PATH RECOGNITION USING RASPBERRY PI

Submitted in partial fulfillment of the requirements for the degree of

Bachelor of Engineering

In

Electronics and Telecommunication

By

NABEEL KHAN (15DET63)
KHAN ABDUL MAJID (15DET64)
SHAIKH HAFIZ (15DET77)
YASAR KARBELKAR (15DET58)

Under the guidance of
Dr. MUJIB TAMBOLI

Department of Electronics and Telecommunication Engineering

Anjuman-I-Islam's Kalsekar Technical Campus
Sector 16, New Panvel , Navi Mumbai
University of Mumbai

2018-19

ANJUMAN - I - ISLAM'S KALSEKAR
TECHNICAL CAMPUS, NEW PANVEL
ENGINEERING & TECHNOLOGY
ARCHITECTURE
PHARMACY
AKTC
NAVI MUMBAI - INDIA

CERTIFICATE

Department of Electronics and Telecommunication Engineering
Anjuman-I-Islam's Kalsekar Technical Campus
Sector 16, New Panvel , Navi Mumbai
University of Mumbai

This is to certify that the project entitled **PATH RECOGNITION USING RASPBERRY PI** is a bonafide work of **NABEEL KHAN (15DET63), KHAN ABDUL MAJID (15DET64), SHAIKH HAFIZ (15DET77), YASAR KARBELKAR (15DET58)** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of Bachelor of Engineering in Department of Electronics and Telecommunication Engineering.

Dr. MUJIB ABBAS TAMBOLI

Supervisor	Examiner
PROF. AFZAL SHAIKH	DR.ABDUL RAZZAL HONNUTAGI
Head of Department	Director

Project I Approval for Bachelor of Engineering

This project entitled Receiving Automatic Picture Transmission Signals using V-Dipole Antenna by NABEEL KHAN(15DET63), KHAN ABDUL MAJID(15DET64), SHAIKH HAFIZ(15DET77), YASAR KARBELKAR(15DET58) is approved for the degree of Bachelor of Engineering in Department of Electronics and Telecommunications Engineering.

Examiner

.....

Supervisor

.....

Date;

Place:

DECLARATION

I declare that this written submission represents my ideas in my own words and where others ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

NABEEL KHAN(15DET63)
KHAN ABDUL MAJID(15DET64)
SHAIKH HAFIZ(15DET77)
YASAR KARBELKAR(15DET58)

Date:

ABSTRACT

The aim of this project is to make a PATH RECOGNITION USING RASPBERRY PI. Raspberry serve the purpose of server as well as the advance processor for the system designing of the system requires the knowledge of physical components like Raspberry pi, Python programming. As we know humans cannot perform many task which a robot can do. Robots are required where human intervention are nearly impossible. Due to this a concept of designing a robot which can be controlled through Wi-Fi by web page emerged in our mind Here control of the robot are integrated on a web page which control its movement, the robotic unit will move according to the command given by web page, it will also trace its path according to its movement and come back to its position by remembering its path and all the movement is stored in Raspberry pi and when the retraced button is press on the web page the robot will return to its starting place .This project gives us an approach towards control using advanced processor like raspberry pi .The proposed system can be used in military application just by adding few sensor like infrared sensors so we can detect the movement .

NABEEL KHAN (15DET63)
B.E. (Electronics and Telecommunications Engineering)
University of Mumbai.

KHAN ABDUL MAJID(15DET64)
B.E. (Electronics and Telecommunications Engineering)
University of Mumbai.

SHAIKH HAFIZ(15DET77)
B.E. (Electronics and Telecommunications Engineering)
University of Mumbai.

YASAR KARBELKAR(15DET58)
B.E. (Electronics and Telecommunications Engineering)
University of Mumbai.

ANJUMAN - I - ISLAM'S KALSEKAR
TECHNICAL CAMPUS, NEW PANVEL
ENGINEERING & TECHNOLOGY
ARCHITECTURE
PHARMACY
AKTC
NAVI MUMBAI - INDIA

CONTENTS

LIST OF FIGURES

LIST OF TABLES

Keywords: Raspberry Pi,Wi-fi, Web Page, Python Programming

Glossary :

G

GPIO – General Purpose Input Output. A pin or set of pins that can be configured to act as an input or output for electrical signals.
GPU – Graphics Processing Unit. A special processor that handles graphics.

H

HDMI – High Definition Multimedia Interface. An audio/video interface for transmitting digital data. Found on most new monitors, TVs and audio-visual equipment.

L

Linux – A free, open source operating system that can run on the PI.

P

Pi NoIR – Official camera module without the usual infrared filter.
PXE – Preboot Execution Environment. A method to get a device to boot via the network.

S

SoC – System on a Chip. A complete computer packaged in a single chip.

V

VNC -Virtual Network Computing

INTRODUCTION

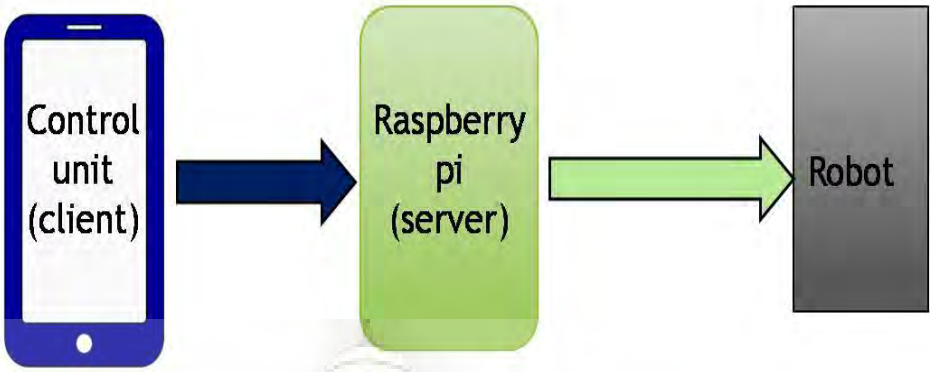
1.1 Statement of Project

An embedded web server creates an easy way for monitoring & controlling any device which is at remote place. For designing the system we require remote pc Wi-Fi dongle Raspberry pi. We implement a system which is portable, low cost & having less maintenance.

