DESIGN AND IMPLEMENTATION OF VOICE CONTROLLED ROBOT

MHB4233 DESIGN PROJECT – I REPORT

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BONAFIDE CERTIFICATE

Certified that this project report titled "**DESIGN AND IMPLEMENTATION OF VOICE CONTROLLED ROBOT**" is the Bonafide work of **Mr. SASIDHARAN (20130002), Mr. VISSVAA (20130004), Mr. NOEL INNOCENT (20130009) and Mr. SYED NADEEM (20130010)** who carried out the project work under my supervision during the academic year 2021-2022.

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ABSTRACT

Voice signal plays a major role in the communication among human beings. Robots reduce the human efforts in their day-to-day tasks. In this project, a voice-controlled robotic vehicle is developed. The human voice commands are taken by the robotic vehicle through an android application with a micro controller. The voice signal commands are directly communicated to the robotic vehicle using Bluetooth. The robotic vehicle is controlled by voice commands received from the user. The development of the robotic vehicle is carried out using two DC gear motors associated with micro-controller at the collector side. The commands from the application are changed over in to computerized signals by the Bluetooth RF transmitter for a fitting reach (around 100 meters) to the robot. At the receiver end the information gets decoded by the receiver and is taken care of to the micro-controller which drives the DC motors for the fundamental work. The voice-controlled robot is designed and implemented to reach out the necessary undertaking by paying attention to the commands of the user. An earlier preliminary meeting is required for the smooth activity of the robot by the user. A code is utilized for offering guidance to the user. Performance valuation is carried out with appreciable results of the initial experiments.

Keywords: Robot, Plan, Voice control, Micro controller, Bluetooth, Computerization and Performance.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

The rapid growing and advancement of modern technology has yield to the developments and inventions of modern equipment and machineries. Many amputate people usually depend on others in their daily life. Nowadays, many kinds of bots have implemented utilizes the analogue joysticks, touch activated switches, chin-controlled switches and head-controlled switches. They also implemented the GUI system to control the bot. In this project, we will develop control system of the bot movement will be employed by the voice and the robot will response the commanding persons.

1.2 PROBLEM STATEMENT

- People who are disabled and handicapped and cannot drive their own vehicle.
- Amputated and handicapped people dependent to the other person.
- People who cannot use the GUI and Joystick

1.3 OBJECTIVE OF THE PROJECT

The project aims to achieve the following

- To control the robotic vehicle using human voice
- To integrate mobile application, actuators, and controllers along with wireless communication to gain good experience at training.
- The Interface between the mobile application and bot is done through via Bluetooth technology.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter we are discussing about the previous researches which are focused on designing and developing of voice-controlled bot. There are many types of voice control techniques in bot which has been implemented. The sources of this information are mainly from journals and conference papers.

2.2 REVIEW OF LITERATURE SURVEY

[1] Single-Equipment with Multiple-Application for an Automated Robot-Car Control System by Saleem Ullah, Zain Mumtaz, Shuo Liu, Mohammad Abubaqr, Athar Mahboob and Hamza Ahmad Madni (2019). This paper is deals about the innovative element of the proposed work in this paper the integration of greater functionalities into vehicles increase the complexity of car-controlling. The proposed system has capability to identity voice commands and makes them to move using Bluetooth technology. They have used two modes of transmission and controlling of the robot car. The first mode is to control a robot car with an android mobile application when the user presses the corresponding touch button in mobile application , a signal is transferred to the micro-controller that is attached to the car through the built-in mobile Bluetooth device motor module to move the wheels of the robot car accordingly to the received signal .The second mode is the hand-gesture system in that accelerometer first senses the acceleration forces from the direction of the hand and sends them to the micro-controller that is attached to the hand. After receiving the data, micro-controller converts it into different angles, between 0–450°, and sends it to the RF receiver of the Arduino Uno that is attached to the robot car through the RF sender. After receiving the signal, it will process the data and sends the signal to motor module to move the wheels of the robot car

accordingly to the angles.

