MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Project Report

on

Remote-Control Car based on IOT using a Raspberry Pi

A project report submitted in partial fulfillment of the requirement for the degree of

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING

Submitted by:

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Submitted to:

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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CERTIFICATE

This is certified that **Tejendra Prajapati** (0901CS193D11) has submitted the project report titled **Remote-Control Car based on IOT using a Raspberry Pi** under the mentorship of **Prof. Mahesh Parmar**, in partial fulfilment of the requirement for the award of degree of Bachelor of Technology in Computer Science and Engineering from Madhav Institute of Technology and Science, Gwalior.

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DECLARATION

I hereby declare that the work being presented in this project report, for the partial fulfilment of requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering at Madhav Institute of Technology & Science, Gwalior is an authenticated and original record of my work under the mentorship of **Prof. Mahesh Parmar**, **Assistant Professor** Computer Science and Engineering.

I declare that I have not submitted the matter embodied in this report for the award of any degree or diploma anywhere else.

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ABSTRACT

There are many robot cars are introduced today with high technology such as IOT based. In a current scenario various technologies are used for implementing robot cars, is built with Bluetooth, WIFI, and ZigBee technology. This is the communication technology of IoT which work at the data link layer. Bluetooth technology operates on the Personal Area Network and has a range of 5 to 10 meters. as well as other WIFI ZigBee operates on a local area network, whereas WIFI has a range of 4 to 20 meters and ZigBee has a range of 10 to 300 meters. This technology has a very limited range. We can't control that robot car from another city using this technology. In this report, we introduced a new prototype of a remote- control car based on IOT using a Raspberry Pi. The main aim of this work is to broaden its application. I used the internet network, which is a public network with cellular technology (4G). With this network, we can control our robot car (remote control car) from anywhere in the world. This level of network coverage is essential for IOT application that require data access across multiple cities or regions. The infrastructure required for cellular IOT enablement is already in place and does not require any additional investment infrastructural requirement for cellular IOT like cellular and base station are already in place. This robotic car has a several features such as It can record a person's voice using a microphone, speak using a speaker, Surveillance using a camera, and easily track its location using a GPS tracker module, this all features controlled via the internet.

सार:

IOT आधारित उच्च तकनीक के साथ आज कई रोबोट कारें पेश की गई हैं। वर्तमान परिदृश्य में रोबोट कारों को लागू करने के लिए विभिन्न तकनीकों का उपयोग किया जाता है, जिसे ब्लूटूथ, वाईफ़ाई और ज़िगबी तकनीक के साथ बनाया गया है। यह IoT की संचार तकनीक है जो डेटा लिंक परत पर काम करती है। ब्लूटूथ तकनीक पर्सनल एरिया नेटवर्क पर काम करती है और इसकी रेंज 5 से 10 मीटर तक होती है। साथ ही अन्य WIFI ZigBee एक स्थानीय क्षेत्र नेटवर्क पर संचालित होता है, जबकि WIFI की सीमा 4 से 20 मीटर और ZigBee की सीमा 10 से 300 मीटर होती है। इस तकनीक का दायरा बहुत सीमित है। हम इस तकनीक का उपयोग करके उस रोबोट कार को दूसरे शहर से नियंत्रित नहीं कर सकते। इस पेपर में, हमने रास्पबेरी पाई का उपयोग करके IOT पर आधारित रिमोट-कंट्रोल कार का एक नया प्रोटोटाइप पेश किया। इस कार्य का मुख्य उद्देश्य इसके अनुप्रयोग का विस्तार करना है। मैंने इंटरनेट नेटवर्क का उपयोग किया, जो सेलुलर तकनीक (4G) के साथ एक सार्वजनिक नेटवर्क है। इस नेटवर्क से हम दुनिया में कहीं से भी अपनी रोबोट कार (रिमोट कंट्रोल कार) को नियंत्रित कर सकते हैं। IOT एप्लिकेशन के लिए नेटवर्क कवरेज का यह स्तर आवश्यक है जिसके लिए कई शहरों या क्षेत्रों में डेटा एक्सेस की आवश्यकता होती है। सेलुलर आईओटी सक्षमता के लिए आवश्यक बुनियादी ढांचा पहले से ही मौजूद है और सेलुलर आईओटी जैसे सेलुलर और बेस स्टेशन के लिए किसी अतिरिक्त निवेश की आवश्यकता नहीं है। इस रोबोटिक कार में कई विशेषताएं हैं जैसे कि यह माइक्रोफोन का उपयोग करके किसी व्यक्ति की आवाज रिकॉर्ड कर सकती है, स्पीकर का उपयोग करके बोल सकती है, कैमरे का उपयोग करके निगरानी कर सकती है, और जीपीएस ट्रैकर मॉड्यूल का उपयोग करके आसानी से अपने स्थान को ट्रैक कर सकती है, यह सभी सुविधाएं इंटरनेट के माध्यम से नियंत्रित होती हैं।

CHAPTER 1

1.1 Introduction:

The Internet of Things (IOT) is a physical object network. The internet is no longer just a network of computers; it has evolved into a network of devices of all shapes and sizes, vehicles, smart phones, home appliances, robots, cameras, medical instruments and industrial systems, people, and buildings, all connected, all communicating and sharing information based on predefined protocols in order to achieve smart reorganizations, positioning, tracing, safe & control, and even personal real time online monitoring, online upgrade, process control, and process optimization.

1.2 Objectives and Scope:

Today, various crimes are taking place in our city. As an example, theft crime and terrorism. This crime is handled by the crime branch. However, in some cases, the crime branch is unable to keep tabs on the secret thieves, what they are planning and executing. This prototype and model have been designed so that we can use it in the crime branch. For example - Crime branch has to catch the thief and see what he is doing and listen to what he is saying and track the thief where he is. So, we can use our IOT based remote control car in this place and some other places we can use this model. For example, disaster site (earthquake) Some people get trapped in their homes due to earthquake, some find it difficult to go there. So, at this place we can see how many people are trapped through our robot car by using camera. And we can communicate with those who are stuck using speakers and microphones. This is how we can help them.

1.3 Project Features:

The robotic car has a several features such as It can record a person's voice using a microphone, speak using a speaker, Surveillance using a camera, and easily track its location using a GPS tracker module, this all features controlled via the internet.

1.4 System Requirement:

1.4.1 HARDWARE Requirement:

- **Chassis of the 4-wheel drive robot:** This is a robotic car body to which many hardware body parts are mounted.

Fig 1: 4WD Car chassis

- **Raspberry PI:** Raspberry Pi is a single-board computer. The Raspberry Pi can be used as a mini computer by connecting peripherals such as a keyboard, mouse, and display. Raspberry Pi is a popular platform for real-time image/video processing, IoT applications, and robotics. Raspbian OS is based on Debian and is officially provided by the Raspberry Pi Foundation [4]. They also offer NOOBS OS for Raspberry Pi. Several Third-Party OS versions, such as Ubuntu, Arch Linux, RISC OS, Windows 10 IOT Core, and others, can be installed. The Raspberry Pi board comes in a variety of versions. In our model, I'm using a Raspberry Pi 3 model B. Technical Specification of in this model - WIFI, Bluetooth, Our model has 1024 MB of RAM, four USB ports, one ethernet port, one HDMI port, a microSD card slot, a 5V power supply port, a 64bit quad core Arm cortex A53 processor, and GPIO pins. GPIO pin is a general-purpose input and output pin. There is total 40 pins. GPIO Pins handle both incoming and outgoing digital signals.

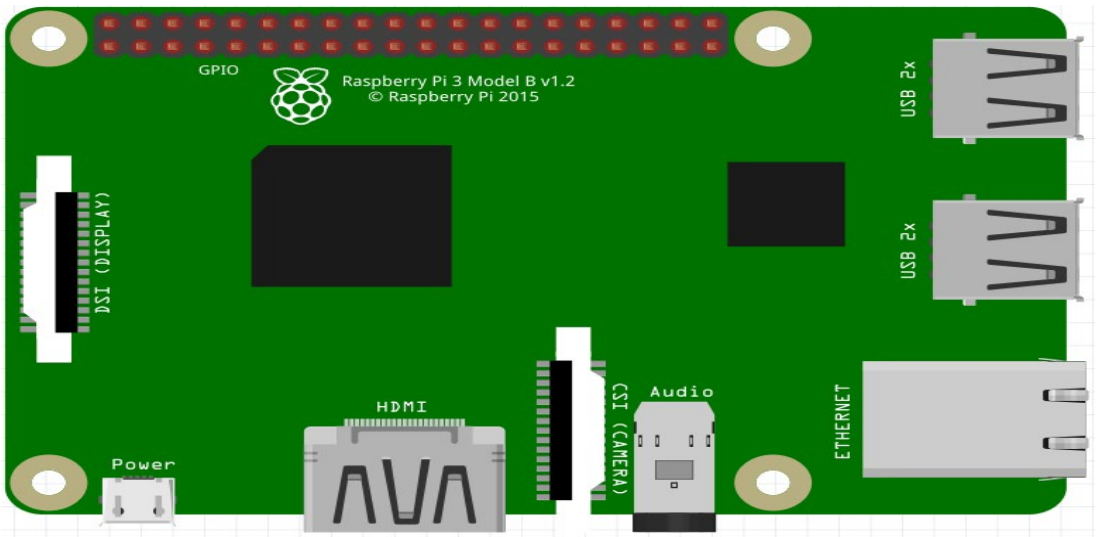


Fig 2: Raspberry pi

- **Motor Driver IC:** Motor Driver IC L293D Which can control four – motor.

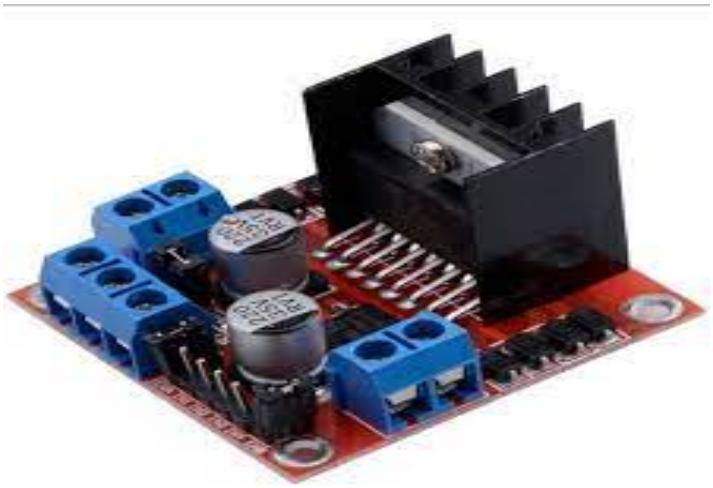


Fig 3 : Motor Driver

- **Jumper Wire:** Jumper Wire for connecting a separate component.