As the internet of things is the concept, newly introduced in the field of Electronics. The concept is about handling the things with the use of internet and the best model for these applications is raspberry pi. Where raspberry pi serve his purpose as it is good at connectivity simply plugging Wi-Fi dongle into one of its port .

Robots are being used in variety of industrial applications for various activities like pick and place, painting, assembling of subsystems and in hazardous places for material handling etc. Robots are becoming more and more advanced as technology increment in the areas of CPU speed, sensors, memories etc. And there is ever demanding applications even in defence . With the rapid growth of the Internet, more and more advanced devices or sensors have been embedded into it for performing the desired work, distributed computer systems, Although the implementation of Internet robotics or web- based robotics is relatively new and still in its early stage, it has gathered the huge interest of many researchers in the world .The proposed system consist of two units mainly a robotic unit and a remotely control unit. The remotely unit is mobile phone and the robotic unit consist of Wi-Fi dongle and the heart of the project, raspberry pi along with the PCB containing motor driven IC and voltage regulator circuitry

1.1.1 Project Architecture



1.1.2 Motivation

This project gives us an approach towards control using advanced processor like raspberry pi by using this we create a robot which does not require any manual direction for its return path. By simply pressing a Retraced button on console page it return to its initial position.

1.2 Objective and Scope

The objective of this project is to create a mobile robot platform which returns back to its initial position by pressing retraced button on web page. The project utilizes a Raspberry pi b3 model to command all the action of the robot. Additionally, the Raspberry pi host a server by using program written in python the client controls the robot through webpage that is hosted on the robot server.

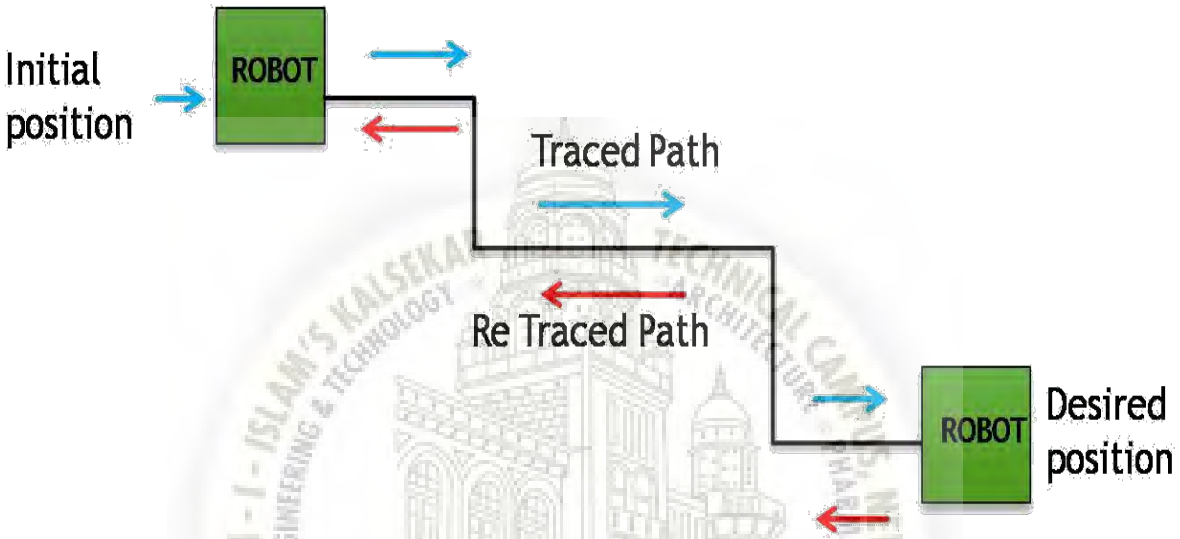


Figure 1.2: Project Output Image

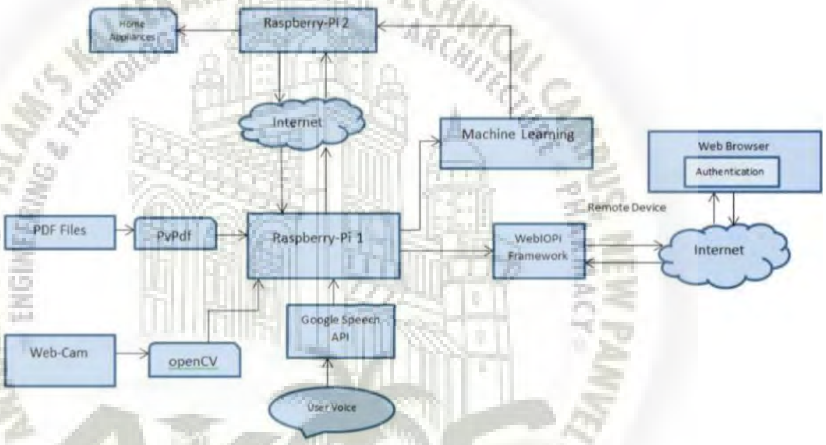
LITERATURE REVIEW

2.1 Paper Title

1. "**Raspberry pi and IOT based family ROBOT** "

Abstract: This work demonstrate a simple home automation system that allows the users to control home appliances through wireless.