[2] Voice-Controlled Autonomous Vehicle Using IoT (2019) by Sumeet Sachdeva, Joel Macwana, Chintan Patela, Nishant Doshia. This paper deliberates about the concept of Internet of things which can be accessed by any others part of the world. In this project, the motor will be controlled using voice commands through google assistant in smartphones. To use the google assistant, they use the software called “IFTTT”. In this “IFTTT”, we can create the simple programs to control the devices. They also used the Adafruit.io for storing the data, viewing the data and control devices.

[3] Design of Voice Controlled Smart Wheelchair (2015) by Ali A. Abed The motivation behind the project to help the handicapped people and patients to control the wheelchair using voice commands. In this project, they use new component called “voice recognition board with HM2007”. This will enable the system to recognize different voices, inflections and enunciations of the target word so that it will recognize the different languages .More interesting part in this project , in order to not respond to some similar words spoken randomly in an environment, secret voice key is preferred to be a word with complex pronunciation in order to not pick up by others and also by utter the words twice in order to respond the system The direction and velocity of the chair are controlled by pre-defined Arabic voice commands. They have controlled the direction and velocity of the chair by pre- defined Arabic voice commands. They have tested and successfully demonstrated with patients for utterance of Arabic words.

[4] Arduino Based Voice Controlled Robot Vehicle by M Saravanan et al 2020 This paper deliberates to create voice controlled robotic vehicle (VCRV) is to listen and act on the commands of the user. For that, they have developed the android app AMR voice for the voice control robot using MITA2 app. The developed app contains the option to connect to Bluetooth module and access the Bluetooth setting of the phone

[5] Design and Fabrication of a Voice Controlled Wheelchair for Physically Disabled People by G Azam and M T Islam (2015). The authors have used CAD/CAE tools to eliminate the early flaws and to improve the quality of the Wheels and their mechanism. With the combination of these mechanical and electrical parts, the manual wheelchair is turned to be an electrical wheelchair. They have utilized a PIC controller manufactured by Microchip Technology to control the system operations. They have programmed the assembly level code and stored in controller's memory. In this project, they have developed a cost effective and efficient movable and easily controllable Wheelchair that can be controlled via voice commands. By using PIC, they are controlling the motors and using voice recognition board to identify the voice commands. It was allowed to move in a straight line. In voice recognition board, we have to train the board to recognize the voice. There is no further add upon to their project, they have calculated the velocity that wheelchair with and without the load.

[6] Obstacle Avoidance and Voice Control Unit for Autonomous Car (2021) by MA Bhikule, MS Mankame, MS Khot, MY Nhawkar In this paper, the authors have done new approach in methodology they have included the obstacle avoidance to their project. when the user is commands move forward to the robot. But at the same time some objects are in front of robot. The robot can avoid the way and search another way to move on. They are using the ultrasonic

sensor for detection of obstacle. The ability of the machine to receive and interpret the human voice or to understand and carry out spoken commands can be concluded as speech recognition.

2.3 SUMMARY

From all the previous methods implemented in the voice controlled based project we can understand that various methods were used for recognition for voice. In all these studies we come across a common fact that they used mobile application for voice recognition

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

The Voice Controlled bot is designed to provide a mobility to the disability. The whole process is controlled by the Arduino Uno microcontroller. The user will control the bot with the mobile application. The mobile application will provide the user to input their voice to recognize. For adjusting the orientation, they can use various commands to control the bot

3.2 BLOCK DIAGRAM OF BOT

The aim of the project is to build a bot with voice controlled and of low cost. The hardware's implementation has been structured is been selected accordingly to achieve the goal.