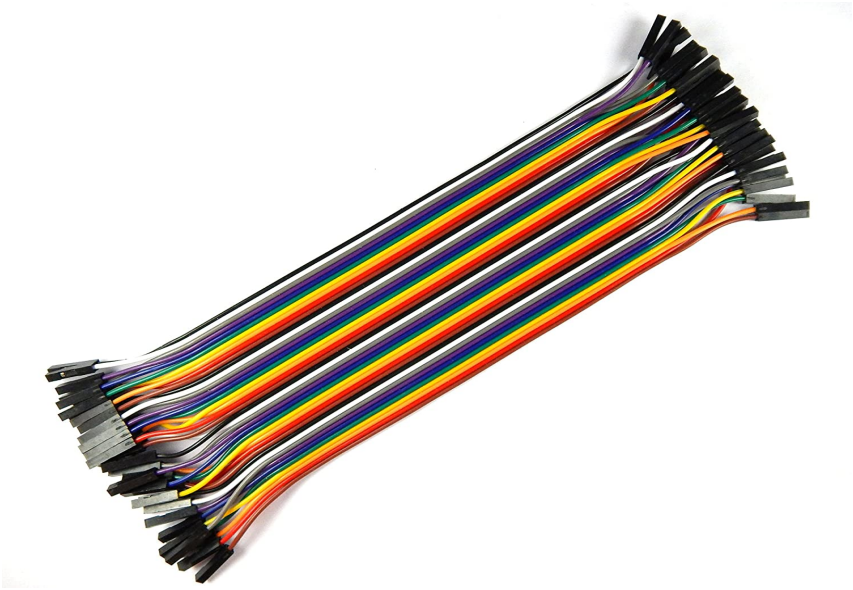


Fig 4 : Jumper Wire

- **Battery:** Battery provides power to all hardware components.

Fig 5: Battery

- **Webcam:** This is the camera that can shoot high-definition videos and photos. Webcam are connected with the raspberry pi board. It is used in this project for internet surveillance and streaming (live video).

Fig 6: USB Webcam

- **Microphone:** A microphone is a device that translates sound vibrations in the air as an electronic signal or scribes to the recording medium. In this project, which can be used to record a person's voice by robot .

Fig 7: USB Microphone

- **Speaker:** Speakers are transducers that convert electromagnetic waves into Sound waves. In this project the speaker is connected in the raspberry pi board.

Fig 8: Mini speaker

- **GPS Tracker**: GPS Tracker is used for tracing a location [5]. Various types of GPS tracker are available in the market, we have used a neo6mv2 GPS tracker.

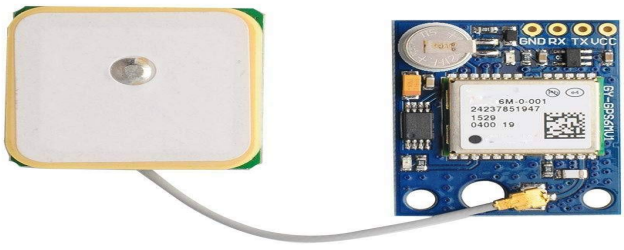


Fig 9: GPS Sensor

- **4G WIFI Hotspot device**: Hotspot device provide high-speed Internet connectivity Hotspot device that can be easily carried everywhere. Its a very small size. WIFI Hotspot device are connected to raspberry pi because this device allows to provide an Internet connection to raspberry pi.

Fig 10: 4G WIFI Hotspot device

- **TP4056-Charging module**: The module is capable of charging lithium-ion batteries.

Fig 11: Charging Module

- **DPDT SWITCH:** A DPDT switch is used where an open and closed wiring system is used. This switch is frequently used for simultaneous switching of two independent signals that should work in tandem.

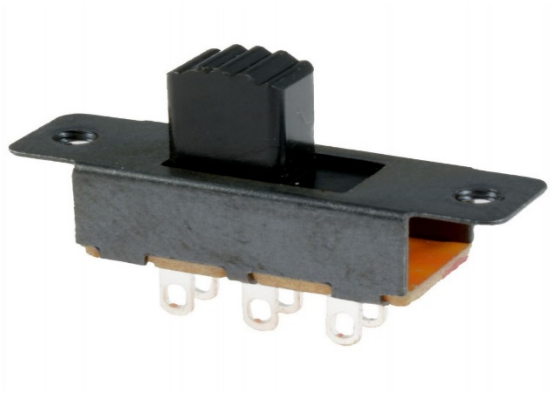


Fig 12: DPDT Switch

- **Speaker Amplifier:** The goal of audio amplifiers is to reproduce input audio signals at sound-producing output elements, with desired volume and power levels—faithfully, efficiently, and at low distortion.

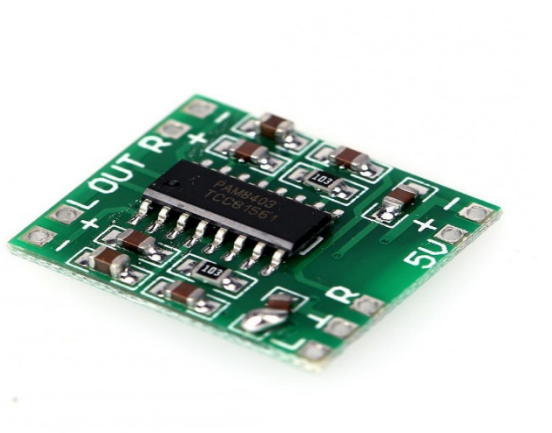


Fig 13: Pam840 amplifier

1.4.2 Software Requirement:

- **Raspbian OS :** This is the computer's operating system. It is primarily intended for use with the Raspberry Pi board. This is a system software that is open-source and based on Linux. It's simple to get from the Raspberry Pi website.

- **Python :** Python is an object-oriented, high-level, general-purpose programming language that is interpreted. In comparison to C, C++, and Java, this programming language is very simple. because its syntax enables programmers to express ideas in fewer lines of code.

- **Open-CV:** Open CV is a python open-source library, which is used for computer vision in Artificial intelligence, machine learning, face recognition etc.

- **Espeak :** With the help of this package, robot can speak. Espeak covert text or string into spoken words out loud on your robot.

- **Integromat:** Integromat is a cloud-Based automation platform designed to connect apps and services with powerful codeless integrations to automate online workflow.

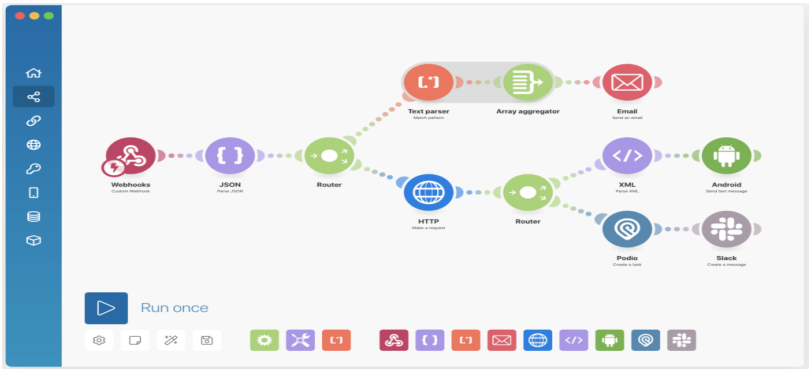


Fig 14: Integromat Platform

- **Google Sheets:** Google sheet is a cloud-based software. This software is same like Microsoft excel. We can access google sheet through internet.

- **VNC Viewer:** VNC viewer is a piece of software. We can remotely access or control our local machine from another location using this software.

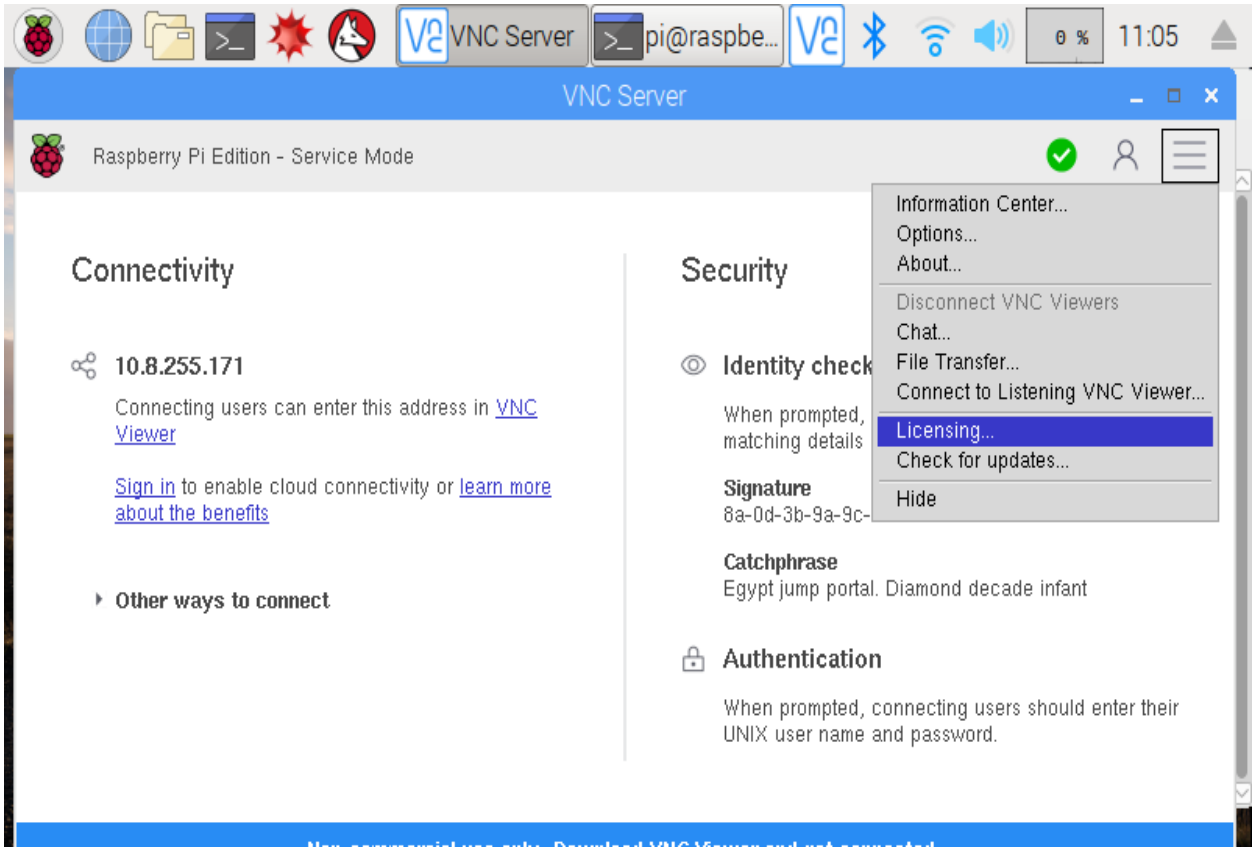


Fig 15: VNC Viewer

- **Ngrok:** Ngrok is a secure tunnelling service that allows you to access your device online from anywhere. Tunnelling is a method of creating a private connection between two computers on a public network such as the Internet. A tunnel between two computers must be secure and private, as well as capable of passing through network barriers such as port blocking routers and firewalls. It's a useful service that lets you tunnel requests from a secure Wi-Fi network or the open Internet behind a firewall to your local machine. With this platform, you can easily connect to your Raspberry Pi from outside your home or local network.