Diagram:



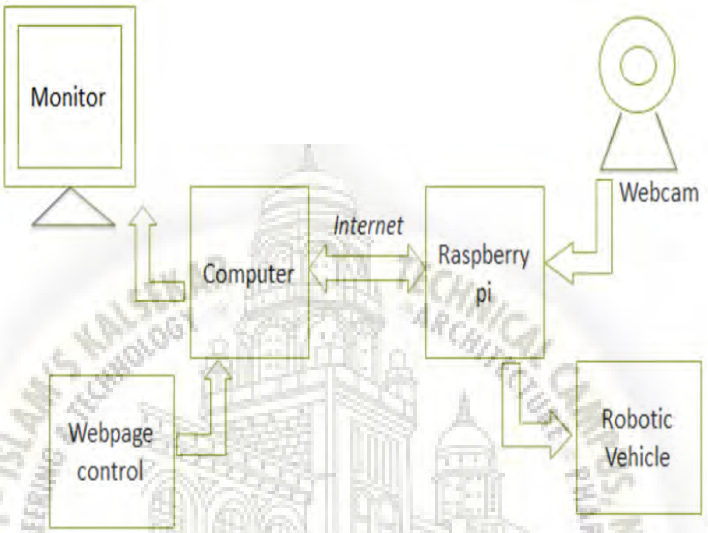
Conclusion : Designed an automation system which has surveillance and reduced most of the human interaction.

Future scope: We can use a memory to record a video and can be used thereafter for surveillance.

2. "**Wi-Fi Surveillance Robot Using Raspberry Pi**"

Abstract: This paper gives an approach towards video surveillance and control using advanced processor like raspberry pi.

Diagram:



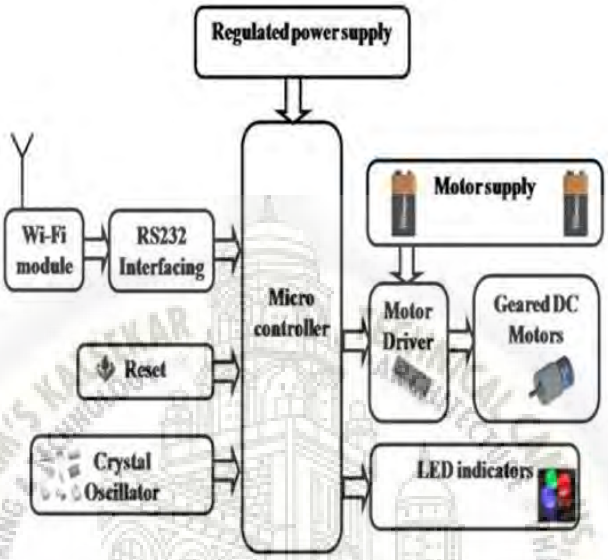
Conclusion: Using this robotic system a remote area can be monitored easily from remote end.

Future scope: With reduced time delay we can have faster operation and quick response to any illegal activities in the monitored area.

2. "**WI- FI Based Robot Controlling by Webpage Interface and Video Monitoring**"

Abstract: Using a Microcontroller which handles all basic functions of a Robot.

Diagram:



Conclusion: The Robot is tested and found working in all aspects. Robot is easily controlled by webpage

Future scope: It can be used for survelliance in a factory or industry as well as for militry purpose.

2.1.1 Weaknesses

All the above paper does not contain the easy return option for the robot, when the robot reach to its desired position it should come back to its initial position without giving any direction on web page.

2.1.2 How to Overcome

1. Algorithm we use python programming language for programming .
2. CGI (common gateway interface) file is used for server side coding.
3. Since the robot will be controlled by a webpage we have to initialize a client server communication paradigm.
4. This will execute some CGI file at a server side depending upon clients choice.
5. This hole process should be remembered by R.P.I
6. By using above procedure the robot should come to its initial position when ever clients calls.

