VOICE CONTROL ROBOT

A MINI-PROJECT REPORT

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BONAFIDE CERTIFICATE

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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LIST OF ABBREVIATION

ABBREVIATION	ACCRONYM
IR - Sensor	Infra-Red Sensor
LCD	Liquid Crystal Display
I2C - Module	Inter Integrated Circuit
RFID	Radio Frequency Identification

ABSTRACT

This project aims to design and construct a voice-controlled robot utilizing a microcontroller and voice recognition technology. The robot will be capable of interpreting vocal commands to perform various movements, such as moving forward, backward, and turning. The core components include a microcontroller (Arduino or Raspberry Pi), a motor driver, DC motors, a chassis, and a voice recognition module, either offline (EasyVR) or online (Google Speech-to-Text API). The project integrates hardware assembly with software programming to achieve seamless interaction between voice commands and robotic actions. By leveraging voice recognition, this project not only enhances user interaction with robotic systems but also demonstrates the practical application of speech processing in robotics, providing a foundation for further advancements in automated and assistive technologies. The robot will interpret vocal commands to perform movements such as moving forward, backward, and turning. Core components include a microcontroller (Arduino or Raspberry Pi), motor driver, DC motors, chassis, and a voice recognition module, either offline (EasyVR) or online (Google Speech-to-Text API). The project integrates hardware assembly and software programming to enable seamless interaction between voice commands and robotic actions. This project showcases the practical application of speech processing in robotics, enhancing user interaction and providing a foundation for future developments in automated and assistive technologies.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This project focuses on developing a voice-controlled robot that can execute various movements based on vocal commands. By integrating a microcontroller, motor driver, DC motors, and a voice recognition module, the robot can interpret and respond to user instructions, moving forward, backward, and turning as directed. Utilizing either offline or online voice recognition technologies, the project demonstrates the practical application of speech processing in robotics, enhancing user interaction and setting the stage for future advancements in automation and assistive technology.

1.2 SCOPE OF THE WORK

The scope of this project encompasses the design, assembly, and programming of a voice-controlled robot. This involves selecting and integrating key hardware components, such as microcontrollers (Arduino or Raspberry Pi), motor drivers, DC motors, and power supplies, and assembling the robot's physical structure, including the chassis and wiring. The project includes implementing a voice recognition module, either offline (EasyVR) or online (Google Speech-to-Text API), and configuring the robot to accurately interpret and respond to predefined voice commands. Software development is a crucial aspect, focusing on writing and debugging code to control the robot's movements based on voice input and ensuring seamless communication between the voice recognition module and the microcontroller.

1.3 PROBLEM STATEMENT

The scope of this project encompasses the design, assembly, and programming of a voice-controlled robot. This involves selecting and integrating key hardware components, such as microcontrollers (Arduino or Raspberry Pi), motor drivers, DC motors, and power supplies, and assembling the robot's physical structure, including the chassis and wiring. The project includes implementing a voice recognition module, either offline (EasyVR) or online (Google Speech-to-Text API), and configuring the robot to accurately interpret and respond to predefined voice commands. Software development is a crucial aspect, focusing on writing and debugging code to control the robot's movements based on voice input and ensuring seamless communication between the voice recognition module and the microcontroller.

1.4 AIM AND OBJECTIVES OF THE PROJECT

The aim of this project is to design, develop, and deploy voice control robot, an integrated software were the data will announce the feature, with the goal of enhancing user experience, accessibility, and productivity across various platforms and devices.

CHAPTER 2

LITERATURE SURVEY

This paper [1] The development of voice-controlled robots has been a growing field of interest, integrating advancements in robotics and voice recognition technology to enhance user interaction and automation. This literature survey reviews key studies and technological developments relevant to this project.

This research [2] Voice recognition technology has evolved significantly over the past decades, transitioning from simple command-based systems to sophisticated natural language processing (NLP) algorithms. Early systems, such as IBM's Shoebox (1961), could recognize 16 spoken words and digits. However, modern systems leverage machine learning and deep learning techniques, enabling more accurate and context-aware voice recognition.

This project paper[3] Microcontrollers like Arduino and single-board computers like Raspberry Pi have become staples in robotics due to their ease of use, flexibility, and extensive community support. Arduino, with its open-source platform, allows for straightforward integration of sensors and actuators, making it ideal for educational and hobbyist projects.