Chapter 2

Literature Review

In 2018, D. Kalaiarasi1 et al. [2] the author describes a IOT based motion control system of a robotic car, using Arduino node MCU. Here node MCU is a microcontroller to which different sensors are connected. An app developed allows users to send commands to their car via Bluetooth, Wi-Fi and mobile phones. The way to send commands to the car is to manually click the button that appears in the user interface. where The GPS sensor continuously pings the actual location of the car, and an obstacle sensor measures distance before and after an obstacle. Based on the command received Arduino takes appropriate actions to change the car's direction or state. The GPS data is sent to the android app which updates the UI based on the location of the robotic car. The robot car has a camera attached to it, which lets the user know about the car's motion as well as the environment in which it is being driven. This robot car has a limited range, so can't control it from afar.

In 2018 Zakiah Ayop et al. [3] Author provides a Prototype of Wireless Indoor Surveillance Using Raspberry Pi Robot Car. In this paper, the Raspberry Pi is acting as a controller or a small computer, sending signals to all the hardware devices it is connected to. A wireless IP camera attached to the robot car is used for surveillance. The interface of the robot controller is installed in a laptop or smartphone. The instructions and video feed received from the robot car is enabled through a wireless connection between the Raspberry Pi and the laptop/smartphone. It uses an analog to digital converter to determine the percentage of the robot's battery. Using this monitoring function one can check battery percentage balance and plan recharge. The range of this prototype is extremely limited. It is not remotely controllable. And it isn't even possible to control its features remotely.

CHAPTER 3

Preliminary design

3.1 HARDWARE COMPONENTS CONNECTION

The chassis of the robot is made of wood. Its size is (15*26) cm. This chassis body is divided into two layers: upper and lower. We connected four gear motors with bolts and screws in the lower layer body chassis, as well as the speaker lithium-ion battery, L239D motor driver, charging module, and DPDT switch. In addition, linked to another module in the upper layer chassis raspberry pi, USB webcam, GPS module, and power bank. The upper and lower layers of the body (chassis) are connected by a (Spacer stand) with a height of (4) cm.

3.1.1 Connection of battery / charging module / DPDT switch :

To increase the voltage, two lithium-ion batteries (3.7 volts) are connected in series to the battery holder. The TP4056 module is used to charge the lithium-ion battery, but it charges the battery in parallel. We get low voltage when connected in parallel, but I want high voltage. So, in this case, I am putting a DPDT switch. There are two input and four output pins on the switch. I connected the DPDT switch to the (TP4056) module and the lithium-ion battery. When we slide the DPDT switch to the left, our battery is connected in parallel, and it starts charging. When we slide the DPDT switch to the right, our battery is connected in series, and it starts getting high voltage. The TP4056 module has a (+) and (-) battery pin. We have connected the DPDT wire to this pin, and the output pins are OUT (+) and OUT (-) on the other side; We will take the output voltage through this pin. (fig 16) shown Connection of battery / charging module / DPDT switch .

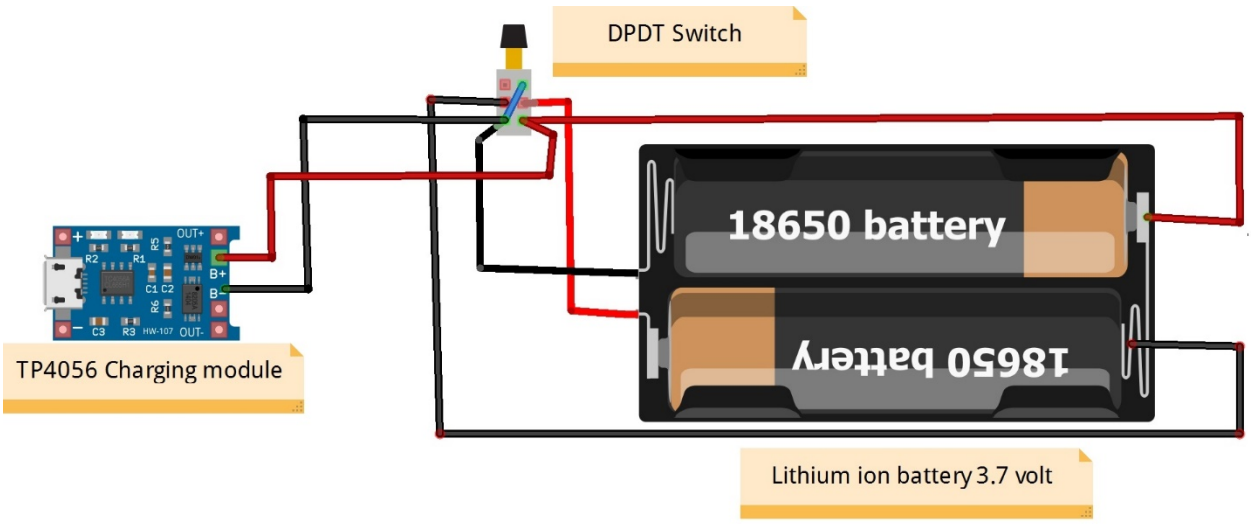


Fig 16 : Connection of battery / charging module / DPDT switch

3.1.2 Connection of 4 gear motor with raspberry pi and L239D motor driver, battery:

All four geared motor wires are connected to the L293D motor driver module. There are two output ports on the motor driver. This port sends output signals to the four geared motors, and on the other side of the motor driver are the VCC and GND pins for power. In this pin we give DC voltage of 7.4 volts. The motor driver can be powered by this voltage. Input pins are given right next to the power pins. This pin will receive the signal from our Raspberry Pi. The motor driver has four input pins, all of which are connected to the Raspberry Pi GPIO pins Input 1 = pin 7, Input 2 = pin 11, Input 3 = pin 13, and Input 4 = pin 15. Raspberry pi will give input signal to our gear motor with the help of L293D motor driver [7]. Due to which our motor is forward, reverse, turn left, turn right. (fig 17) shown connection diagram of four gear motor with lithium ion battery.

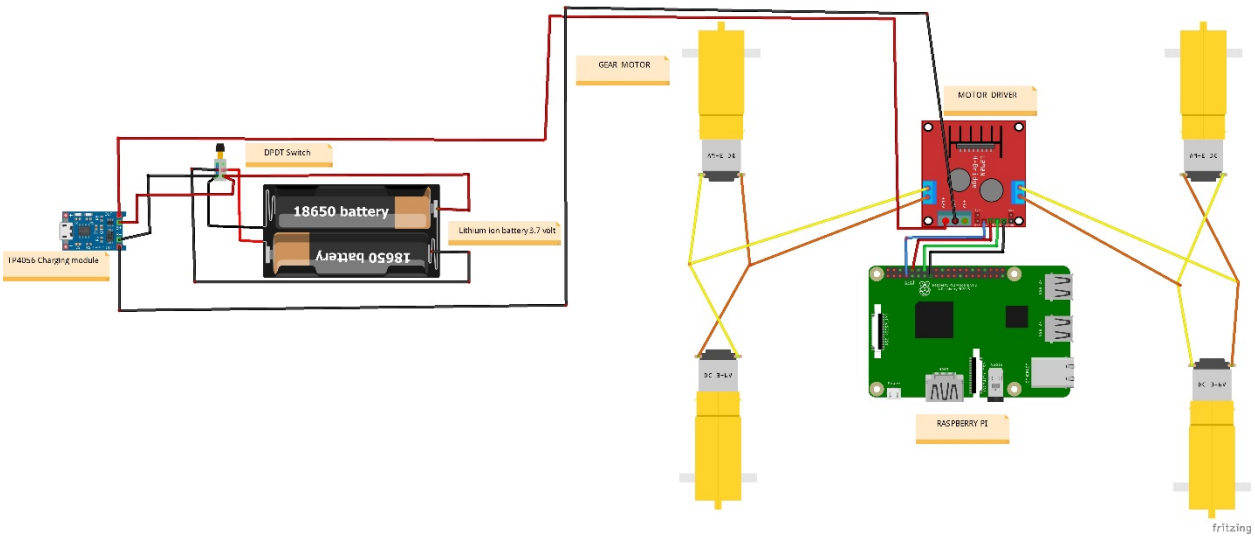


Fig 17: Connection diagram of 4 gear motor with raspberry pi and L239D motor driver, battery

3.1.3 Connection of Speaker / Camera / GPS Module/ USB Microphone

- **Connection of Speaker with raspberry pi**: We used a 2-watt speaker. Speaker wire is connected to the stereo audio amplifier (PAM8403) module's output (+) and output (-) pins on the left output channel. On the other side of this amplifier module, there is a Left channel input pin. This channel has an aux cable wire connected to it, and the

other side of the aux cable audio jack pin is connected to the raspberry pi's aux port. There is also a power pin available in this module (+) VCC pin, (-) GND pin 5 volts shown in (fig18).

- **Connection of GPS module NEO6MV2 with raspberry pi**: There are four pins on this module. VCC, GND, TX, and RX pins In this module, we require three pins. The VCC of the Neo 6M must be connected to the 5v of the Raspberry Pi, the GND of the Neo 6M must be connected to the GND of the Raspberry Pi, and the TX of the Neo 6M must be connected to the RX of the Raspberry Pi so that the GPS module can send data to the Raspberry Pi via serial connection shown in (fig 18).

- **USB webcam and microphone connection with raspberry pi:** connected a USB webcam and USB micro the Raspberry Pi's USB port connection shown in (fig 18).