TECHNICAL DETAILS

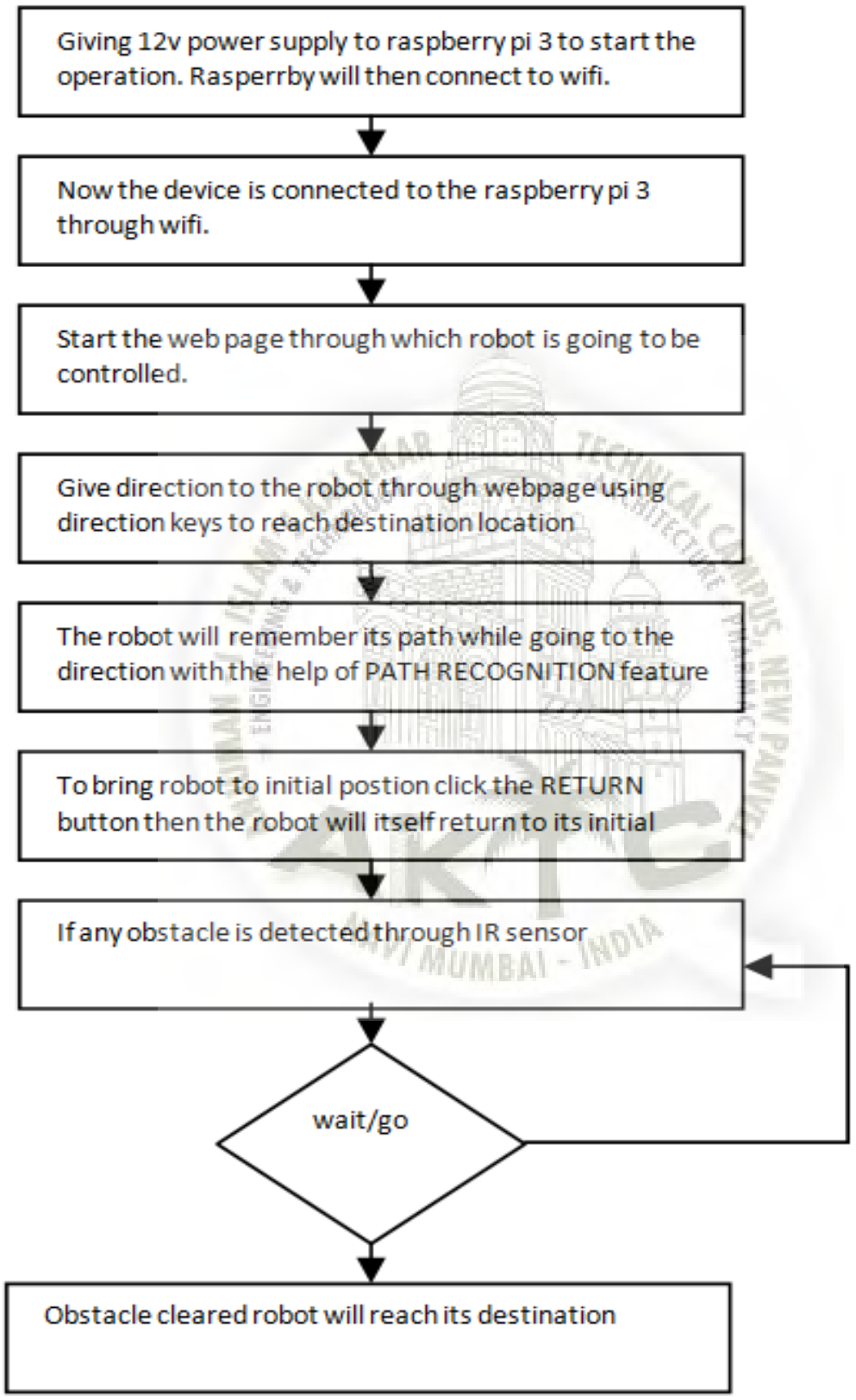
3.1 Methodology

The web controlled robot is seems like a very simple project, but when we started thinking about its actual implementation then we understands how much tough and complicated it is. To design a IOT project, first we have to build a user interface which is a web page or an application, and according to me its a bit simple to built a static web page using html. But when its come to control a robot, we need an object oriented programming language, so we decided to implement that part using Java Script language, Java scripting language is not enough for object oriented programming. After completing a huge research on java scripting language, we came to a conclusion that Robot cannot be controlled using this language.

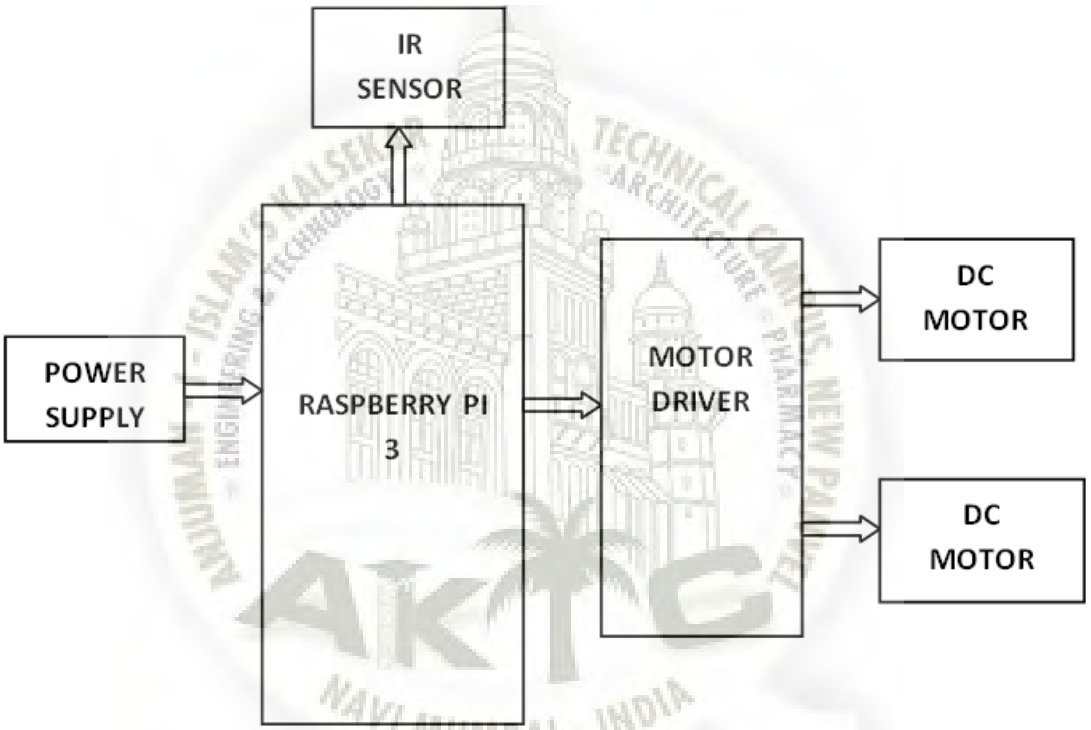
Therefore we started searching another language trough which we can control that robot, and we came to a new language, that is python. Python programming language has hundred of variation for different types of programming. Therefore we started learning only the required part of that language, and after some time we all came to a conclusion that we can control that robot using python.

For connecting the robot we have to initialize a client server protocol. To initialize a client server communication we started studying about Java Socket programming. But after studying that we came to a result that computer and Raspberry-pi can understand java socket programming but mobiles not. Therefore we Move to a pre developed application called "Apache2". Apache2 is a open-source software used for designing a Web-server. All over the world, 67% of Web-server uses Apache2. Therefore we decided to use that software for our project.

3.1.1 Flow chart:



3.1.2 Block diagram:



2.2 Project Requirements

This project required lots of programming and less hardware. since we have to build a website therefore we use Hypertext Markup Language(HTML) website development language. HTML is used for static web page development, but our website is not just static, therefore we have to use a java scripting language in it. We will use Cascading Style Sheets (CSS), it is a style sheet language used for describing the presentation of a document written in a markup language.