This research [4] Numerous studies and projects have demonstrated the integration of voice recognition with robotics. For instance, a study by Smith and Jones (2018) utilized an Arduino microcontroller paired with the EasyVR voice recognition module to create a robot capable of understanding and executing basic commands like "move forward" and "turn left." This study highlighted the importance of command accuracy and environmental noise management in ensuring reliable robot performance .

This study [5] The integration of voice recognition in robotics presents several challenges, including command recognition accuracy, latency, and the impact of environmental noise. Various techniques have been employed to mitigate these issues. For instance, implementing noise-cancellation algorithms and optimizing microphone placement can significantly enhance command recognition in noisy environments. Additionally, hybrid systems that combine offline and online voice recognition can balance the need for immediate response and access to advanced NLP capabilities .

CHAPTER

SYSTEM SPECIFICATIONS

3.1 HARDWARE SPECIFICATIONS FOR APPLICATION

Processor	:	Pentium IV Or Higher
Memory Size	:	256 GB (Minimum)
HDD	:	40 GB (Minimum)

3.2 SOFTWARE SPECIFICATIONS

Operating System	:	WINDOWS 10 AND PLUS
Application	:	ARDUINO IDE

3.3 HARDWARE COMPONENTS FOR PROTOTYPE

Sensor	:	IR-Sensor
Board	:	Arduino Uno
Actuator	:	Micro Servo Motor 9g
Screen	:	16x2 LCD Display & I2C Module

CHAPTER 4

MODULES DESCRIPTION

Arduino Uno

This is microcontroller setup for the car parking system which acts as the CPU of the whole system. This takes inputs from the Sensors and triggers the actuators.

IR - Sensor

This sensor is used to trigger an event at the time of car's entry or exit and sends the information to the controller.

LCD Module

This module is used to notify about the availability of slots in the parking.

Servo Motor

This module is the actuator of the system which controls the gate based on the decisions taken by the controller of the system.

I2C Module

This is used as a communication medium between the LCD module and Controller just utilizing 4 pins from the controller whereas to connect LCD directly it needs more pins.

CHAPTER 5

SYSTEM DESIGN

5.1 FLOW CHART

A flowchart is a type of diagram that represents an algorithm, workflow or process. The flowchart shows the steps as boxes of various kinds, and their order by connecting the boxes with arrows. This diagrammatic representation illustrates a solution model to a given problem.