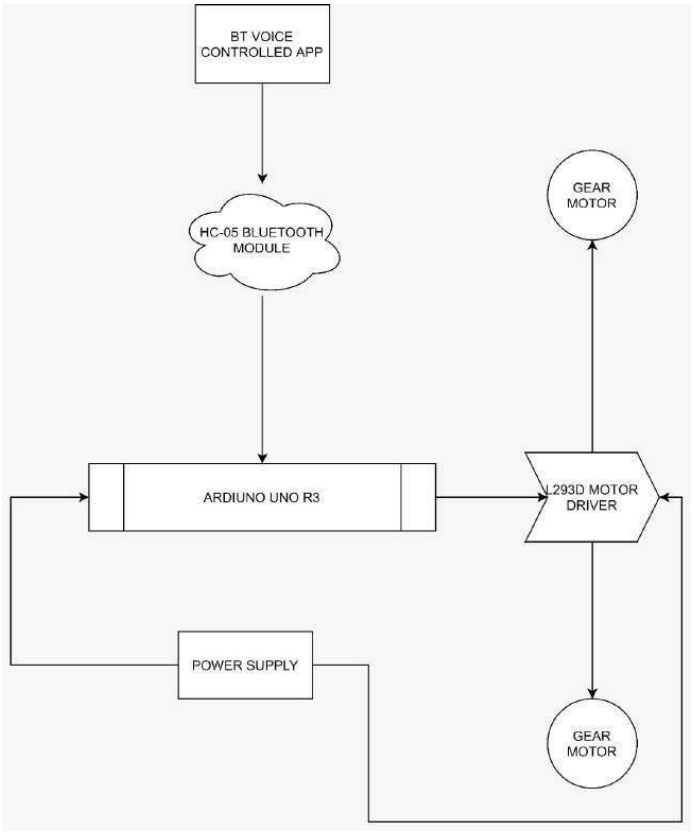

Fig 3.1 Block diagram of BOT

a) **Arduino Uno:** Arduino Uno is the brain of the bot. The microcontroller board “Arduino at Mega” depends on the Atmega328P microcontroller. It includes 14 digital input/output pins, where 6 pins are Analog inputs, 6 are used like PWM outputs, hardware serial ports (UARTs) – 1, a crystal oscillator of 16 MHz, a power jack, a USB connection, as well as an RST button. This board will control the motor drivers and Bluetooth module.

b) **L293D Motor Driver:** L293D motor driver IC is very simple is to drive the two DC motors simultaneously. This IC works on the principle of Half H-Bridge. It controls the speed of the motor microcontroller sends the pulse signals to it accordingly. An L293D has four input pins, four output pins, 2 enable pins, Vss, Vcc and GND.

c) **Gear Motor:** A gearmotor is an all-in-one combination of an electric motor and a gearbox. This makes it a simple, cost-effective solution for high-torque, low-speed applications because it combines a motor with a gear reducer system.

d) **HC-05 Bluetooth module:** HC-05 Bluetooth Module is a smooth to use Bluetooth SPP (Serial Port Protocol) module, designed for obvious wireless serial connection setup. Its communication is through serial communication which makes an easy manner to interface with controller or PC. HC-05 Bluetooth module gives switching mode among master and slave mode which means it capable of use neither receiving nor transmitting records.

e) **Power supply:** The power supply for the bot will be provided with two switch mode power supply (SMPS) and a separate small adapter for Arduino mega. A 3.7V 2000mAh lion battery is used for motor drivers.

3.3 FLOWCHART FOR WORKING OF THE BOT

The Voice Controlled bot is designed to get controlled wirelessly by an android application. The flow of working of the machine is described below,