We python for robot control. because Python is an easy to learn, powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming. Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms.

For server side we need shell script. A shell script is a computer program designed to be run by the Unix shell, a command-line interpreter. The various dialects of shell scripts are considered to be scripting languages. Typical operations performed by shell scripts include file manipulation, program execution, and printing text.

2.2.1 Software Requirements

1 :- Brackets.

Brackets is an open-source editor written in HTML, CSS, and JavaScript with a primary focus on web development. It was created by Adobe Systems, licensed under the MIT License, and is currently maintained on GitHub. Brackets is available for cross-platform download on Mac,Windows, and Linux.

2 :- IDLE by Python 3.5.

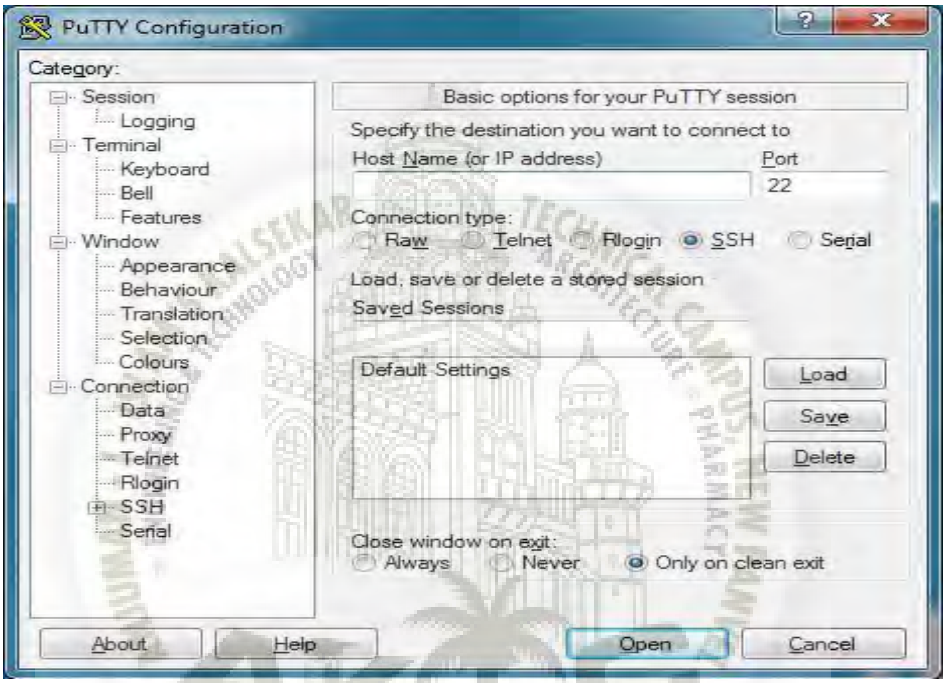
IDLE (Integrated Development Environment or Integrated Development and Learning Environment) is an integrated development environment for Python, which has been bundled with the default implementation of the language. It is packaged as an optional part of the Python packaging with many Linux distributions. It is completely written in Python. IDLE is intended to be a simple IDE and suitable for beginners, especially in an educational environment. To that end, it is cross-platform, and avoids feature clutter.

3 :- Apache2.

Apache is the most commonly used Web server on Linux systems. Web servers are used to serve Web pages requested by client computers. Clients typically request and view Web pages using Web browser applications such as Firefox, Opera, Chromium, or Internet Explorer. Users enter a Uniform Resource Locator (URL) to point to a Web server by means of its Fully Qualified Domain Name (FQDN) and a path to the required resource. For example, to view the home page of the Ubuntu Web site a user will enter only the FQDN.The most common protocol used to transfer Web pages is the Hyper Text Transfer Protocol (HTTP). Protocols such as Hyper Text Transfer Protocol over Secure Sockets Layer (HTTPS), and File Transfer Protocol (FTP), a protocol for uploading and downloading files, are also supported. Apache Web Servers are often used in combination with the MySQL database engine, the HyperText Preprocessor (PHP) scripting language, and other popular scripting languages such as Python and Perl. This configuration is termed LAMP (Linux, Apache, MySQL and Perl/Python/PHP) and forms a powerful and robust platform for the development and deployment of Web-based applications.

4 :- PuTTY

PuTTY is a free and open-source terminal emulator, serial console and network file transfer application. It supports several network protocols, including SCP, SSH, Telnet, rlogin, and raw socket connection. It can also connect to a serial port. The name "PuTTY" has no definitive meaning.PuTTY is a very versatile tool for remote access to another computer. It's probably used more often by people who want secure remote shell access to a UNIX or Linux system than for any other purpose, though that is only one of its many uses. PuTTY is more than just an SSH client.



Supporting protocols:

1 raw: The raw protocol is normally used for network debugging.

2 rlogin: This is an unencrypted UNIX remote login protocol that uses port 513 by default.

3 serial: The serial option is used to connect to a serial line. The most common purpose for this is to establish a serial connection between computers in lieu of an Ethernet or other network connection.

4 SSH: As already noted, SSH is an encrypted secure remote login protocol, which uses port 22 by default.

5 Telnet: Like rlogin, Telnet (telecommunication network) is an unencrypted remote login protocol. It typically uses port 23 and is available on many systems other than UNIX. Like rlogin, Telnet has waned in popularity due to privacy concerns. In addition to the five protocols supported by PuTTY, it also supports features such as saved session configurations, session logging, locale (language) settings, and proxy sessions.

