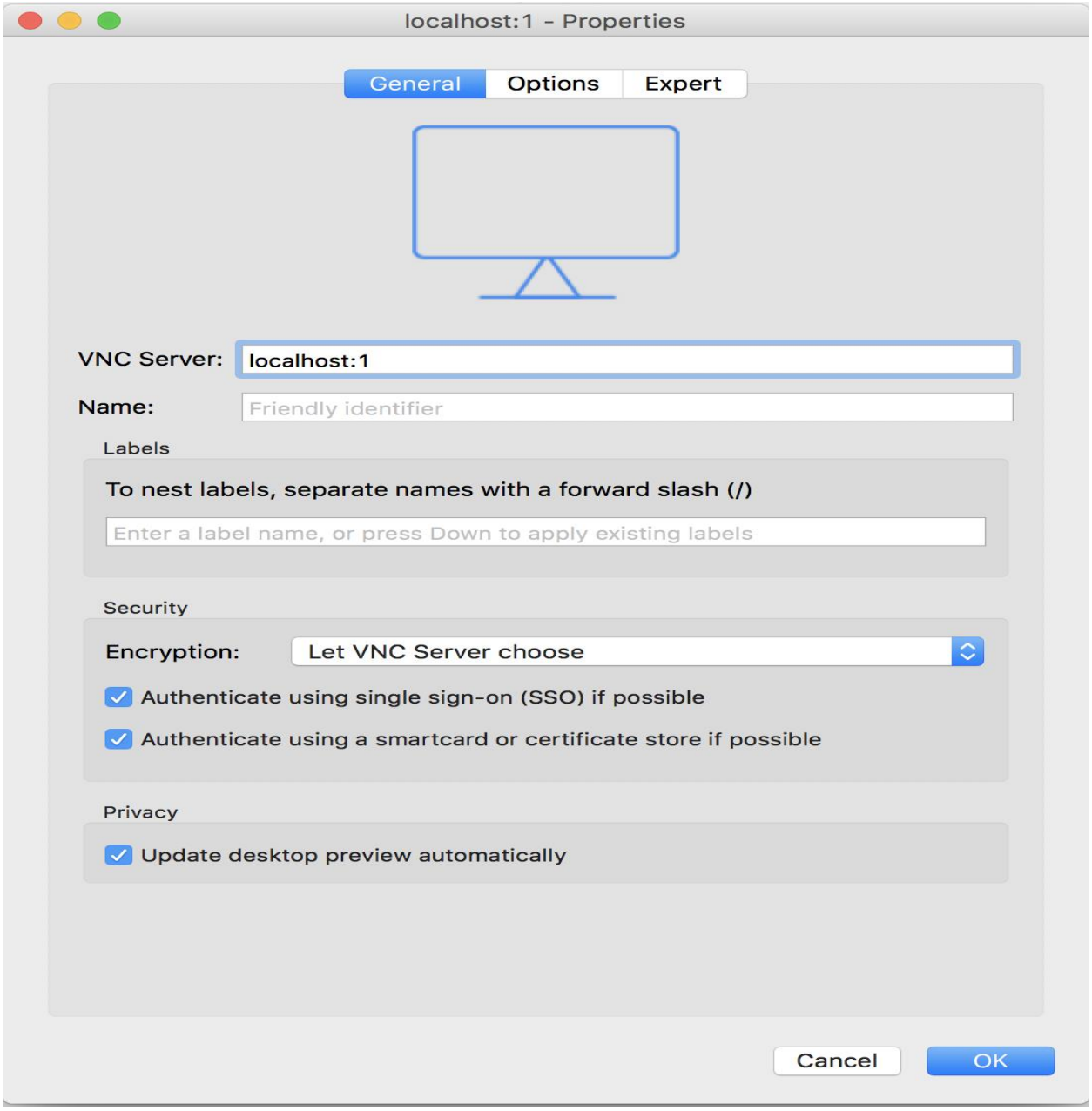

Fig: 4.2.1c : VNC Viewer

- Open Python IDE in the raspbian OS through VNC viewer and dump the code for this project and run the code.