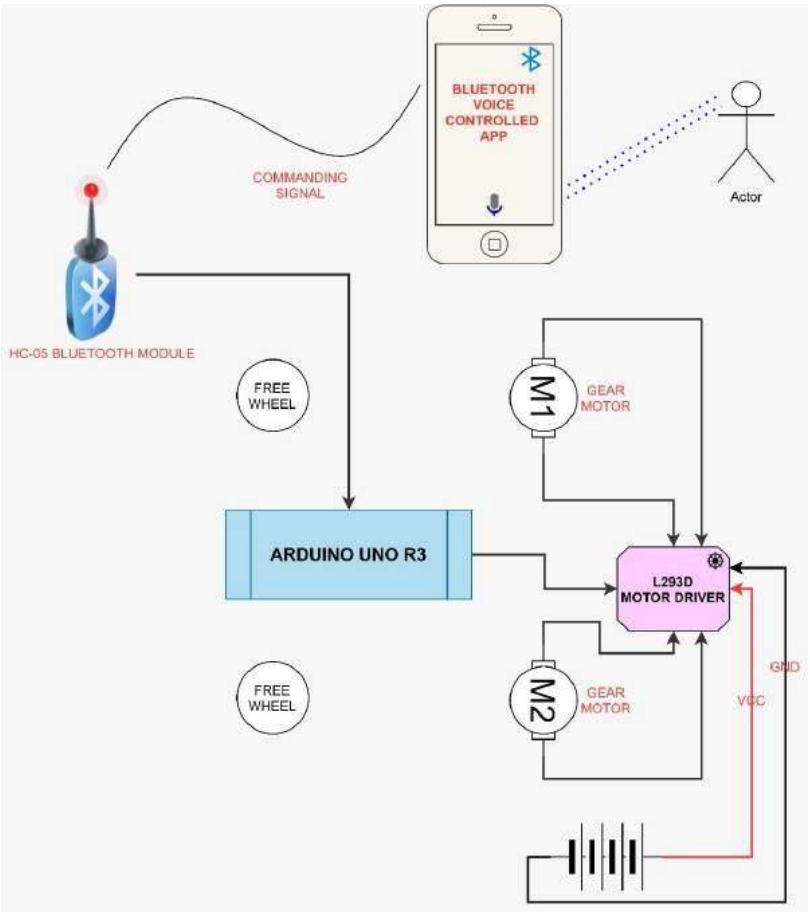

Fig 3.2 Flowchart of the working of Bot

When the voice-controlled bot is connected to the power supply, the bot gets initialized. At the initial stage we have connect the Bluetooth module with mobile application. Once it connected, we will start the commanding the bot by voice. We have four basic commands which send to microcontroller through Bluetooth which uses mobile application. Mobile application will process the input data converted into commanding signal. This signal is processed by Arduino UNO then signals the motor driver. Gear motors will start rotates according to signal received from motor driver.

CHAPTER 4
HARDWARE COMPONENTS

4.1 COMPONENTS USED IN BOT

Components of the Voice Controlled Bot are chosen to get an efficient output with a greater accuracy.

- Arduino Uno microcontroller,
- L293D Motor Driver,
- Gear motor,
- Bluetooth module HC-05

4.2 COMPONENT DESCRIPTION

4.2.1 ARDUINO UNO

Fig.4.1 Arduino Uno

Arduino Uno is a microcontroller board and it having 14 output and input pins, in this 6 pins used as PWM output,6 analog input,1 UARTs 16 having usb, power jack icsp button and reset button, Vin, Gnd, serial communication, external interrupts, led can simply connect to a computer and the supply AC to DC adapter or battery, operating voltage of this boards is 5 volt and the range of the input will 7 to 12 volts, length of the board is about 68.6 mm and the width is 53.4, the weight of this is 25 g, comparing to the Arduino Nano it having more space and more processing, programming of the Arduino Uno

can be done in pc with the c programming language and it can transfer to the Arduino by using USB cables.

4.2.2 GEAR MOTOR

4.2. Gear Motor

A gear motor is an all-in-one combination of an electric motor and a gearbox. This makes it a simple, cost-effective solution for high-torque, low-speed applications because it combines a motor with a gear reducer system.

4.2.3 L293D MOTOR DRIVER: -

L293D motor driver IC is very simple is to drive the two DC motors simultaneously. This IC works on the principle of Half H-Bridge. It controls the speed of the motor microcontroller sends the pulse signals to it accordingly. An L293D has four input pins, four output pins, 2 enable pins, Vss, Vcc and GND.

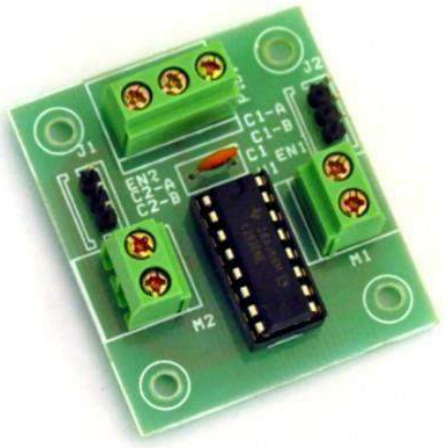

Fig.4.3. L293D motor driver

4.2.4 BLUETOOTH MODULE HC – 05

Fig.4.4. Bluetooth module HC-05

HC-05 Bluetooth Module is a smooth to use Bluetooth SPP (Serial Port Protocol) module, designed for obvious wireless serial connection setup. Its communication is through serial communication which makes an easy manner to interface with controller or PC. HC-05 Bluetooth module gives switching mode among master and slave mode which means it capable of use neither receiving nor transmitting records.