5:- VNC viewer

Virtual Network Computing (VNC) is a graphical desktop sharing system that uses the Remote Frame Buffer protocol (RFB) to remotely control another computer. It transmits the keyboard and mouse events from one computer to another, relaying the graphical screen updates back in the other direction, over a network.

VNC is platform-independent – there are clients and servers for many GUI-based operating systems and for Java. Multiple clients may connect to a VNC server at the same time. Popular uses for this technology include remote technical support and accessing files on one's work computer from one's home computer, or vice versa.

VNC was originally developed at the Olivetti & Oracle Research Lab in Cambridge, United Kingdom. The original VNC source code and many modern derivatives are open source under the GNU General Public License.

2.2.2 Hardware Requirements

1 :- Raspberry-Pi 3 Model B

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. The original model became far more popular than anticipated, selling outside of its target market for uses such as robotics. Peripherals (including keyboards, mice and cases) are not included with the Raspberry Pi. Some accessories however have been included in several official and unofficial bundles. According to the Raspberry Pi Foundation, over 5 million Raspberry Pi is have been sold before February 2015, making it the best-selling British computer.By November 2016 they had sold 11 million units, reaching 12.5m in March 2017, making it the third best-selling "general purpose computer" ever. Several generations of Raspberry Pi is have been released. The first generation (Raspberry Pi 1 Model B) was released in February 2012. It was followed by the simpler and cheaper Model A. In 2014, the Foundation released a board with an improved design in 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-pose input/output (GPIO) capabilities was released in November 2015 for US$5. Raspberry Pi 3 Model B released in February 2016 and is bundled with on-board WiFi, Bluetooth and USB boot capabilities. As of January 2017, Raspberry Pi 3 Model B is the newest mainline Raspberry Pi. Raspberry Pi boards are priced between US$5–35. On 28 February 2017, the Raspberry Pi Zero W was launched, which is identical to the Raspberry Pi Zero, but has the Wi-Fi and Bluetooth functionality of the Raspberry Pi 3 for US$10.

Features of raspberry pi :-

All models feature a Broadcom system on a chip (SoC), which includes an ARM compatible central processing unit (CPU) and an on-chip graphics processing unit (GPU, a Video Core IV). CPU speed ranges from 700 MHz to 1.2 GHz for the Pi 3 and on board memory range from 256 MB to 1 GB RAM. Secure Digital (SD) cards are used to store the operating system and program memory in either the SDHC or Micro SDHC sizes. Most boards have between one and four USB slots, HDMI and composite video output, and a 3.5 mm phone jack for audio. Lower level output is provided by a number of GPIO pins which support common protocols like I²C. 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.

Wireless radio :-

So small, its markings can only be properly seen through a microscope or magnifying glass, the Broadcom BCM43438 chip provides 2.4GHz 802.11n wireless LAN, Bluetooth Low Energy, and Bluetooth 4.1 Classic radio support. Cleverly built directly onto the board to keep costs down, rather than the more common fully qualified module approach, its only unused feature is a disconnected FM radio receiver.

Antenna:-

There's no need to connect an external antenna to the Raspberry Pi 3. Its radios are connected to this chip antenna soldered directly to the board, in order to keep the size of the device to a minimum. Despite its diminutive stature, this antenna should be more than capable of picking up wireless LAN and Bluetooth signals – even through walls.

SoC:-

Built specifically for the new Pi 3, the Broadcom BCM2837 system-on-chip (SoC) includes four high-performance ARM Cortex-A53 processing cores running at 1.2GHz with 32kB Level 1 and 512kB Level 2 cache memory, a Video Core IV graphics processor, and is linked to a 1GB LPDDR2 memory module on the rear of the board.

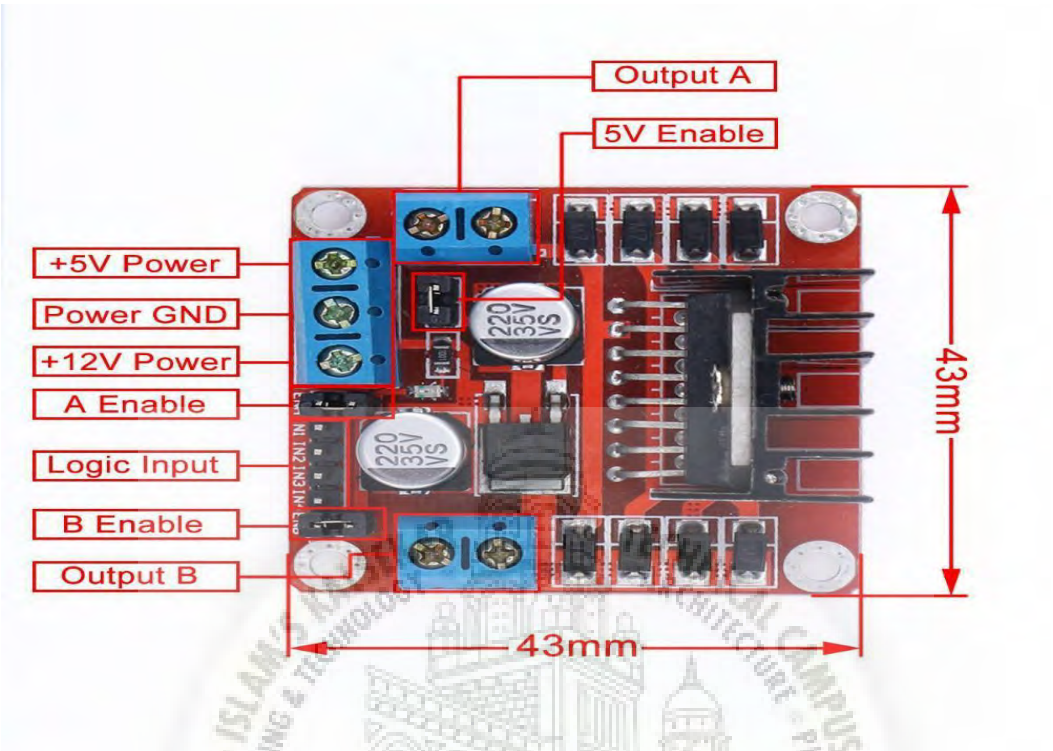
GPIO:-

The Raspberry Pi 3 features the same 40-pin general-purpose input-output (GPIO) header as all the Pis going back to the Model B+ and Model A+. Any existing GPIO hardware will work without modification; the only change is a switch to which UART is exposed on the GPIO's pins, but that's handled internally by the operating system.