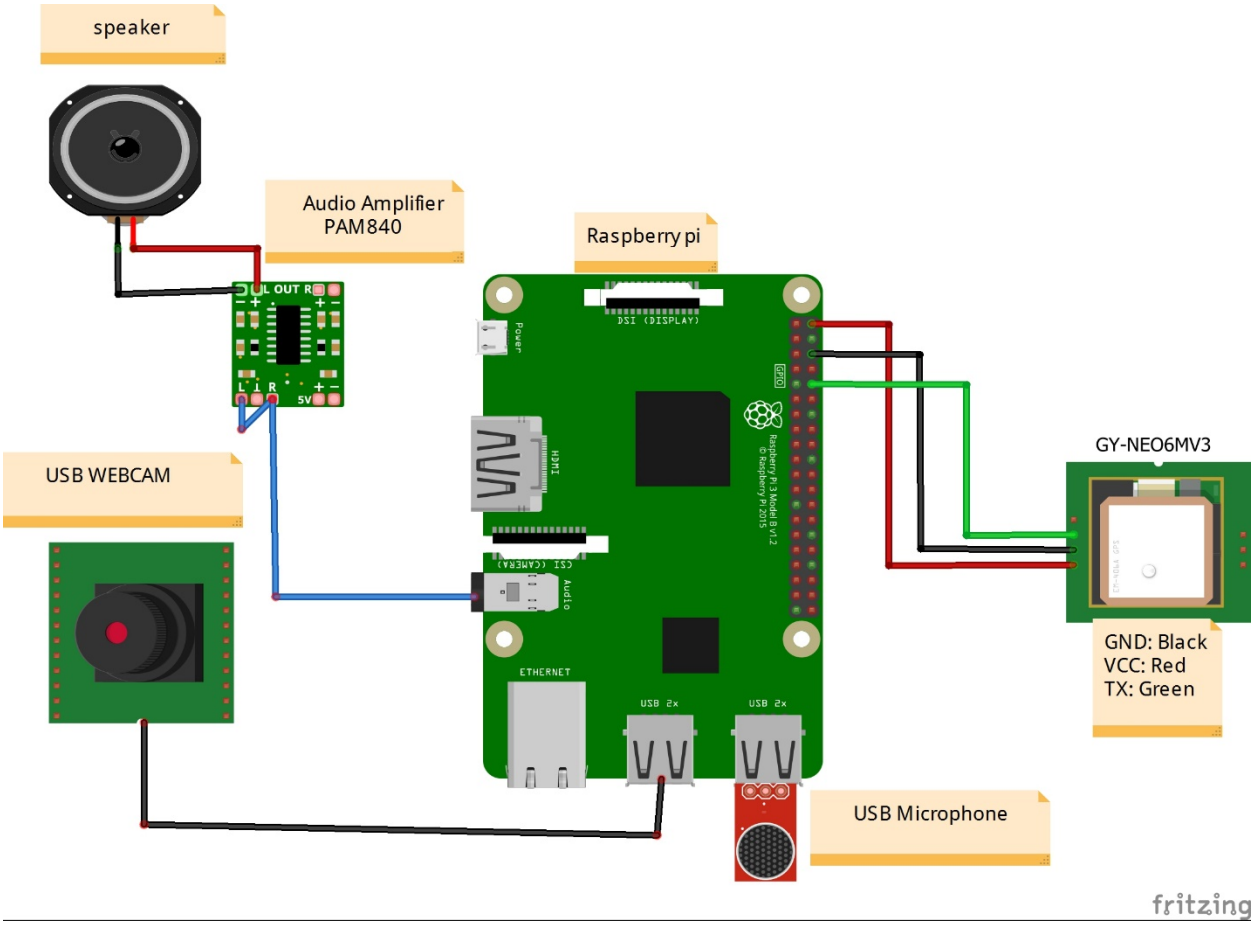


Fig 18: Connection diagram of Speaker / Camera / GPS Module / USB Microphone

Chapter 4:

Final Analysis and Design

4.1. Project Phases:

4.1.1. Robot car access to a remote location via ngrok:

To operate, we must gain access to our robot car and send a signal from a remote location. So, we can use the ngrok software package. With this software, we can access our local machine (Raspberry Pi) from anywhere in the world via the internet. (Fig 19) depicts how we can remotely access our Raspberry Pi.

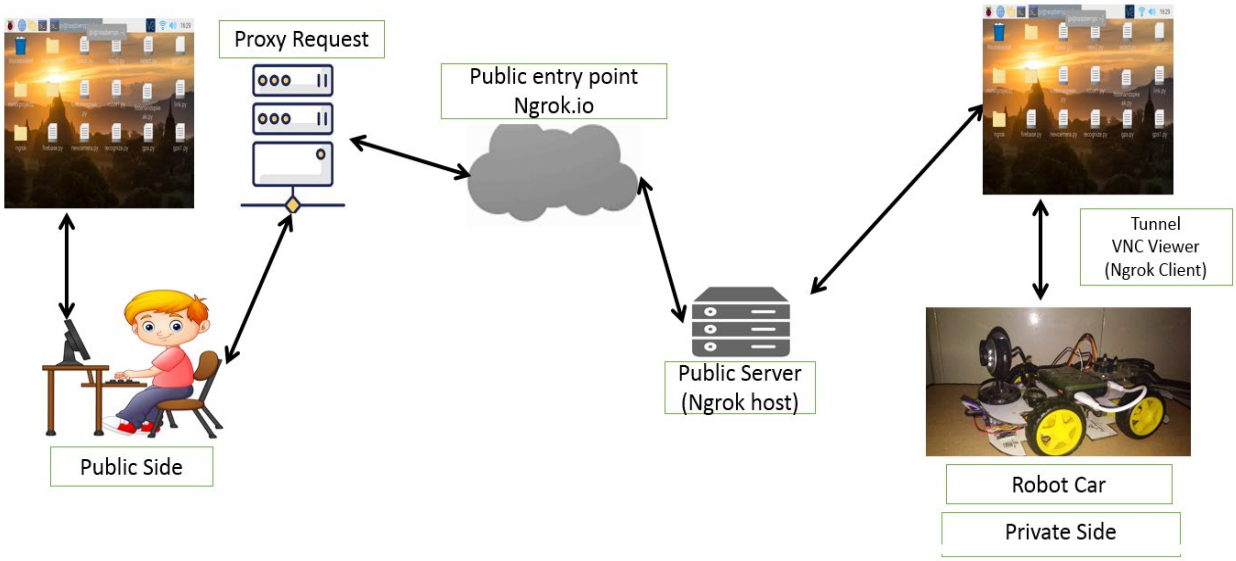


Fig 19: Robot car access to remote place using ngrok

- **Steps to Begin NGROK Services:** we used some commands to install the ngrok package on the raspberry pi board. and entered this command into the raspberry pi terminal after installing the ngrok software.(. /ngrok begin —all) This command tells us whether or not our ngrok software was successfully installed. If our ngrok software has been successfully installed on our raspberry pi (. /ngrok start —all), this command will start all the services. After that, take note of the host address and port number as shown in (fig 20) the image below.

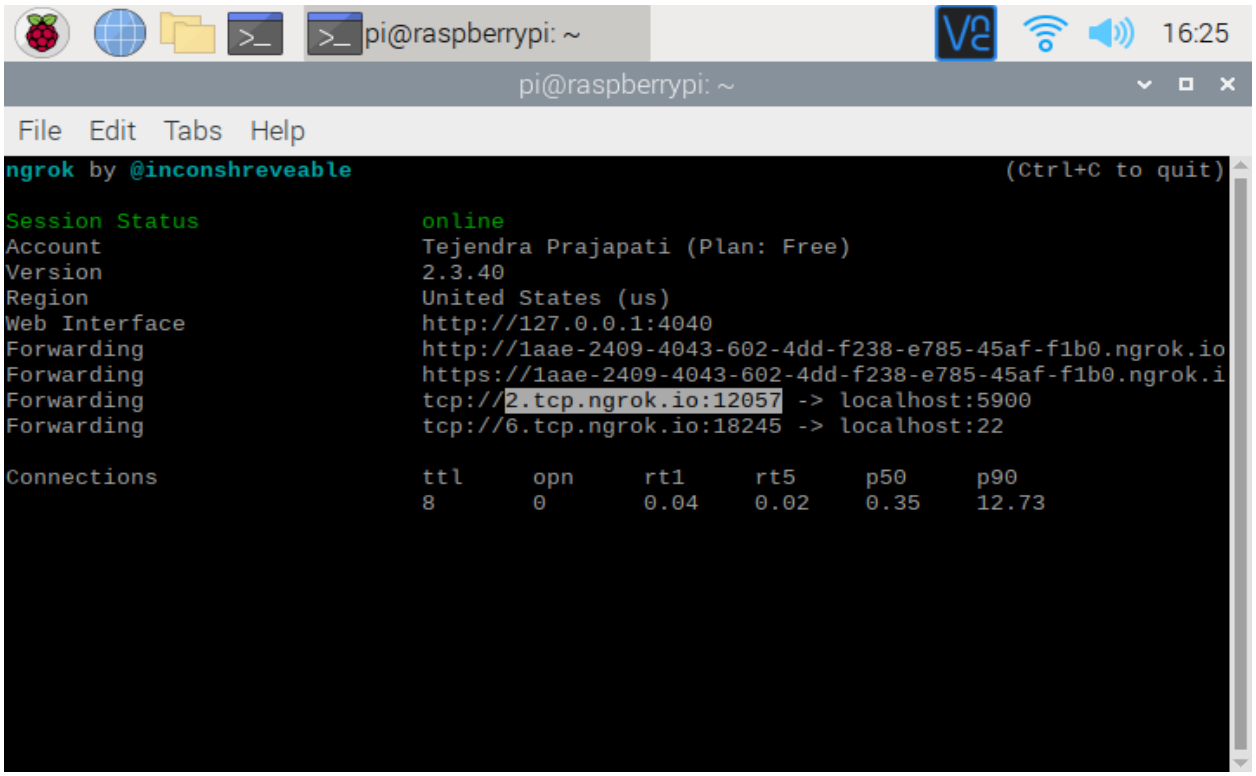


Fig 20: Raspberry pi terminal

To access VNC viewer online, launch a new vnc viewer from any computer connected to the internet, then enter your ngrok host address and port number as shown in the (Fig. 21) image below and click open.

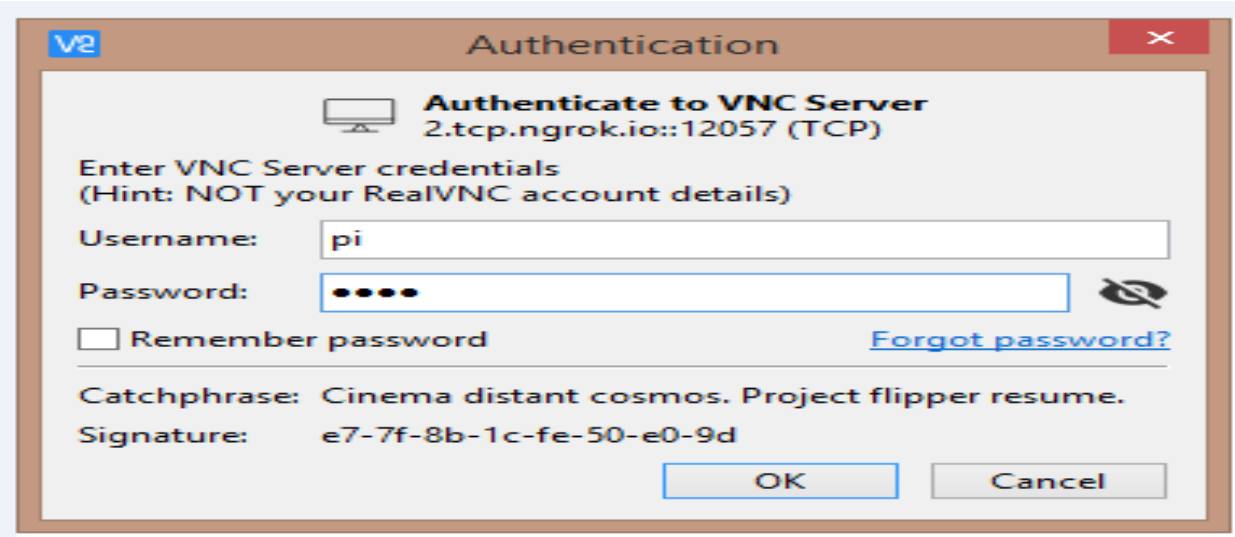


Fig 21: Authentication

When you enter a username and password into the vnc viewer, a security alert window appears. When you try to access your pi from a remote location for the first time, you can use your rsa2 key to store the rsa2 key in your cache for future reference. Request permission, then click Yes to proceed (fig 22).

