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VOICE CONTROLLED ROBOTIC CAR FOR AMUSEMENT PARK

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Abstract - This experimental work aims to make a voice-controlled movement of a robotic car using the Internet of Things (IoT) based Android application. The idea is to design and assemble the hardware of the Robotic car and develop the software as an interface with the hardware to control the movement of the robotic Car with the help of Bluetooth-based communication. Bluetooth module will be used to read the voice orders from Android-based Cell phones and control the movement of the robotic car remotely.

Key words: Arduino UNO, Bluetooth Module, Motor Driver, Robot Chassis, Android Cell phone, Robot car, Rechargeable Battery.

1. INTRODUCTION

In this project, the robotic car is working based on Speech Recognition System. This is a prominent technology for the future. Voice Recognition is the process of capturing spoken words and commands using an Android cell phone and converting them into a digitally stored set of words. These types of systems are also called Speech Controlled Automation Systems. When the voice commands are given to the robotic car using Android Applications, then the AMR Voice is connected to the Bluetooth module, which is directly connected to Arduino UNO. After that, we give a voice-based command as input to the robotic car and it moves the car accordingly to the given specific command.

2. Literature Review

While studying on the voice-controlled robot with automatic banking found that Speed slow down and avoidance of obstacles automatically or manually can be done using an ultrasonic sensor for Arduino. Where an LCD will display the proximity of the obstacle for a threshold limit. And to find the object distance ultrasonic sensor, the power is directly proportional to the range of the ultrasonic sensor. [1]. It also says that a mobile app can handle the requirement using a Bluetooth device in such a case [2]. They also say that robot will have the capability to detect obstacles and inform the user to use a different command (Slow Forward, Fast Forward, Slow Backward, Fast Backward, Sharp Right, Sharp Left, Slow Left, Slow Right, Zigzag, and Stop) to detect and avoid obstacles and an ultrasonic module is implemented and programmed.[3]. While studying on Robot voice a voice-controlled robot using Arduino we found that the hardware platform consist of a gripper module. It is the state of Robotic arm which can be used in picking and placing kinds of Robots. Where using two microcontrollers. One is used for communication between the Robot and server and another one for the movement of the Robot. The upper deck of the robot has an Arduino Due which is used for talking the voice commands and forwards the commands to the Arduino Uno. Forwarding commands from one microcontroller to another is done by using a pin-to-pin connection. Moreover, Bit voice server is used because speech recognition is a bit difficult task and each person has their ascent. [4]. The framework proposed in this paper has to control the movement of the vehicle by using voice commands. The command will be sent by using the mobile application which will be connected to the car through a Bluetooth module. This system contains a transmitter to convert Analog voice commands to Digital word sequences. Which is capable of detecting the voice of the user and should not give any response to other unauthorized voices.

The module will be using the MEL frequency Cestrum coefficient (MFCC) for extracting the features and the Hidden Markov Model (HMM) for recognizing the voice of a valid user of the operator of the car. It contains a smart zone-based vehicle speed control by using RF and obstacle detection and accident prevention system. [5].

3. Methodology

3.1. Hardware Components

The hardware requirements for this project are:

Motor Shield: It is based on L293 IC, which is a dual full-bridge driver. This is used to drive inductive loads such as relays, DC, and Stepping motors. It lets us drive four DC motors and 2 servo motors with our Arduino. The speed and direction of each motor can be controlled independently.

Bluetooth module: It is a class- 2 Bluetooth module with a serial port profile. We can configure it as either master or slave. We can use it simply for establishing a connection between MCU, pc to our embedded project, and many more.

Arduino Uno: Arduino Uno is a microcontroller board based on chip ATmega328p. There are 14 digital input/output pins. 6 analog inputs, a 16MHZ ceramic resonator. Arduino Uno can be used by mounting the motor driver shield in it. It is also cheap. Easy to use and requires less space as many things have to be placed on the chassis.

Battery: we can use a Li-ion cell battery which supplies 12 volts and it is a type of rechargeable battery. We can also use a power bank to power the Motor driver and Arduino. In our project, we used a power bank.

DC Motors: It is an electric motor operated by direct current. A DC motor has the ability to convert electrical energy into mechanical energy. Although we can use Stepper motors or Servo motors for the project work DC motors are used because of their cost-efficiency. Following are the features and power of some of the motors commonly used.

MOTOR	FEATURES	POWER
DC Motor	Low cost, High reliability	Supplies in the range of 1.5V-100V
Servo Motor	High response, accurate rotation, and speed control	supplies in the range of 4-6V and 100Ma-2A
Stepper Motor	Its shaft rotates by moving by a fixed amount of degrees	Power supplies in the range of 2.8V and a maximum of 1.68 Amps

3.2. Software Requirements

The software requirements for this project are:

ArduinoIDE: Arduino IDE means Arduino Integrated Development Environment which is a cross-stage application using for Windows Linux that is written in capabilities from C and C++.

Voice Control App: This voice control android app identifies the user's voice command. The voice commands transmit to the Bluetooth module with the help of a Bluetooth link. The android application user interface is very much simple. It also has one button, which is used for sending commands.