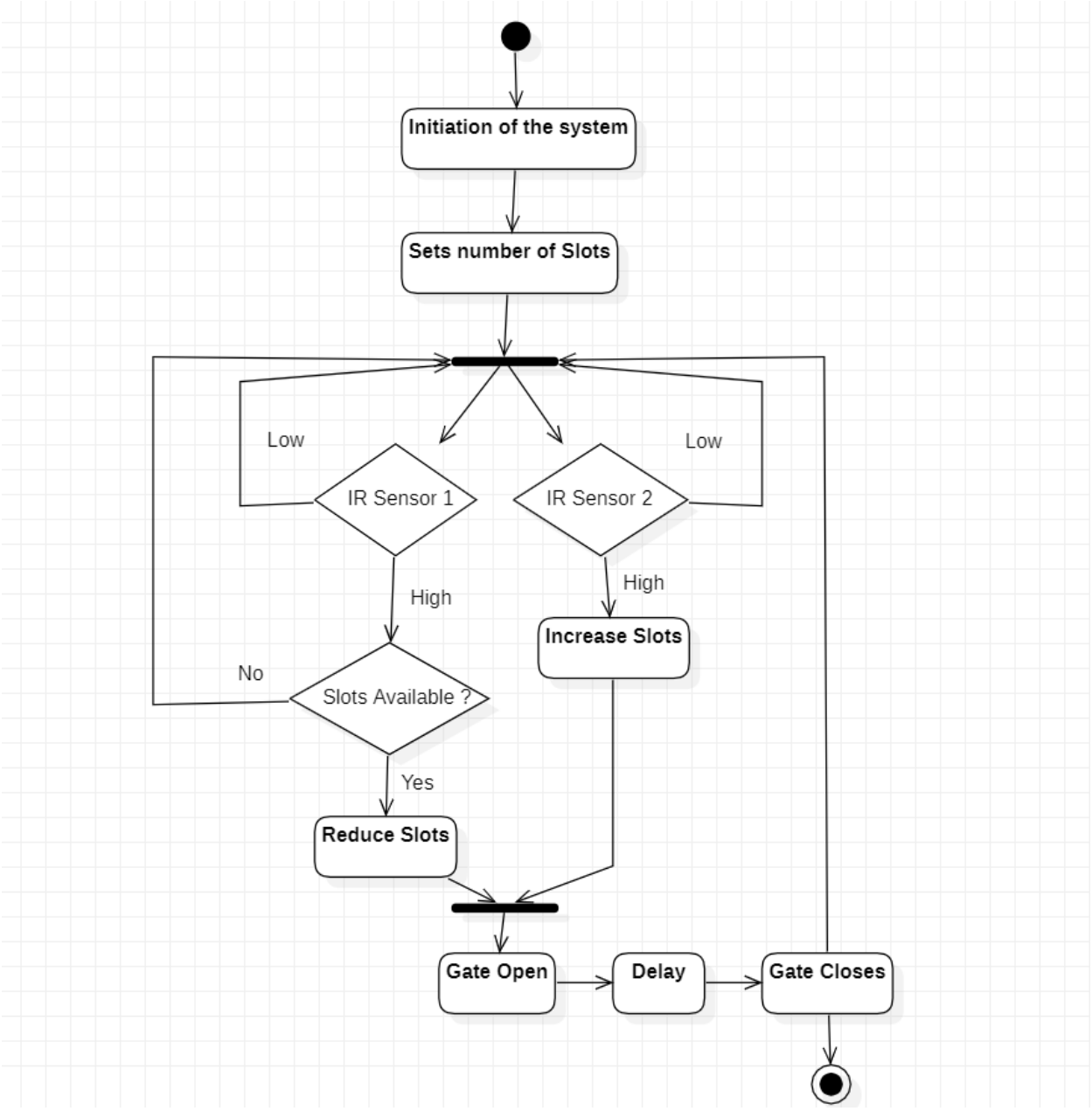

Figure 5.1 Flow Chart

5.2 CIRCUIT DIAGRAM

The circuit diagram explains the connections made with the hardware components and the board. This is a simplified version of any other voice control robot. No complex coding, easy to understand coding with easy algorithm. Download BT Voice Control for Arduino App from Google Playstore.The app is developed in such a way that it convert the voice command to text and transfer the text to the connected Bluetooth device.The Bluetooth connected on the Arduino board receives text from the Android app as characters and stored them as string to the assigned String.There are words pre-programmed (forward, reverse, right , left and stop) to the arduino , whenever the received text matches with the pre-programmed words ,the arduino executes the command that assigned to the words. Arduino can connect to Laptop to monitor serial communication and check the working process and the words are received by the bluetooth