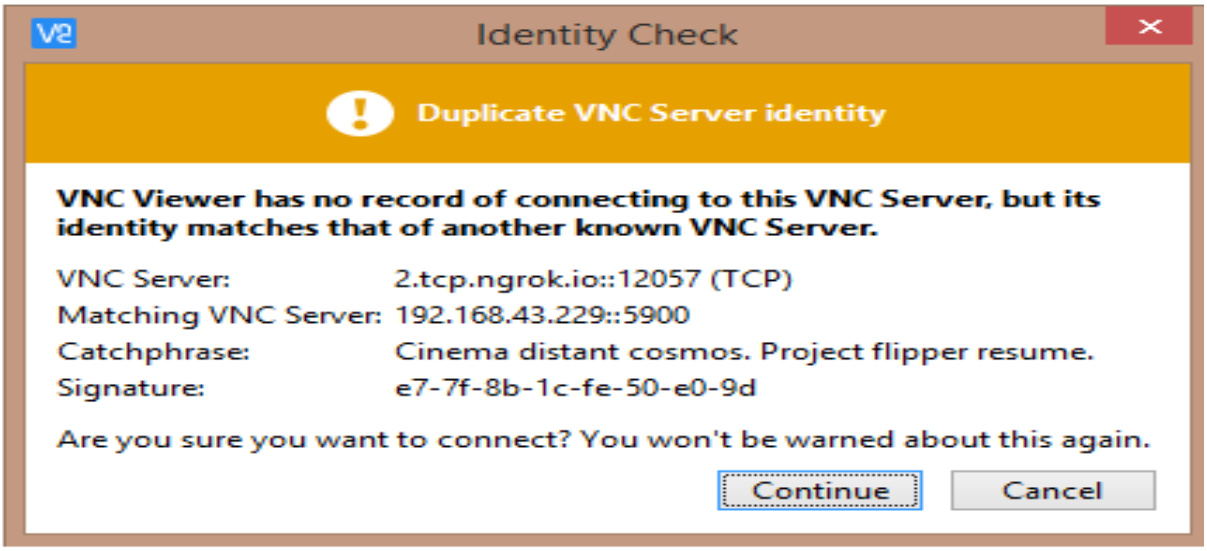


Fig 22: Identity Check

Now our computer is connected to our Pi while it is not connected to our home/local network fig(23).

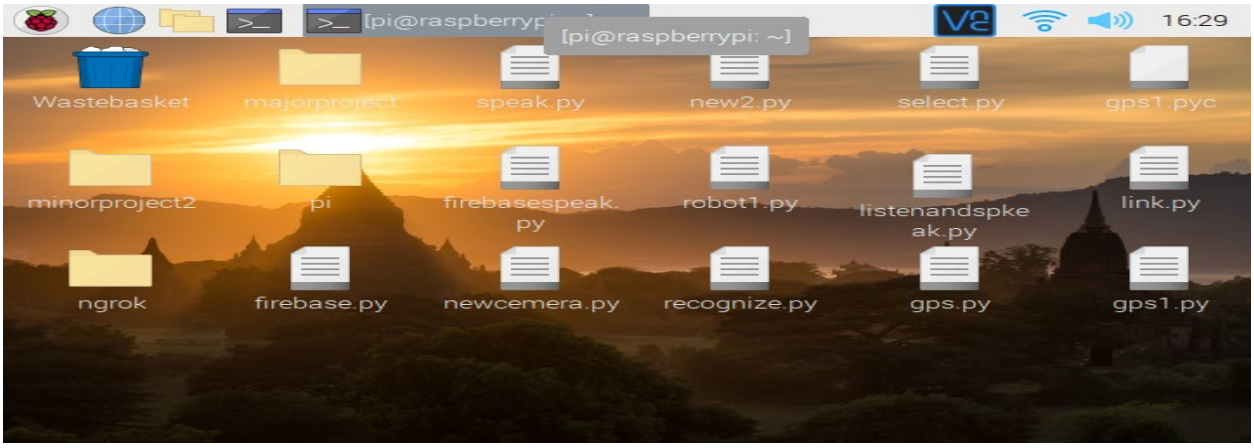


Fig 23: Raspberry pi interface

4.1.2. Controlled four gear motor remotely using NGROK:

After installing ngrok software, now is to be able to control our gear motor remotely via internet using VNC Viewer. We written a Python program on Raspberry Pi board. The file name is Robot1.py. Will execute this python program remotely using a python editor. The logic we have written is contained in this program file. The keyboard is used to provide instructions to the Robot Car. The following are the keys:

Keyword Keys	Movement
w	Forward car
s	Reverse car
a	Turn left car
d	Turn right car
e	Pivot right car
q	Pivot left car

Using flow diagram to demonstrate logic fig(24).

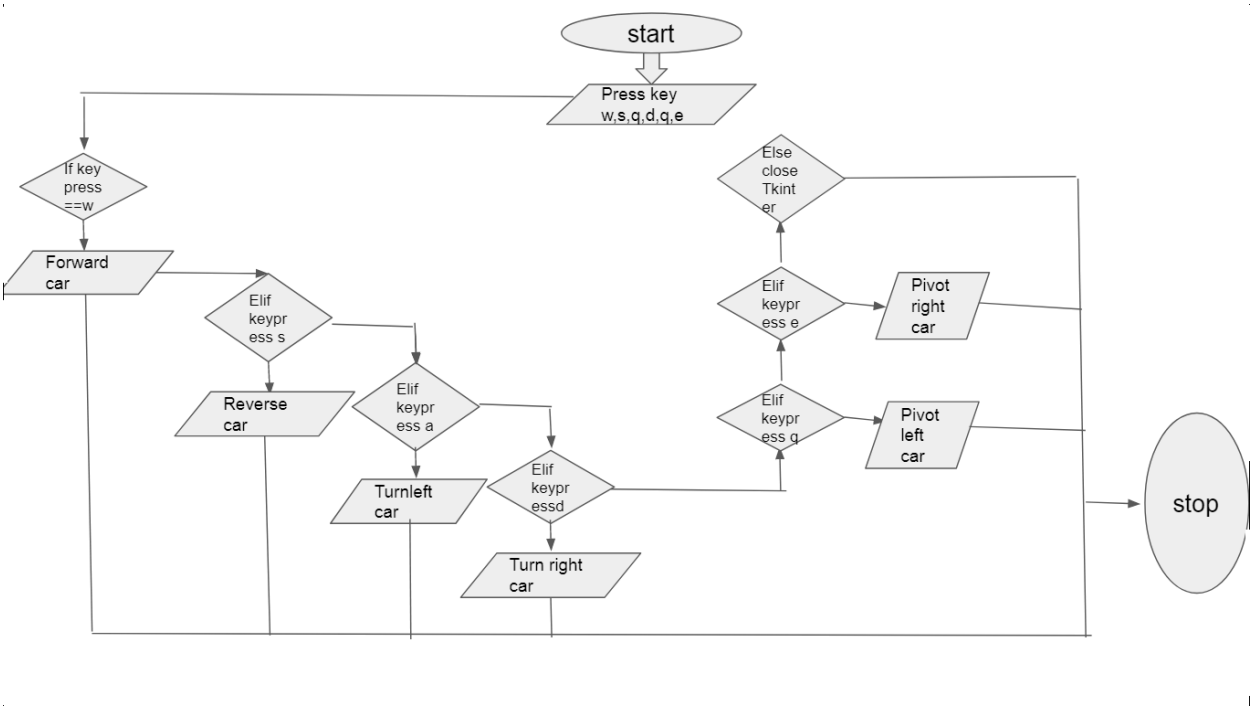


Figure 24: Flow Diagram of a Controlled Four Gear Motor

Pivot left and right movement we might want our robot car to be able to pivot if we don't to gain as much forward ground as a regular turn would require

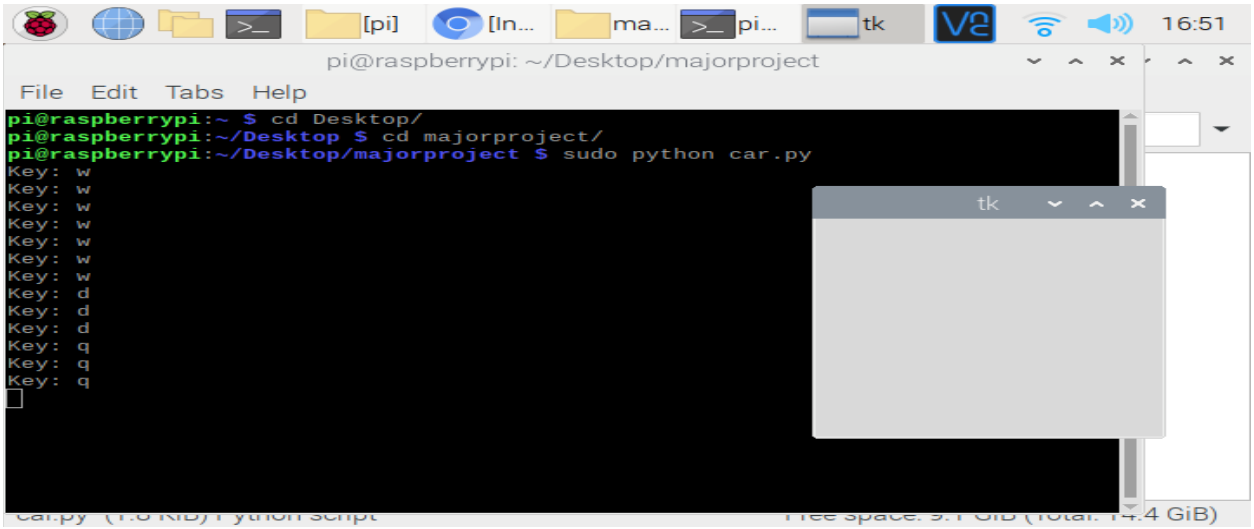


Fig 25: Program output

4.1.3. Controlled Speak Robot and voice recording functionality with ngrok:

- **Speak Functionality:**

Using ngrok software we can remotely speak our robot car through VNC viewer using internet. (Fig 25) shown how robot can speak and show how to send a command.

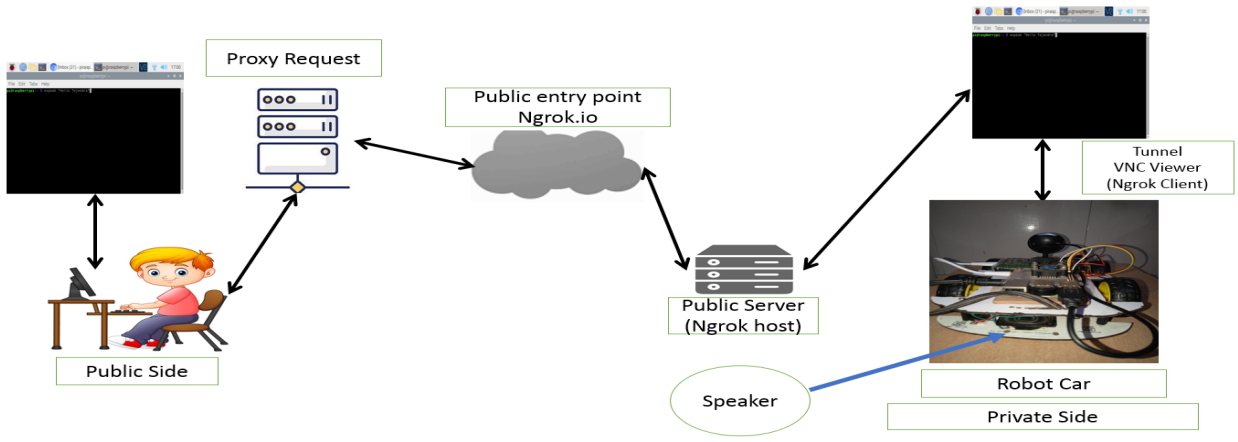


Fig 25: Controlled Speak Robot

The espeak package helps to make the robot speak; With this package, our robot car can communicate. This package adds text-to-speech functionality to the Raspberry Pi terminal. This is a command that will be executed on the terminal shown (fig 26) of the Raspberry Pi. we will run this command from a remote location using the Raspberry Pi terminal.