- After successful execution, the robot starts moving and if any sound is identified, the Pi camera starts capturing images.

4.2.2 CLOUD

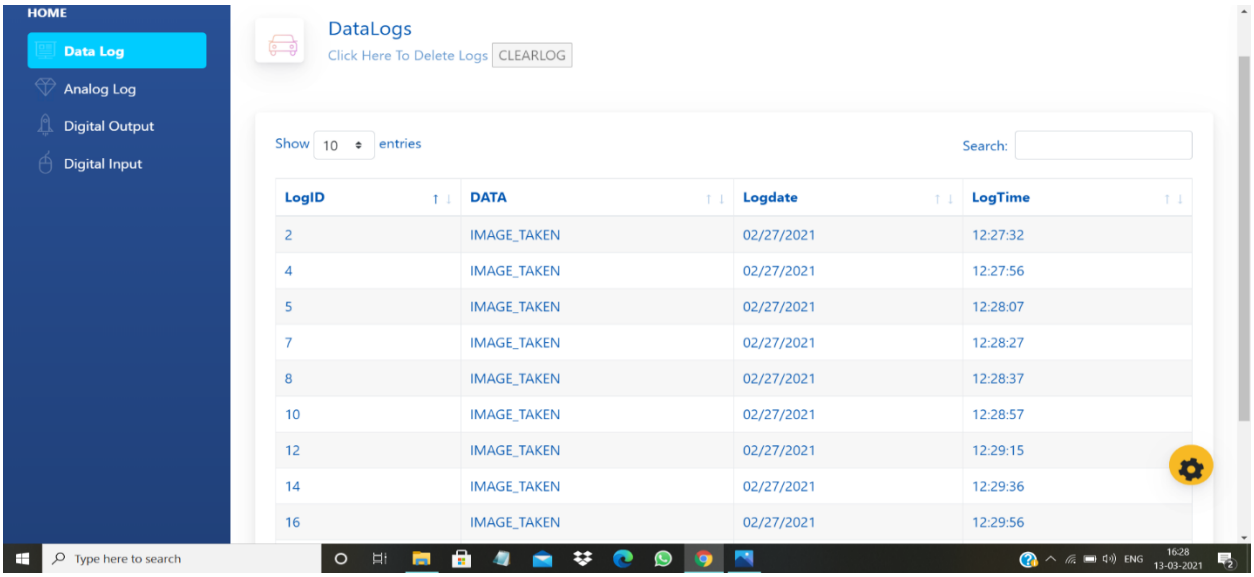

Fig:4.2.2 : Cloud

The main of using cloud in our proposed patrolling system is to received the warning messages to the user. So for this we need to create a cloud or to subscribe for existing one. Here we used a data log cloud to receive the warning messages to the user. This gives us extra information about images which e have received to the mail. Concerning this the warning message contains the captured image time and date will be saved in the cloud. So that we can use this our further security preceding. The image mentioned image is the screenshot is one which we are used in proposed system. We can see the taken image particular time and date in our cloud. We can remove the unwanted data like long ago data captured in the cloud. There are many organizations which provides cloud facilities with affordable prices.

CHAPTER 5

RESULTS AND DISCUSSION

After setting up all the connection as shown in demonstration, the sensors detects the data and send the data to the server through Wi-Fi module as code embedded into the Raspberry pi functioning the data shown in the server. The python script dumped in system control function of the robot. In this code, we have mentioned separate syntax for each integrated circuits, mainly sound sensor, pi camera, raspberry pi and Wi-Fi module. When the code is implemented and executed, the robot starts moving forward with in the surrounding area.