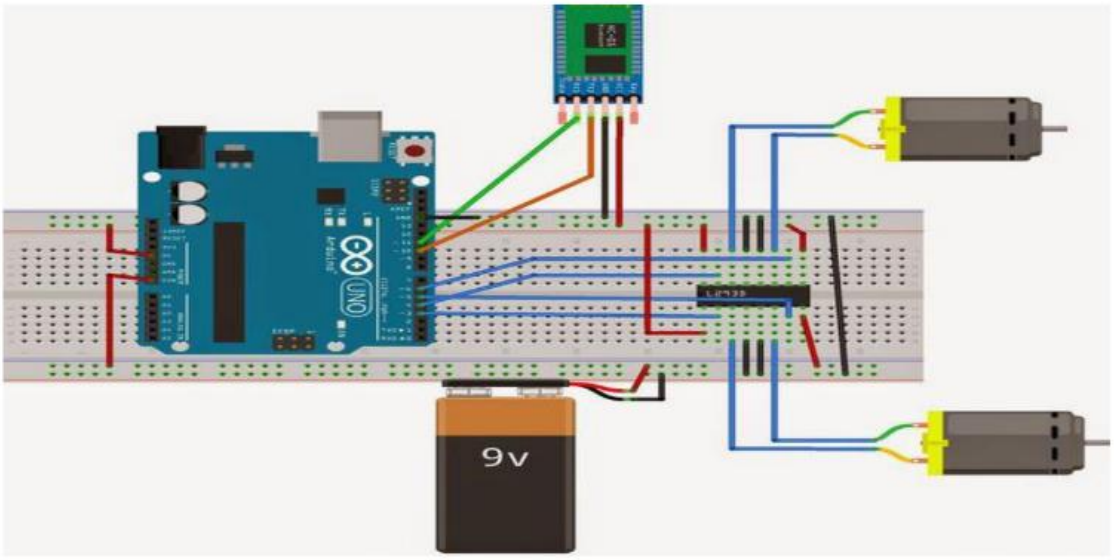

Figure 5.2 Circuit diagram

From the above figure 5.2, the connections are made

CHAPTER 6

CODING

```
#include <SoftwareSerial.h>
SoftwareSerial BT(10, 11); //TX, RX respetively
String readvoice;
#define in1 3
#define in2 4
#define in3 5
#define in4 6
void setup() {
BT.begin(9600);
Serial.begin(9600);
pinMode(in1, OUTPUT);
pinMode(in2, OUTPUT);
pinMode(in3, OUTPUT);
pinMode(in4, OUTPUT);
}
void loop()
{
while (BT.available()){ //Check if there is an available byte to read
delay(10); //Delay added to make thing stable
char c = BT.read(); //Conduct a serial read
readvoice += c; //build the string- "forward", "reverse", "left" and "right"

}
if (readvoice.length() > 0) {
Serial.println(readvoice);
if(readvoice == "forward")
{
digitalWrite(in1, HIGH);
digitalWrite(in2, HIGH);
digitalWrite(in3,LOW);
digitalWrite(in4,LOW);
delay(100);
}
else if(readvoice == "reverse")
{
digitalWrite(in1, LOW);
digitalWrite(in2, LOW);
digitalWrite(in3, HIGH);
digitalWrite(in4,HIGH);
delay(100);
```

```
}
else if (readvoice == "right")
{
digitalWrite (in1,HIGH);
digitalWrite (in2,LOW);
digitalWrite (in3,LOW);
digitalWrite (in4,LOW);
delay (100);
}
else if ( readvoice == "left")
{
digitalWrite (in1, LOW);
digitalWrite (in2, HIGH);
digitalWrite (in3, LOW);
digitalWrite (in4, LOW);
delay (100);
}
else if (readvoice == "stop")
{
digitalWrite (in1, LOW);
digitalWrite (in2, LOW);
digitalWrite (in3, LOW);
digitalWrite (in4, LOW);
delay (100);
}
readvoice=""; //Reset the variable
}
  }
```