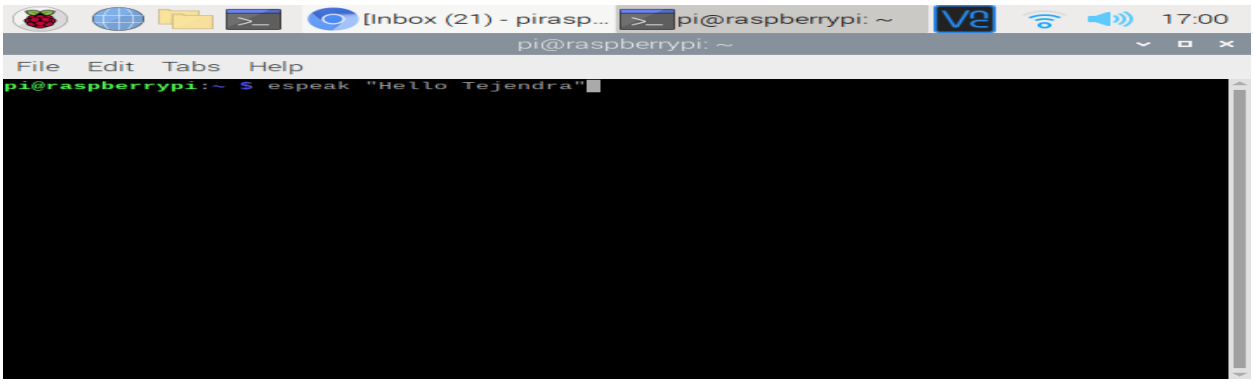


Fig 26: espeak output

- **Recording Functionality:**

Using ngrok software we can remotely record anyone's voice with our robot car and listen to anyone's voice through VNC viewer using internet. (Fig 27) shown how to record a person's voice using robot and show how to send a command.

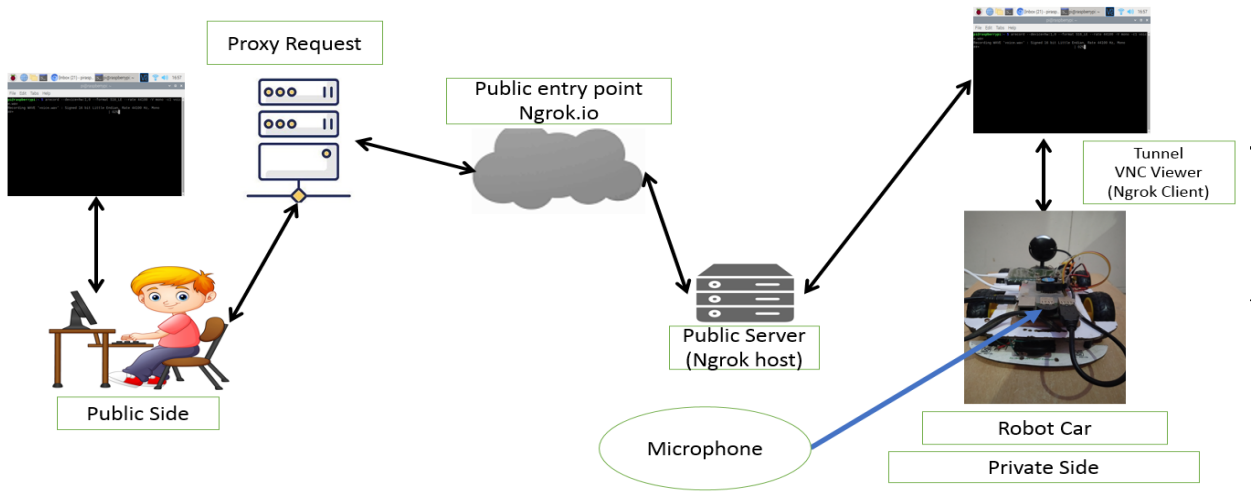


Fig 27: Controlled robot recording

This is a command that will be executed on the terminal of the Raspberry Pi shown (fig 28). We will run this command from a remote location using the Raspberry Pi terminal. Run the following command in the raspberry pi terminal to begin recording your voice.

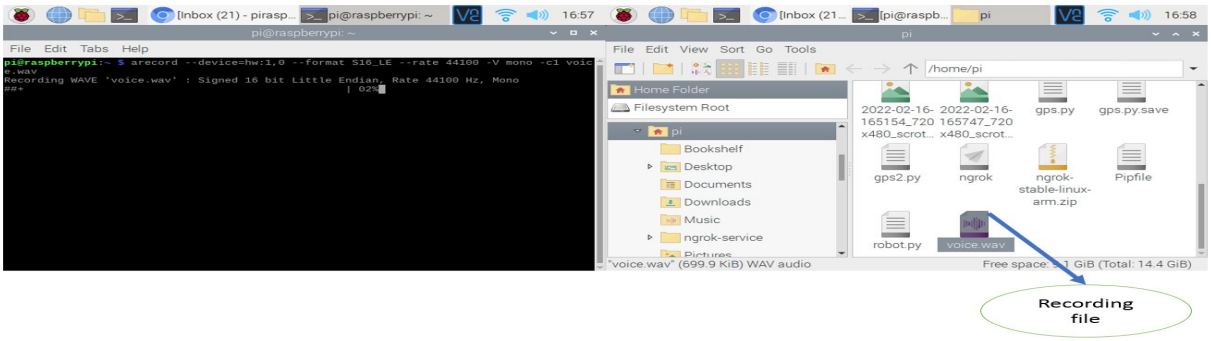


Fig 28: Recording Output

4.1.4. Controlled Surveillance features through USB Webcam using ngrok:

Using the ngrok software, we can remotely access our robot car camera via the Internet using a VNC viewer. (fig 29) shows how to remotely access robot car webcam.

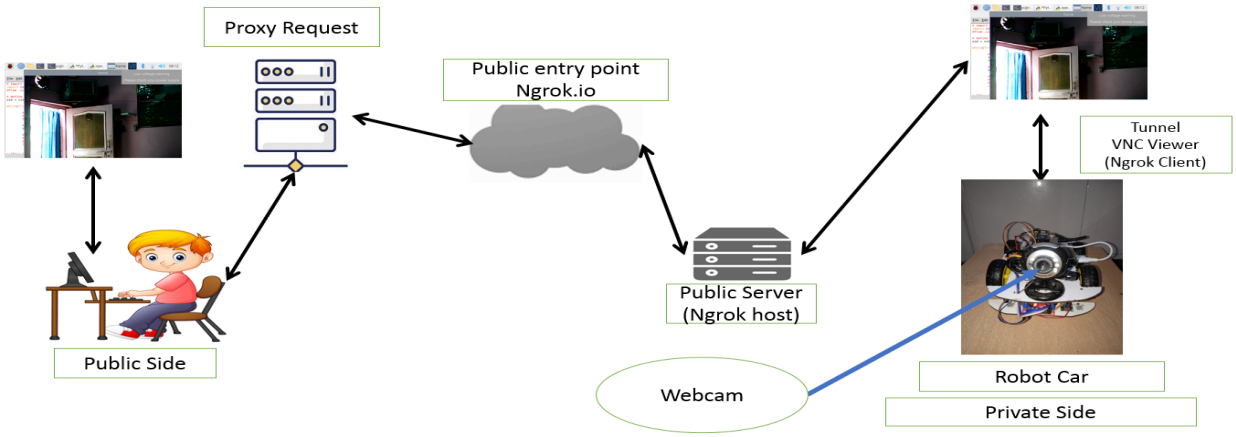


Figure 29: Remotely controlled USB Webcam

On the Raspberry Pi board, I have written a Python program. The file name is (cam1.py) . We will run this python file remote location using the Python editor's VNC viewer. This python file contains the logic that I have written. Using this logic our usb webcam will be activated shown fig(30).

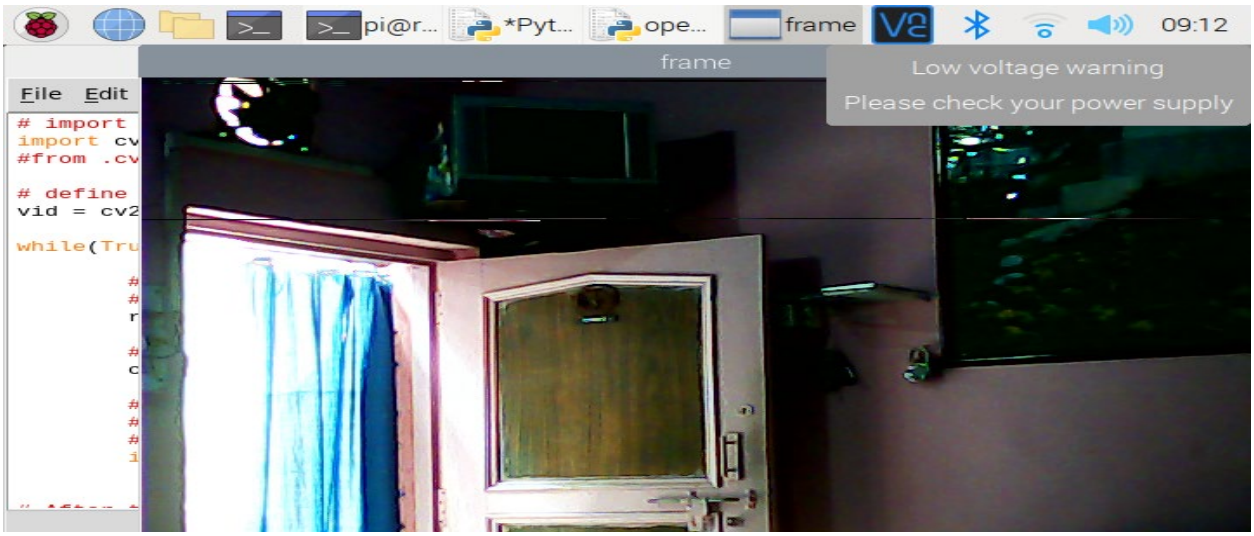


Fig 30: Camera Output remotely

4.1.5. Remotely control the GPS module and track the location:

GPS module provides latitude and longitude values. Latitude and longitude coordinate system that can be used to determine the position or location of any point on the Earth's surface. This latitude and longitude value is pushed to Google Sheets via the Integromat cloud server. We can use Google Maps (fig 18) to determine the exact location of our robot car using this latitude and longitude value. On the Raspberry Pi board, we have written a python program for the GPS module. Run this python file remote location using the Python editor's VNC viewer. This program returns latitude and longitude values, as well as date and time. This value is pushed to the Integromat cloud server via the Integromat API key. (fig 31) shown how to get latitude and longitude values.