3.3Block Diagram:

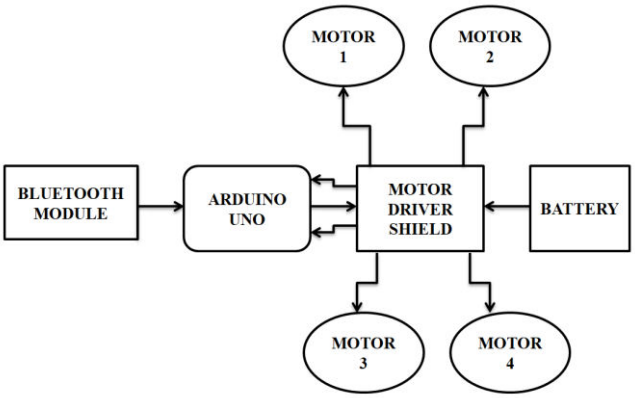

Fig 1: Block Diagram

The voice-controlled Robotic comprises of HC-05 Bluetooth module connected with Bluetooth Mobile App. It also has an Arduino UNO microcontroller to catch and read voice orders, an L293D motor driver shield for driving engines, a couple of DC Motors for movement of the Robotic Car. The motor driver shield is powered by a battery. Whenever the user gives the command in the Bluetooth Mobile App then it will be catch and read by the Arduino UNO and Arduino UNO will decode the commands and send it to Motor Driver Shield. Depending on the commands the Robotic Car will be able to move.

3.4 Circuit Diagram

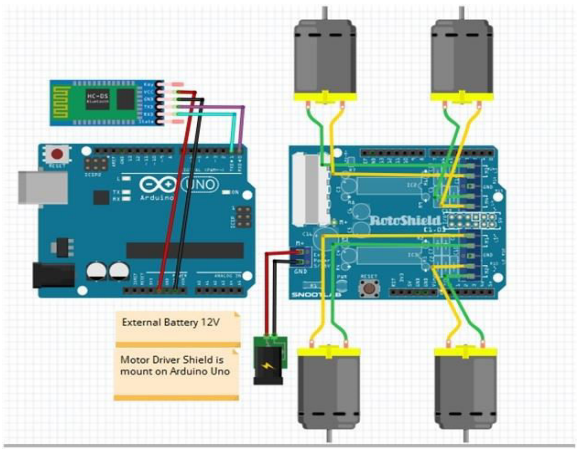

Fig 2: Circuit Diagram

The circuit of the Robotic Car comprises of Arduino UNO microcontroller, HC-05 Bluetooth Module, L293D Motor Driver Shield, couple of DC Motors, and battery. The RX pins of the Bluetooth Module are connected with the TX pins of Arduino UNO and the TX pin of the Bluetooth Module is connected to the RX pin of Arduino UNO. The GND end of the Bluetooth Module will go to the GND end of Arduino and VCC will be connected to the power end of the Arduino. The right DC Motor will be connected to pin 14 and 11 of the L293D motor driver and the left DC Motor will be connected to pin 3 and 6 of the L293D. Arduino pins 2,3,4,5 will be attached with pin 2,7,10,15 of the L293D. The L293D pins 2,5,12,13are called GND pins and 9,1,16 is provided with 5V

3.5 Forward Command Algorithm

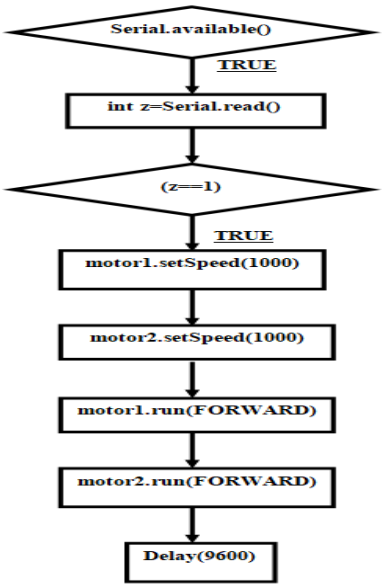

Fig 3: Forward Command Algorithm

4. RESULT

- The voice-controlled robotic car has been successfully implemented and the voice commands are understood by the robot.
- The Bluetooth module is successfully connected with a Bluetooth-controlled mobile app so that the owner can control the robot.

- Google's speech recognition technology is used through which the owner can provide his/her voice as input.
- The owner can control the Robotic car ideally from any place but within a certain range.

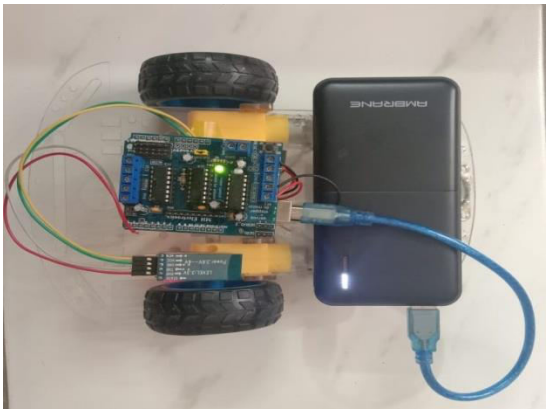

Fig 4: Complete view of the Robotic Car

5. CONCLUSION

In this project, a voice-controlled robotic car is controlled by human voice command with the help of an android app. It is very straightforward to use so robot has become a major part of human everyday lifestyle. It is working based on simple voice command which is converting into a digitally stored set of words.

A voice-controlled robotic car is helpful for an entertainment park for the children group who is physically handicap. The bot car size is very small so it is easy to access.

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