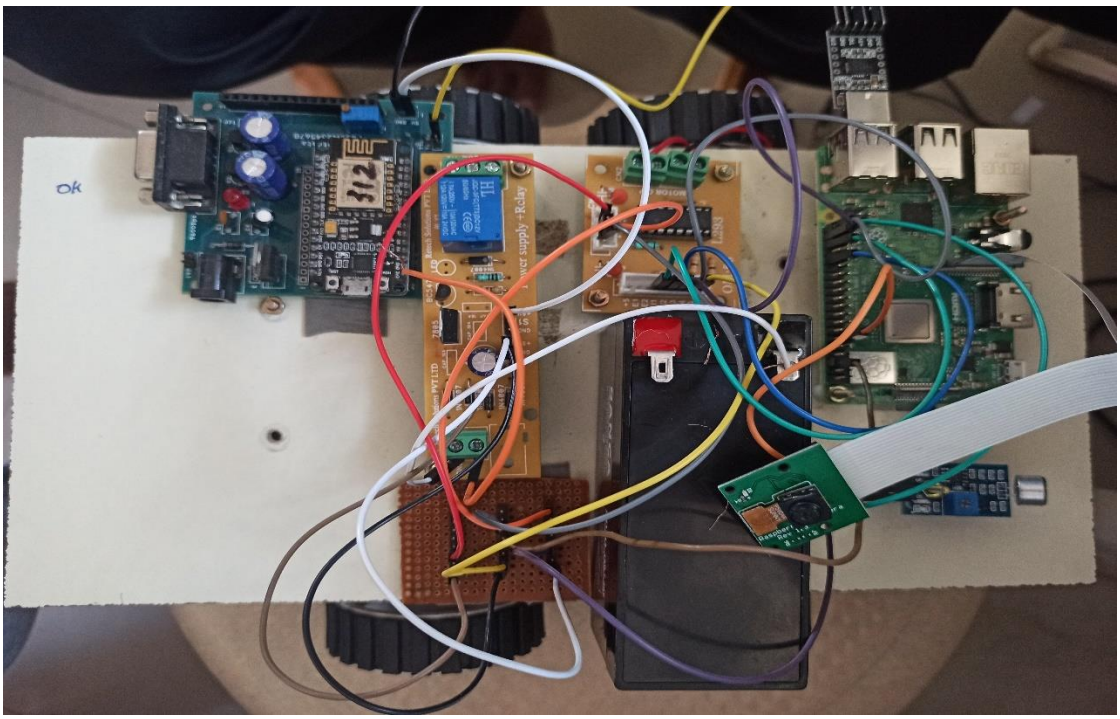

Fig:5.1 : Demonstration

After successful execution of the python script, the robot starts moving and the sensors will become active. When the sound is detected, the pi camera which is attached with raspberry pi will take the photograph of that premises immediately. The image taken by the pi camera sent into the email. Connecting to the power supply the data been processed into the dedicated server. The Patrolling is done and captures images at a good resolution which is actually enough to identify the intruder.

IDEAL VIEW The images shown below used for Ideal view showing the working and Data Processed in the server. If any sudden sound is detected by sound sensor, an alert message is sent to cloud with time and date and image captured is sent to registered email id.