CHAPTER 5
SOFTWARES

5.1 ARDUINO IDE

The Arduino IDE (integrated development environment) is a software developed by Arduino. cc to assist Arduino microcontrollers. This Arduino IDE software supports all kinds of Arduino boards like Arduino UNO, Arduino mega, Arduino micro, Arduino lollypop, Arduino nano, and many more.

The Arduino IDE software supports C and C++ programming languages. This software is mainly used for writing, compiling, and uploading the code required for the respective work. Debugging the written code is easier in this software.

The main code in this software is known as the sketch. This software will automatically generate a hex file after compiling and it will be uploaded to the Arduino board when the upload option is chosen.

The Arduino IDE software consists of two main parts, Editor and compiler. An editor area in the software is used to write the required code for the project.

The Arduino IDE software consists of three sections, (1) Menu bar: The bar located at the top of the window is the menu bar. This contains five options, File, Edit, Sketch, Tools, Help. In this, the file option contains twelve options New, Open, Open recent, Sketchbook, Examples, Close, Save, save as, Page set up, Print, Preferences, Quit. The menu bar also has an option called the Serial monitor which is used to debug the written code of the respective project. To use the serial, monitor option, the Arduino board should be connected with the computer. (2) Text editor: The area below the menu bar is a text editor. (3) Output pane: the bar located at the bottom of the software is the output pane. This bar displays the error messages if there are any.

If any components to be integrated with the Arduino board, the library of the respective component need to be chosen. This can be done using this command,

Sketch -> Include library -> choose the required library.

And if I include a servo library, it will appear in the text editor section of the

Software like #include. In Arduino two main coding section is present, (1) Void setup (): the pin configuration for the components is done in this section. (2) Void loop (): in this section different kinds of loops will be written with the configured pins to execute the required operation. Before uploading the compiled code to the Arduino board, we need to choose the kind of board we are going to use. And also, we need to choose the required port.

5.2 PROTEUS

The Proteus Plan Suite is an exclusive programming device suite utilized fundamentally for electronic plan robotization. The product is utilized for the most part by electronic plan specialists and experts to make schematics and electronic prints for assembling printed circuit sheets.

It was created in Yorkshire, Britain by Lab center Electronics Ltd and is accessible in English, French, Spanish and Chinese dialects.

5.3 BLUETOOTH VOICE: ARDUINO VOICE CONTROLLER

DIY Bluetooth voice App is managed tasks with Arduino, raspberry pi, At mega chips or another micro-controller. It can control from relays to led from your smartphone.

We are using this app for serial verbal exchange over Bluetooth. This app will transfer voice commands directly to serial or map your commands to something

Fig. 5.1. Bluetooth Voice: Arduino Voice Controller

CHAPTER 6

6.IMPLEMENTATION AND RESULT

6.1 IMPLEMENTATION

The **"Voice Controlled Bot"** could be implemented in the wheel chair and serving bot. Implementing Bot in a wheel chair could increase the mobility in disability, due to its low cost, and working with required commands. If we could implement this bot into hotels, this could increase the chance of job opportunity for disability people.

6.2 RESULT

The **"Voice Controlled Bot"** is designed in Proteus Software. The circuit simulation is designed in Proteus software.