USB chip:-

The Raspberry Pi 3 shares the same SMSC LAN9514 chip as its predecessor, the Raspberry Pi 2, adding 10/100 Ethernet connectivity and four USB channels to the board. As before, the SMSC chip connects to the SoC via a single USB channel,acting as a USB-to-Ethernet adaptor and USB hub.

2 :- L-298N Module



The L298 is an integrated monolithic circuit in a 15- lead Multiwatt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver de-signed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors.

FEATURES :-

Speed control:-

The speed of the motors can be adjusted by connecting PWM outputs from your robot's microcontroller to the ENA and ENB input pins on the motor driver board. The ENA pin controls Motor A and the ENB pin controls Motor B. When these pins are HIGH, power is output to the motor. By using PWM, you are turning power on and off very quickly to adjust the speed of the motor. The longer the PWM duty cycle is, the faster the motor will turn. We recommend always using a PWM duty cycle of 90% or less.

Stopping:-

To remove power from the motors, simply set ENA=LOW for Motor A and ENB=LOW or Motor B. This will result in the motors stopping slowly and naturally from friction. To perform a quick braking operation, set ENA=LOW, IN1=LOW and IN2=LOW for Motor A and ENB=LOW, IN3=LOW and IN4=LOW for Motor B. The motors will come to an instant stop. Here are some handy tables to show the various modes of operation.

Direction control:-

The direction that the motors turn is controlled using the IN1, IN2, IN3 and IN4 input pins on the motor driver board. Connect these pins to digital outputs on your robots microcontroller. To make

Motor A go forward, set IN1=HIGH and IN2=LOW. To make Motor A go backward set IN1=LOW and IN2=HIGH. The same method is used to control Motor B: set IN3=HIGH and IN4=LOW to o forward and set IN3=LOW and IN4=HIGH to go backwards. Note that "forward" and "backwards" refer to the direction of the motors themselves. If your robot does not move in the expected direction, reverse the motor polarity by swapping the green screw terminals for Motor A + and - and/or Motor B + and

Truth Table for Motor

Motor A Truth Table

ENA	IN1	IN2	Description
0	N/A	N/A	Motor A is off
1	0	0	Motor A is stopped
1	0	1	Motor A is on turning backward
1	1	0	Motor A is on turning forward
1	1	1	Motor A is stopped

Motor B Truth Table

ENA	IN1	IN2	Description
0	N/A	N/A	Motor B is off
1	0	0	Motor B is stopped
1	0	1	Motor B is on turning backward
1	1	0	Motor B is on turning forward
1	1	1	Motor B is stopped

3 :- Wi-Fi Router

A wireless router is a device that performs the functions of a router and also includes the functions of a wireless access point. It is used to provide access to the Internet or a private computer network . It can function in a wired LAN (local area network), in a wireless-only LAN (WLAN), or in a mixed wired/wireless network, depending on the manufacturer and model.

FEATURES :-

1. One or multiple NICs supporting Fast Ethernet or Gigabit Ethernet integrated into the main SoC

2. One or multiple WNICs supporting a part of the IEEE 802.11-standard family also integrated into the main SoC or as separate chips on the printed circuit board. It also can be a distinct card connected over a MiniPCI or MiniPCIe interface.

3. Often an Ethernet switch supporting Gigabit Ethernet or Fast Ethernet, with support for IEEE
802.1Q, integrated into the main SoC (MediaTek SoCs) or as separate Chip on the PCB.

4.Some wireless routers come with either xDSL modem, DOCSIS modem, LTE modem, or fiber
optic modem integrated.

5.IEEE 802.11n compliant or ready.

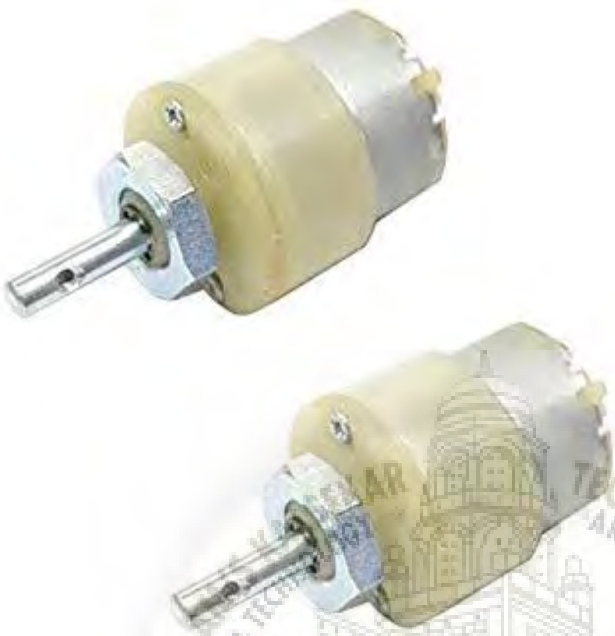
6.Some dual-band wireless routers operate the 2.4 GHz and 5 GHz bands simultaneously.

7.Some high end dual-band wireless routers have data transfer rates of at most 300 Mbit/s (For 2.4 GHz band) and 450 Mbit/s (For 5 GHz band).