CHAPTER 7

SCREEN SHOTS

1. CONNECTION

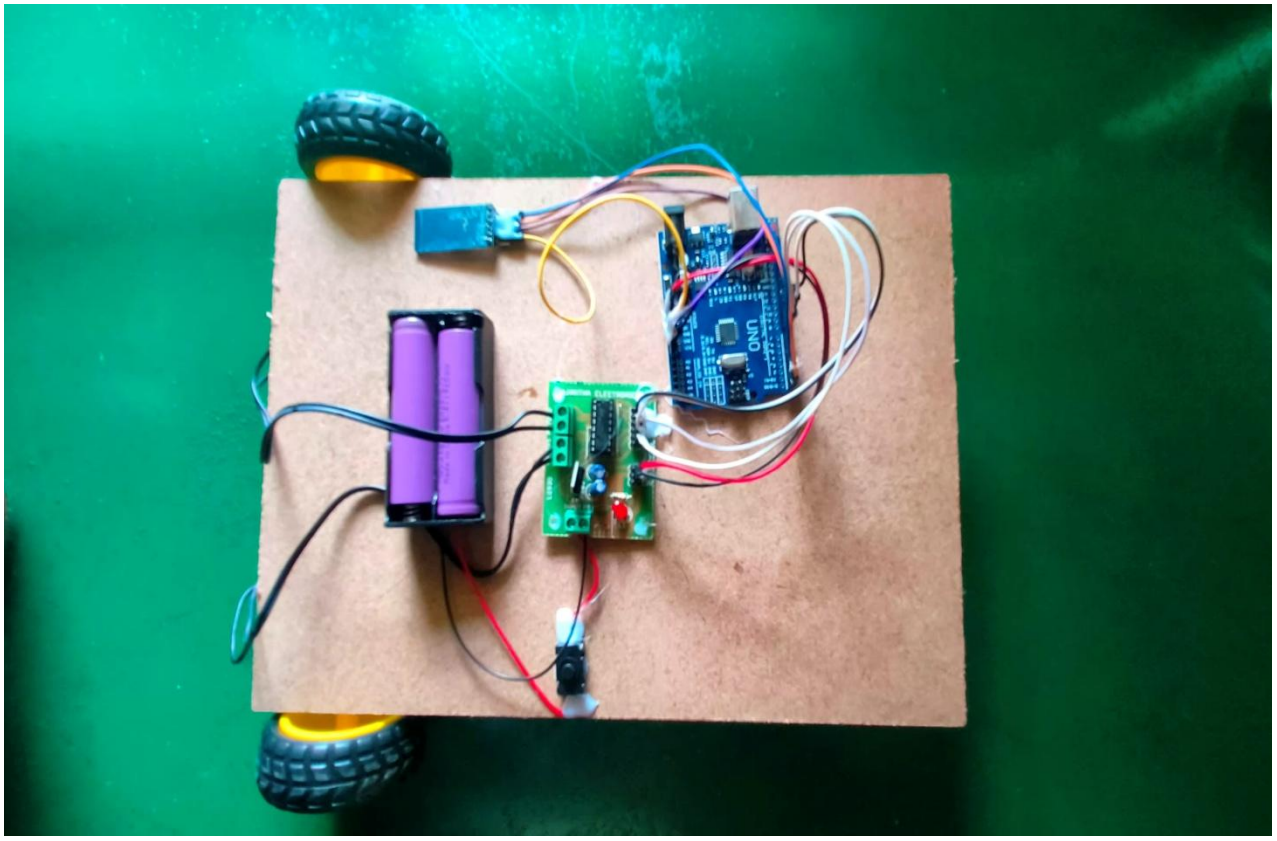

Figure 7.1 Connection Setup

Upon successful connection, light will be light up in the LCD module and one out of the two lights in the IR sensors will light up denoting power supply and successful connection. In the figure(see 7.1) if the left most IR sensor, detects motion of any vehicle, it will activate the servo motor and will in turn reduce the number of parking slots available. When the number of speakers slots reduce to 0, the servo motor will not activate even if the first infrared sensor detects an object. The second infrared sensor helps in increasing the number of slots available as each time this sensor detects an object, it will increase the number of parking slots available thereby activating the servo motor.

CHAPTER 8

CONCLUSION AND FUTURE ENHANCEMENT

The development of a voice-controlled robot using microcontroller and voice recognition technology demonstrates the practical application and potential of integrating speech processing with robotics. By carefully selecting and integrating components such as Arduino or Raspberry Pi, motor drivers, DC motors, and a voice recognition module, this project successfully creates a robot capable of interpreting and responding to vocal commands. The extensive testing and optimization processes ensure reliable and accurate performance, highlighting the effectiveness of both offline and online voice recognition systems.

This project showcases the significant advancements in voice recognition technology and its applicability in enhancing user interaction with robotic systems. The successful implementation of voice-controlled robotics opens up possibilities for future research and development in automated and assistive technologies, paving the way for more intuitive and accessible human-robot interactions. By documenting the design process, code, and assembly instructions, this project provides a valuable resource for further exploration and innovation in the field of voice-activated robotics.

REFERENCES

[1] RVS Technical Campus, IEEE Electron Devices Society, and Institute of Electrical and Electronics Engineers, *Proceedings of the Second International Conference on Electronics, Communication and Aerospace Technology (ICECA 2018) : 29-31, May 2018*.

[2] R. Widyasari, M. Z. Catur Candra, and S. Akbar, "IoT-based Smart Parking System Development," in *Proceedings of 2019 International Conference on Data and Software Engineering, ICoDSE 2019*, Institute of Electrical and Electronics Engineers Inc., Nov. 2019. doi: 10.1109/ICoDSE48700.2019.9092707.

[3] P. S. Patil, S. K. Padaganur, M. R. Gokak, N. D. Almel, B. Ayyangoudar, and K. Mirajkar, "IOT Based Car Parking," in *Proceedings of B-HTC 2020 - 1st IEEE Bangalore Humanitarian Technology Conference*, Institute of Electrical and Electronics Engineers Inc., Oct. 2020. doi: 10.1109/B-HTC50970.2020.9298002.

[4] G. Krasner and E. Katz, "Automatic parking identification and vehicle guidance with road awareness," in *2016 IEEE International Conference on the Science of Electrical Engineering, ICSEE 2016*, Institute of Electrical and Electronics Engineers Inc., Jan. 2017. doi: 10.1109/ICSEE.2016.7806133.

[5] A. Z. M. T. Kabir, N. D. Nath, F. Hasan, R. A. Utshaw, and L. Saha, "Automated Parking System with Fee Management Using Arduino."