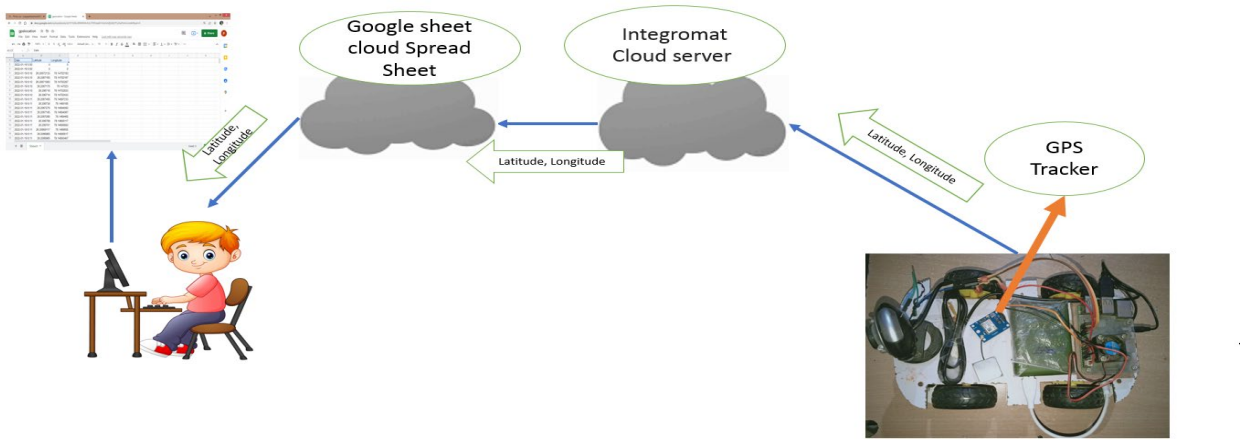


Figure 31: Remotely controlled GPS module

Google Sheets is linked via the integromate cloud platform. So that our latitude and longitude values, as well as the date and time, can be displayed on our Google Sheet shown (fig 32).

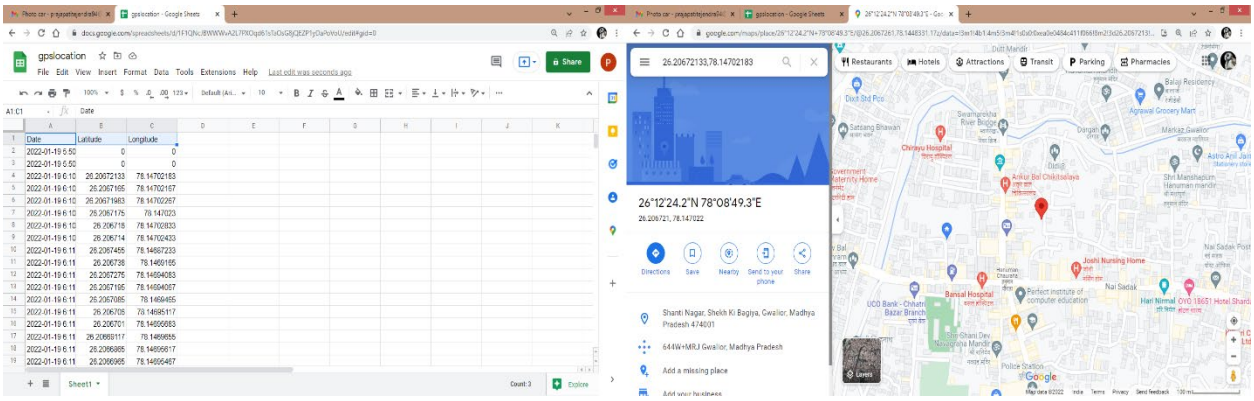


Figure 32: GPS data output

4.2. Application:

1. Crime branch.
2. Disasters Areas.
3. Military
4. Theft

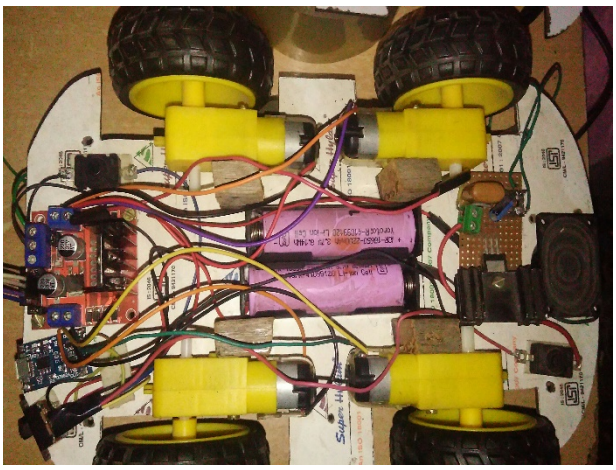
4.3. Problems faced:

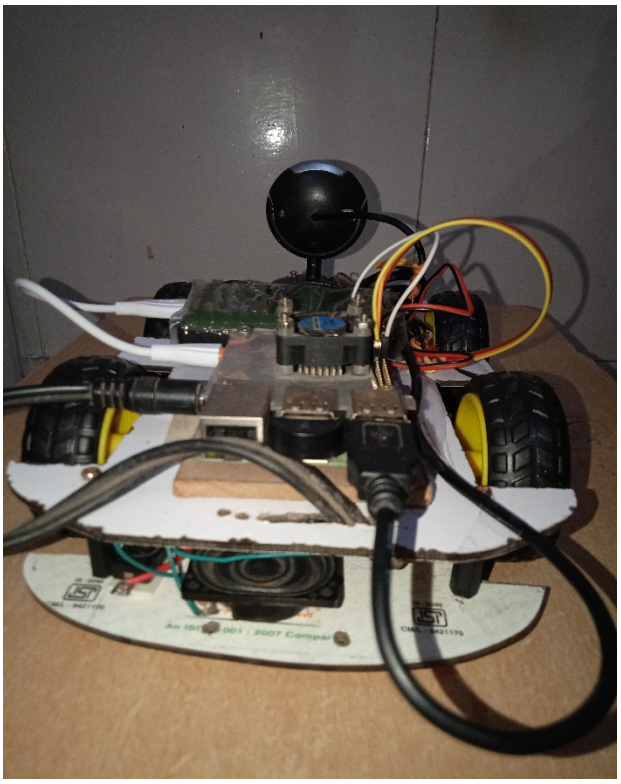
1. Connecting Raspberry Pi to the Cloud
2. connecting GPS sensor.
3. In soldering all the sensors and actuators.
4. Synchronizing all four motors.

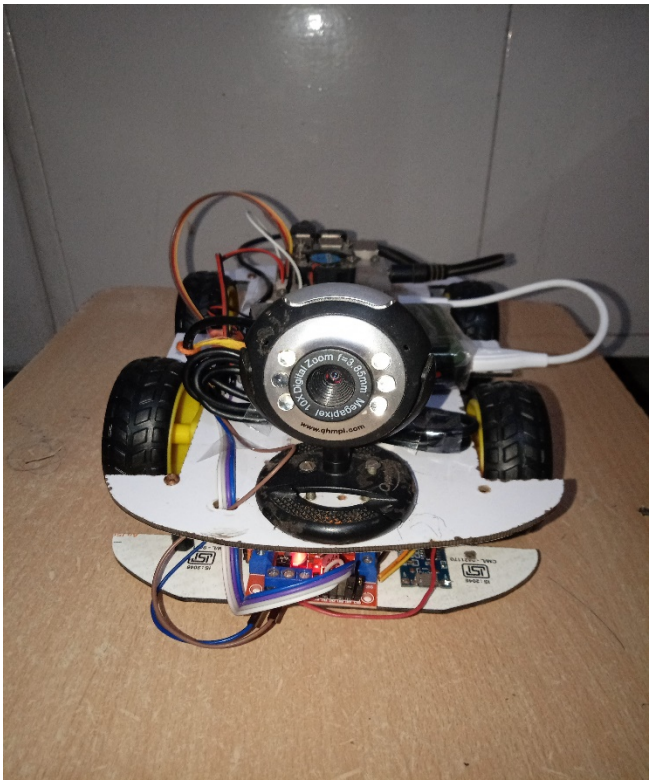
4.4. Limitations:

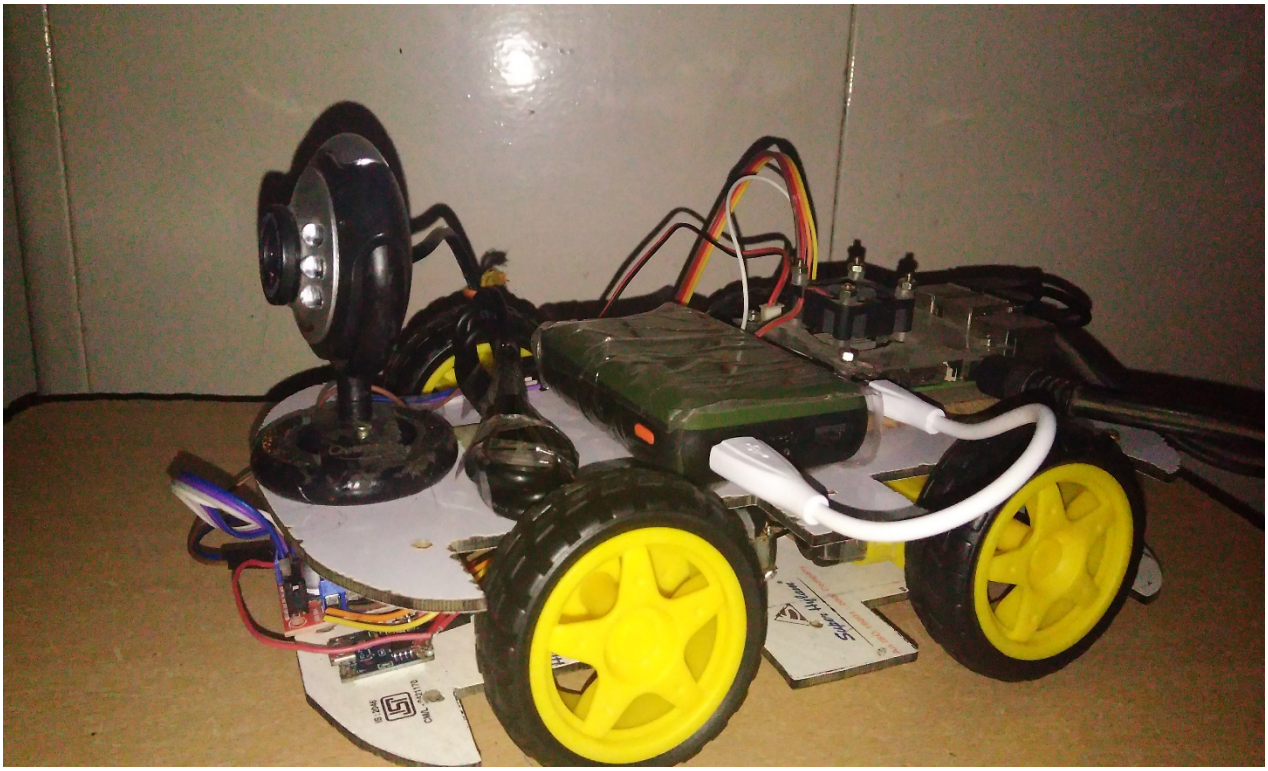
1. All functions of the robot car are dependent on the internet; if the internet goes down, all functions of the robot car will stop working.
2. The robot car's speed is modest.
3. The image quality of a USB Webcam is a little lower.
4. The USB microphone's coverage area is only 5 metres.