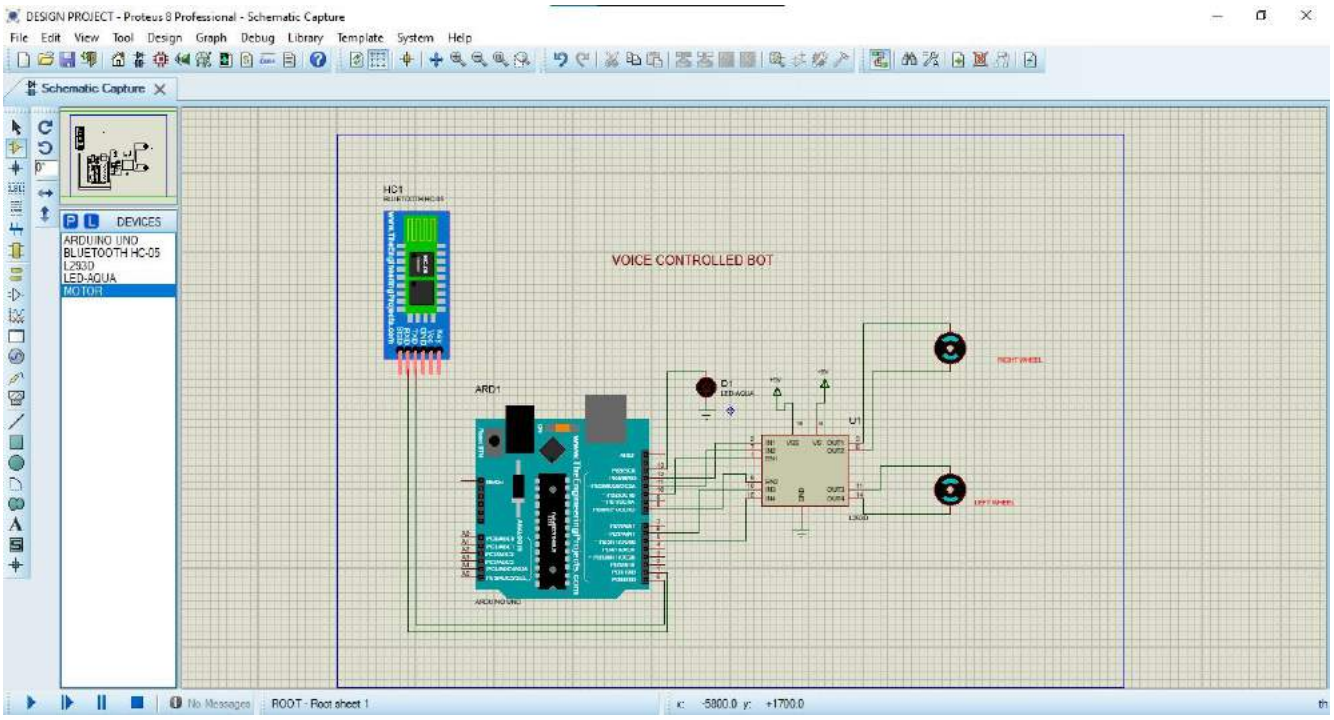

Fig.6.1 Circuit Diagram of Voice Controlled Bot

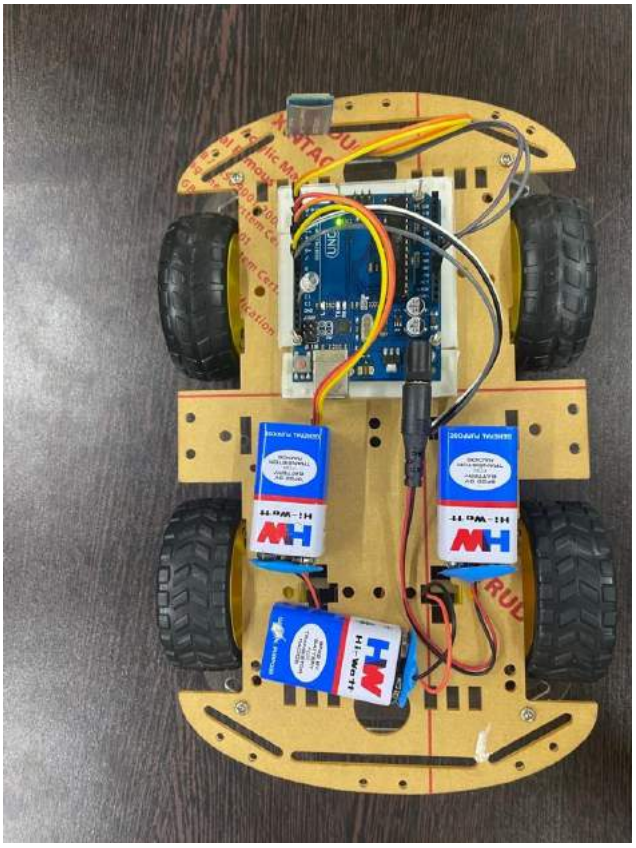

Fig.6.2 Top view of Voice Controlled Bot.