ROBOT WORKING

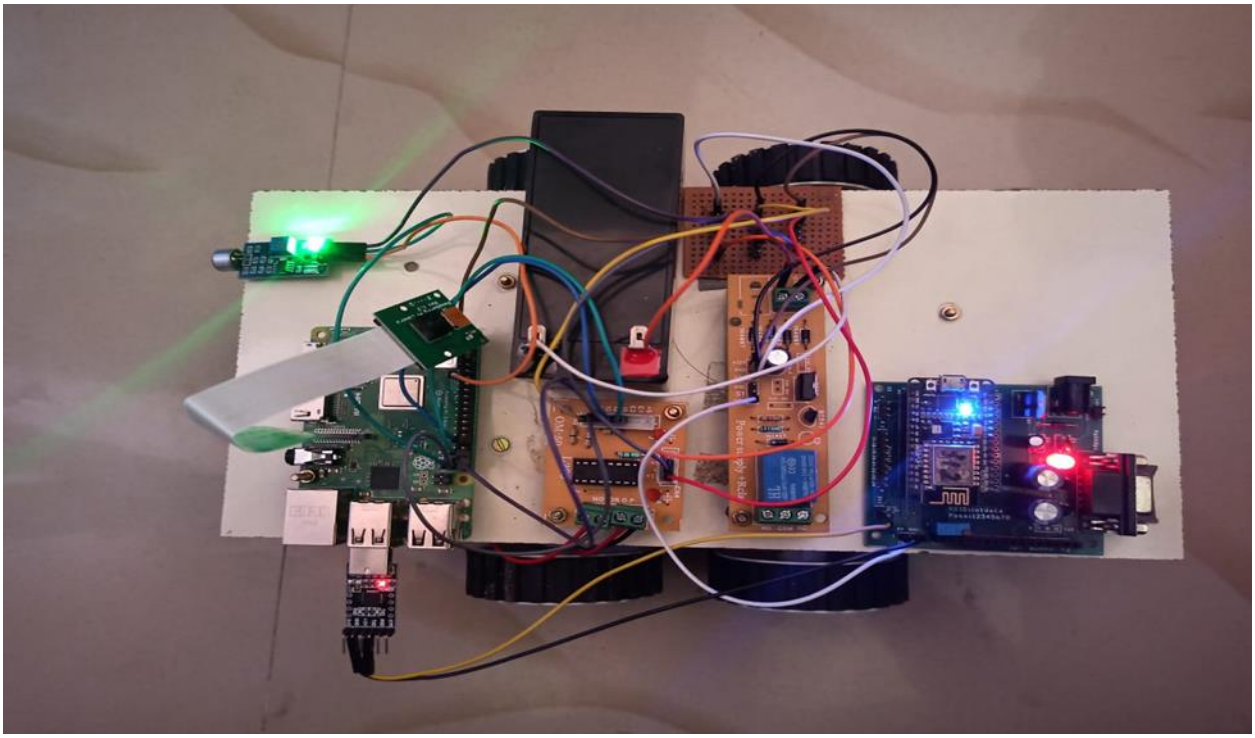

Fig:5.2 : Working of Patrolling Robot

IMAGES SENT TO MAIL

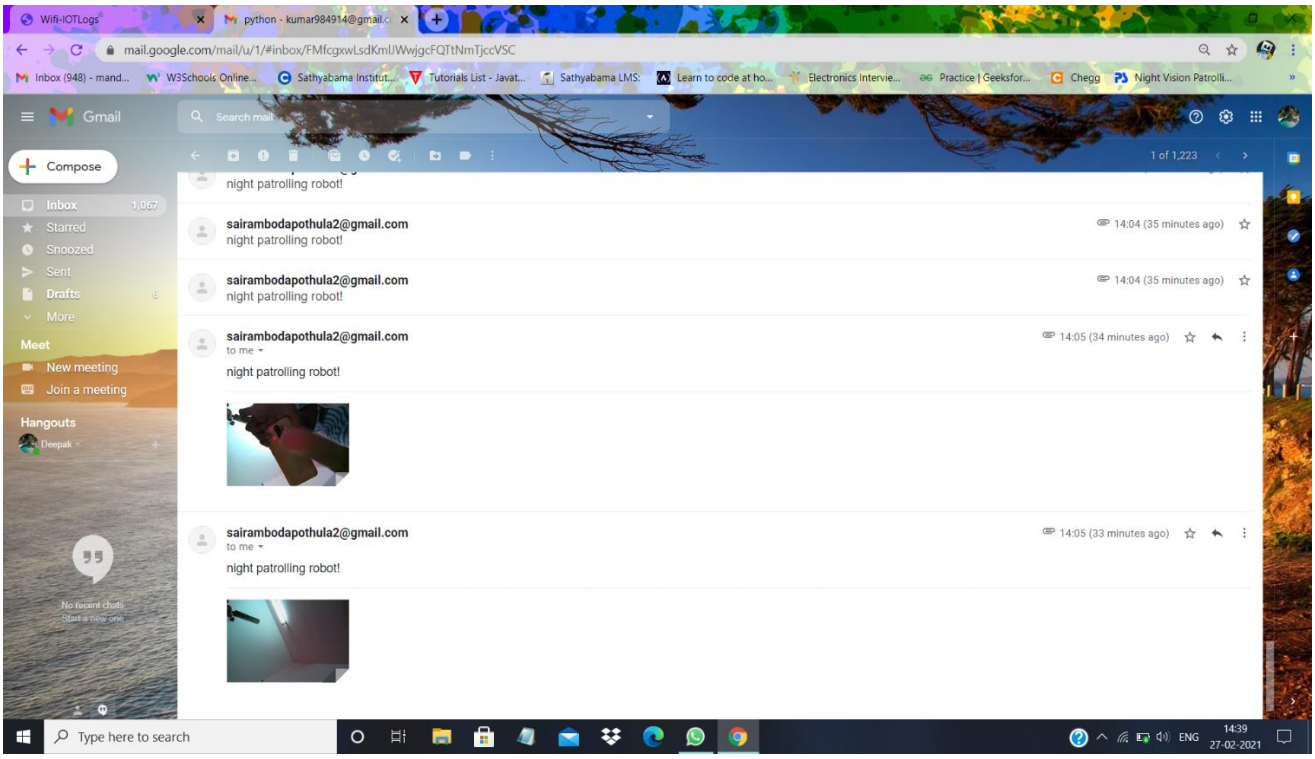

Fig:5.3 : Images received to mail id

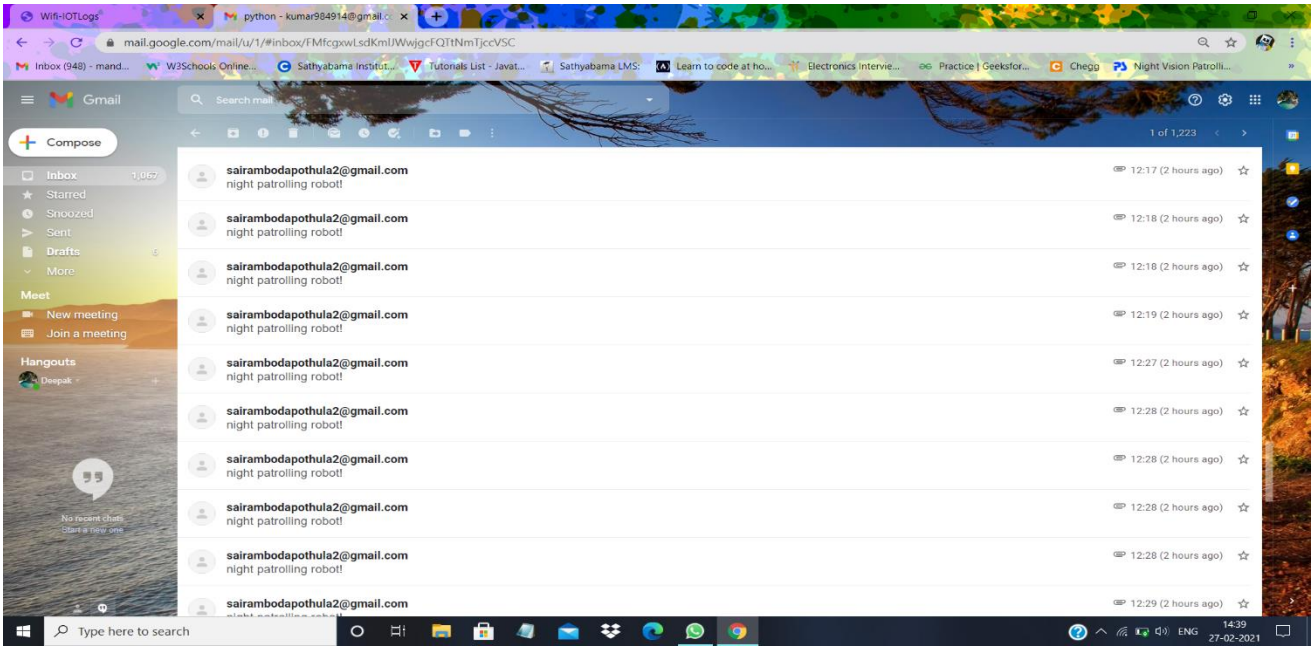

Fig:5.4 : Screenshot of mail id

COULD DATA

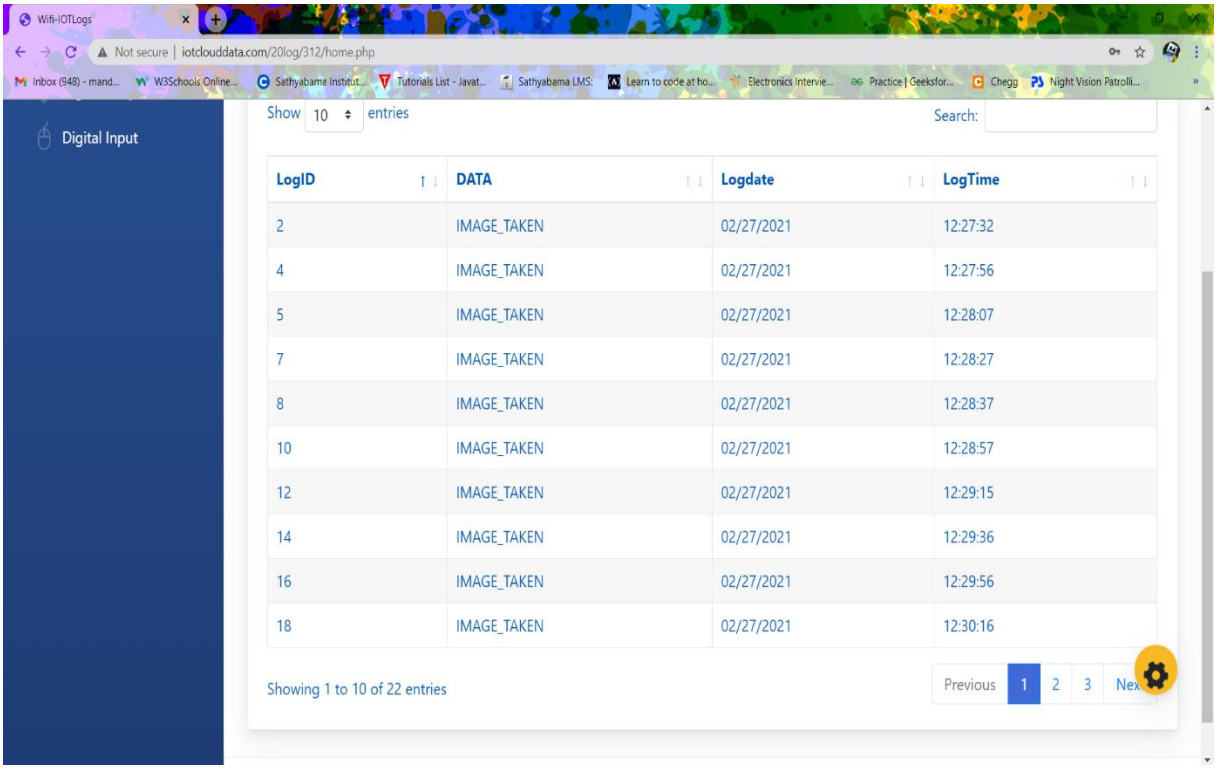

Fig:5.5 : Alert Messages from cloud

CHAPTER 6

CONCLUSION

The project concludes with a design of security robot for patrolling which uses pi camera for securing its premises. We developed the night patrol that, robot is used to find the sound waves in the surroundings, and perform security patrolling services. The robot moves with particular intervals in the same direction. It is likewise outfitted with a camera and sound sensor which are associated with the raspberry pi. Raspberry Pi associated with the camera assumes a significant part in making a programmed automated framework. When the sound is sensed by sound sensor, it records and begins to relay photographs of the situation immediately after identification of the sound in the surroundings. The captured images are sent to the respective mail id, for further actions. An alert message which contains the captured image date and time which is received to our mail id, is displayed in the cloud through IOT. Our project suggests that Robot is friendly to the people, it perform security for human being. The Surveillance robot works like a charm and runs on its own. Anyhow batteries are to be replaced over a period of usage. This patrolling robot provides an extra security to the user.

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