8.The Wi-Fi clone button simplifies Wi-Fi configuration and builds a seamless unified home network, enabling Super Range Extension, which means it can automatically copy the SSID and Password of your router.

9.Some wireless routers have one or two USB ports. For wireless routers having one USB port, it is designated for either printer or desktop/mobile externa

4 :- DC Motor



A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or Electronics, to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power Electronics has made replacement of DC motors with AC motors possible in many applications.

5:- Power Supply and Batteries

We require 2 different voltage batteries 12 volts and 5 volts. 12v is for L298N motor driver IC and 5v is for Raspberry-pi and Motors.

6:- Cables and Jumpers

We need a VGA to HDMI cable for connecting monitor to raspberry pi. And we need some jumper cables for connecting GPIO's of Raspberry-pi with Motor and power supply.

MARKET POTENTIAL

4.1 Market Potential of Project

You want to make a robot, and you want your robot to be clever. But you definitely don't want to spend thousands of dollars, or 3 years to study how to do. A Raspberry Pi board is a small computer (credit card size) that can easily connect to the Internet and interface with a lot of hardware components.

Many people use Raspberry Pi to make a server for home : VPN, weather station, small game server, cluster, etc. But Raspberry Pi is more and more used on robotics project. there fore we implement a mobile robot platform which returns back to its initial position by pressing retraced button on web page.

This are the following reason why our project has market potential?

- Raspberry Pi is small…
- and cheap – less than 40$
- Raspberry Pi is powerful
- Supported by a large community
- A lot of inputs/outputs
- Many connected devices
- Very easy to use compared to industrial technology

4.2 Competitive Advantages of Project

Raspberry Pi

The following are some of the main advantages of Rasperry Pi

Pros

- Entire Linux software stack is available
- It is very easy to connect to internet
- Can be programmed using variety of programming languages

Cons

The following are some of the main limitations of Raspberry Pi

- Accessing hardware is not real-time. If the CPU is busy, then interfacing with hardware can be delayed
- No built-in Analog to Digital converter available
- Does not have enough power to drive inductive loads
- The hardware design is not open source. Even though it is not a big deal, for some people it might a deal breaker

When to use (and not use) Raspberry Pi

If your project has very limited hardware interaction but is slightly complex on the software side or need to be connected to internet then you should just go with Raspberry Pi. Also if you want to program using variety of programming languages (not limited to C/C++), then you should choose Raspberry Pi.

On the other hand, if your project requires a lot of hardware interaction and need to read data from lot of sensors or need to control lot of devices, then Raspberry Pi may not be best choice.

CONCLUSION AND FUTURE SCOPE

5.1 Conclusion

This project gives us an approach towards easy return for the robot by using advanced processor like Raspberry pi and by using python programming language. Using this robotic system, one can easily control the robot at remote place.This system can be used at any conditions and areas where it is difficult for the security forces to reach in the areas. As the communication is done with the help of Wi-Fi so we can control the robot using Wi-Fi as a medium

5.2 Future Scope

1. We can use this system for military applications just by installing suitable sensor.
2. Using some chemical sensors we can detect some harmful gas leakage in the chamber the time delay which occurs in the exhibition of commands can be reduced and thus we can have more real time axis to the robot which reduce time delay we can have faster operation and quick response to any illegal activities in the monitored areas
3. By hosting the web page on Internet we can control the Robot from any part in the world.
4. By adding few sensor like metal detector or infrared sensor we can use in military application for detecting land mine.

REFERENCES

1. " Wi-Fi Robot for Video Monitoring &Surveillance System" By Pavan C & Dr. B.Sivakumar, (International Journal of Scientific &Engineering Research Volume 3, Issue 8, August-2012.)

2. "WI- FI Based Robot Controlling by Webpage Interface and Video Monitoring" by Mohammed Squib Khan, Ataur Rehman Khan (International Journal of Emerging Technology and Advanced Engineering (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 5, Issue 4, April 2015)

3. Robotic Vehicle Control using Internet via Webpage and Keyboard " by Ketan Dumbre, Snehal Ganeshkar , Ajinkya Dhekne(International Journal of Computer Applications (0975 – 8887) Volume 114 – No. 17, March 2015)

ACKNOWLEDGMENT

I would like to take the opportunity to express my sincere thanks to my guide **Dr. MUJIB ABBAS TAMBOLI**, Assistant Professor, Department of Electronics & Telecommunication Engineering, AIKTC, School of Engineering, Panvel for his in valuable support and guidance throughout my project research work. Without his kind guidance & support this was not possible.

I am grateful to him/her for his timely feedback which helped me track and schedule the process effectively His time, ideas and encouragement that he gave us help me to complete my project efficiently.

I am thankful to **Prof. Afzal shaikh**, HOD, Department of Electronics & Telecommunication Engineering, AIKTC, School of Engineering, Panvel and all my B.E. teachers for providing advice and valuable guidance.

I also extend my sincere thanks to all the faculty members and the non-teaching staff and friends for their cooperation.

Last but not the least, I am thankful to all my family members whose constant support and encouragement in every aspect helped me to complete my project.

NABEEL KHAN 15DET63
B.E. (Electronics and Telecommunications Engineering)
University of Mumbai.

KHAN ABDUL MAJID(15DET64)
B.E. (Electronics and Telecommunications Engineering)
University of Mumbai.

SHAIKH HAFIZ(15DET77)
B.E. (Electronics and Telecommunications Engineering)
University of Mumbai.

YASAR KARBELKAR(15DET58)
B.E. (Electronics and Telecommunications Engineering

ANJUMAN - I - ISLAM'S KALSEKAR
TECHNICAL CAMPUS, NEW PANVEL
ENGINEERING & TECHNOLOGY
ARCHITECTURE
PHARMACY
AKTC
NAVI MUMBAI - INDIA