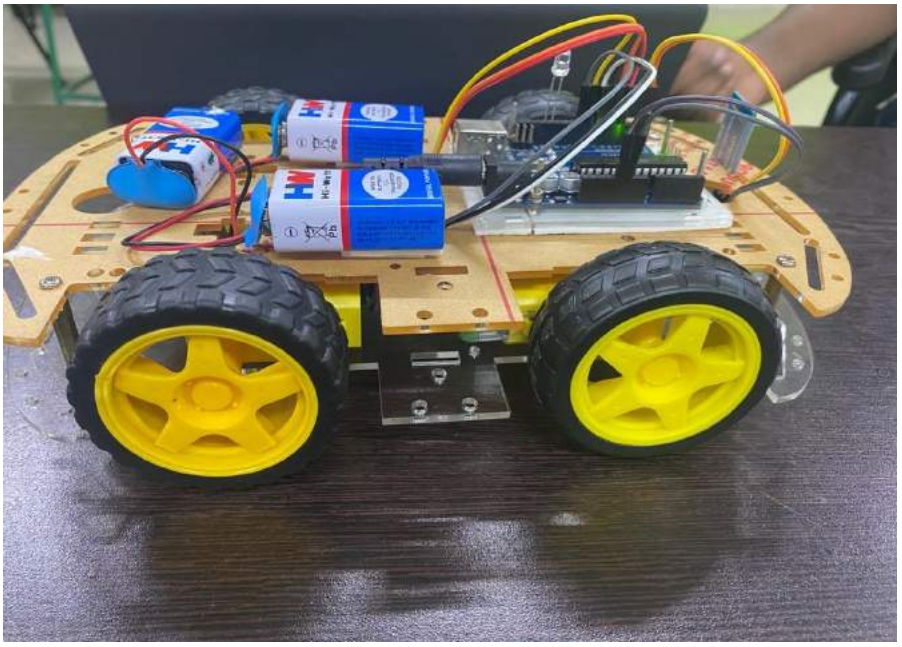

Fig.6.3 Side View of voice controlled Bot

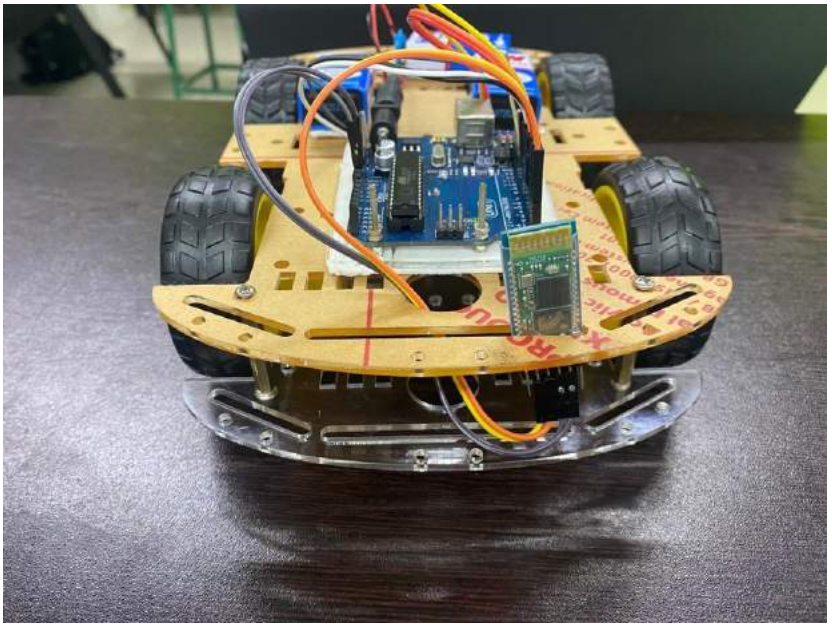

Fig.6.4 Front view of voice controlled Bot

When the voice-controlled bot is connected to the power supply, the bot gets initialized. At the initial stage we have connect the Bluetooth module with mobile application. Once it connected, we will start the commanding the bot by voice. We have four basic commands which send to microcontroller through Bluetooth which uses mobile application. Mobile application will process the input data converted into commanding signal. This signal is processed by Arduino UNO then signals the motor driver. Gear motors will start rotates according to signal received from motor driver.