4.5. Results:









4.6. Conclusion:

A method for creating a self-driving robot car is presented in this paper. Different types of software packages, hardware components and how to connect all the hardware connections are clearly described in this paper. A process of remotely accessing our robot car via the internet is described in detail using ngrok. The flow chart, flow diagram, and connection diagram discussed in the paper have all been successfully implemented on an IOT-powered robot car.

4.7. List of References:

[1] A. Nayyar, "Internet of Robotic Things : Driving Intelligent Robotics of Future - Concept , Architecture , Applications and Technologies Internet of Robotic Things : Driving Intelligent Robotics of Future- Concept , Architecture , Applications and Technologies," 2018 4th Int. Conf. Comput. Sci., no. January 2019, pp. 151–160, 2018, doi: 10.1109/ICCS.2018.00033.

[2] D. Kalaiarasi, S. Pavithra, S. Pratheeba, and R. L. Priyaadharshini, "IoT BASED MOTION CONTROL SYSTEM OF A ROBOTIC CAR," pp. 3–6, 2018.

[3] Z. Ayop, S. Anawar, and S. S. Rahayu, "A Prototype of Wireless Indoor Surveillance Using Raspberry Pi Robot Car A Prototype of Wireless Indoor Surveillance Using Raspberry Pi Robot," no. July, pp. 1–3, 2018, doi: 10.13140/RG.2.2.24958.82242.

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[6] L. M. Giripunje, M. Singh, S. Wandhare, and A. Yallawar, "Raspberry pi based autonomous car," vol. 6, no. 2, pp. 139–144, 2019.

[7] G. SinghPannu, M. Dawud Ansari, and P. Gupta, "Design and Implementation of Autonomous Car using Raspberry Pi," Int. J. Comput. Appl., vol. 113, no. 9, pp. 22–29, 2015, doi: 10.5120/19854-1789.

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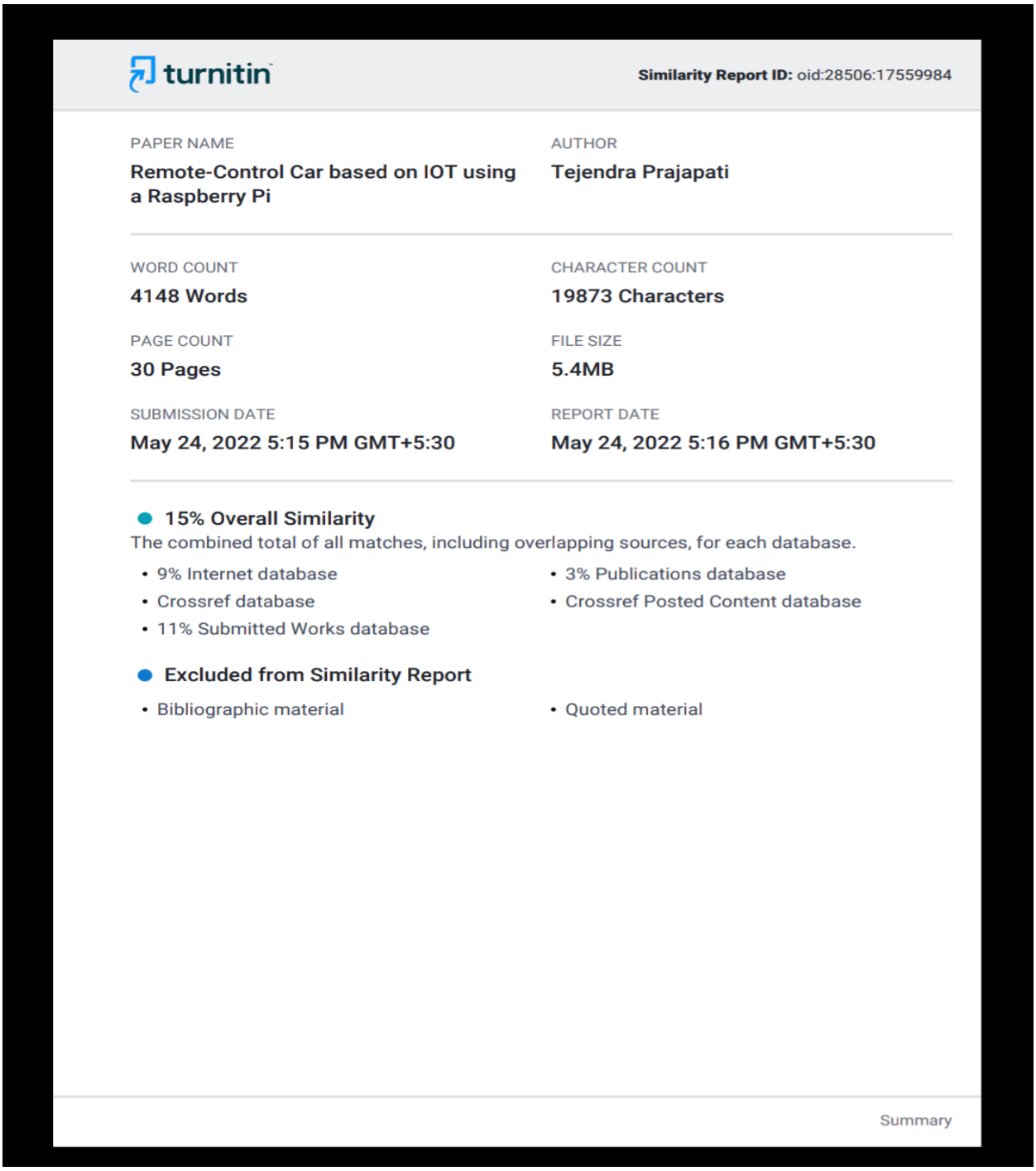

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Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	IOT Based Robotic car = Now I have successfully mounted all sensor and actuator in robot car.				
OVERALL GRADE (Any one)	✓ **POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
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Signature of Industry Mentor					

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Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	IOT Based Robotic car = Now I have connected the cloud server to the robot car.				
OVERALL GRADE (Any one)	✓ **POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
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Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	IOT Based Robotic car = Now I have attached the small speaker to the robot car and downloaded the espeak package for speak robot .				
OVERALL GRADE (Any one)	✓ **POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
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Signature of Industry Mentor					

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Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	IOT Based Robotic car = Now i have accessed my raspberry pi from different location				
OVERALL GRADE (Any one)	✓ **POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
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Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	IOT Based Robotic car = Now i have successfully connect GPS module neo6mv2 to the raspberry pi.				
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Industry/Organization			Date/Duration	12 April-28 April	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	IOT Based Robotic car = Now i have successfully connect USB Microphone to the raspberry pi.				
OVERALL GRADE (Any one)	✓ **POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
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Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	IOT Based Robotic car = Now i have successfully connect USB Webcam to the raspberry pi.				
OVERALL GRADE (Any one)	✓ **POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
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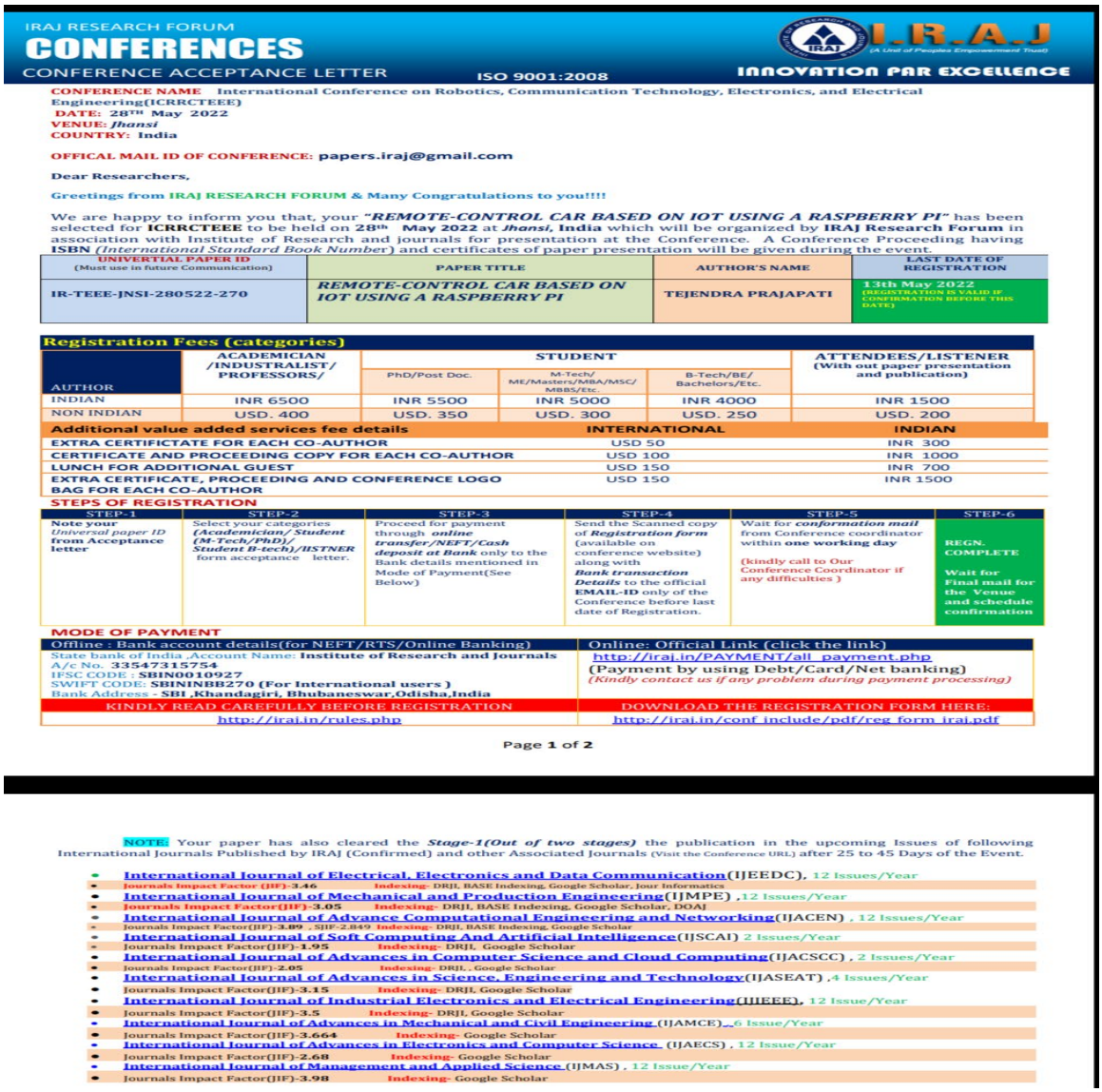

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