CHAPTER 7

CONCLUSION, FUTURE WORK AND OUTCOME

7.1 CONCLUSION

Human voice is identified the use of a microphone inside the android clever smartphone. This voice is analyzed and transformed into English phrases using the android app . Speech reputation is the inter-disciplinary sub-subject of computational linguistics that develops methodologies and technologies that permits the recognition and translation of spoken language into text by way of computers. It is also called computerized speech popularity (ASR) or speech to textual content (STT). It incorporates expertise and research in the linguistics, computer technology, and electrical engineering fields.

speech recognition has an extended history with numerous waves of primary innovations. Most lately, the sphere has benefited from advances in deep getting to know and massive statistics. The advances are evidenced no longer handiest by using the surge of instructional papers posted in the discipline, but more importantly by means of the global enterprise adoption of a variety of deep studying strategies in designing and deploying speech recognition systems.

7.2 FUTURE WORK

- To include Internet of Things product offers a completely new direction to robotics.
- To include artificial intelligence in the bot to identify the individual voice of the user
- To include an Object tracking system to track the Objects so that it will avoid the collision.

7.3 OUTCOME

- To Complete the simulation of circuit in Proteus Software.
- A study of pre-existing technology was done successfully.
- Prototype is tested and worked successfully.

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ANNEXURE

PROGRAM CODE FOR VOICE CONTROLLED BOT

```
#define led 13
#define m1 4
#define m2 5
#define m3 6
#define m4 7
#define en1 8
#define en2 9


void setup()

{
  pinMode(led, OUTPUT);
  pinMode(m1, OUTPUT);
  pinMode(m2, OUTPUT);
  pinMode(m3,OUTPUT);
  pinMode(m4,OUTPUT);
  pinMode(en1,OUTPUT);
  pinMode(en2 , OUTPUT);
  Serial.begin(9600);
}

void loop()
{
  if (Serial.available())
```

```
{
 String voice = Serial.readString();
 Serial.println(voice);
 if(voice == "start")

 {
  Serial.println("start");
  digitalWrite(led, HIGH);
  delay(1000);
 }

 else if(voice == "forward")

 {
  Serial.println("forward");
  digitalWrite(en1,HIGH);
  digitalWrite(en2,HIGH);
  digitalWrite(m1, HIGH);
  digitalWrite(m2, LOW);
  digitalWrite(m3,HIGH);
  digitalWrite(m4,LOW);
 }

 else if(voice == "backward")

 {
  Serial.println("backward");
  digitalWrite(en1,HIGH);
  digitalWrite(en2,HIGH);
```

```
 digitalWrite(m1, LOW);
 digitalWrite(m2, HIGH);
 digitalWrite(m3, LOW);
 digitalWrite(m4, HIGH);
}

else if(voice == "right")

{
 Serial.println("right");
 digitalWrite(m1, LOW);
 digitalWrite(m2, LOW);
 digitalWrite(m3, HIGH);
 digitalWrite(m4, LOW);

}

else if(voice == "left")

{
 Serial.println("left");
 digitalWrite(m1, HIGH);
 digitalWrite(m2, LOW);
 digitalWrite(m3, LOW);
 digitalWrite(m4, LOW);
}

else if(voice == "stop")
```

```
  {
   Serial.println("stop");
   digitalWrite(led,LOW);
   digitalWrite(en1,LOW);
   digitalWrite(en2,LOW);
   digitalWrite(m1, LOW);
   digitalWrite(m2, LOW);
   digitalWrite(m3, LOW);
   digitalWrite(m4, LOW);
  }
  }
}
```

PLAGIARISM REPORT

Curiginal

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