



VOICE CONTROLLED ROBOTIC VEHICLE

K.Venkata Siva Reddy M. Tech, **R.Divya,N.Gopika nalini, P.Raja Bhavani.**

*Assistant Professor^{M.Tech},Department of ECE,Ravindra College of Engineering For Women,Kurnool,AndhraPradesh,India kvenkatasivareddy@recw.ac.in¹

²Department of ECE,Ravindra College of Engineering For Women,Kurnool,AndhraPradesh, India divyaraichur25@gmail.com²

³Department of ECE ,Ravindra College of Engineering For Women, Kurnool, AndhraPradesh,India rajabhavani22@gmail.com³

⁴Department of ECE,RavindraCollegeofEngineeringForWomen,Kurnool,AndhraPradesh,India gopikanalini692@gmail.com⁴

ABSTRACT:

In this project, we will design a Voice Controlled Robot Car Using Arduino. The robotic car can be controlled wirelessly via voice commands directly from the user. The robot can move forward, backward, left, and right and can also be stopped. The Arduino voice-controlled robot car is interfaced with a Bluetooth module HC-05 or HC-06. We will be using 300RPM motor for wheel to run the voice controller car. We can give specific voice commands to the robot through an Android app BT Voice Control for Arduino installed on the phone. At the receiving side, a Bluetooth transceiver module receives the commands and forwards them to the Arduino and thus the robotic car is controlled. The aim of Voice Controlled Robotic Vehicle is to perform the required task by listening to the commands of the user. A prior preparatory session is needed for the smooth operation the robot by the user. For the same a code is used for giving instruction to the controller.

IndexTerms-HC-05, Voice Control,Android app, Arduino.

1.Introduction

The principle this toy concept was based on was voice recognition technology. The car operates by having a voice receiver box on it where it receives your voice commands. The car has a 50 foot radius from where it is initially place on the ground. The child interacts with the car by shouting out commands like "faster", "slower", "right", "left", and "stop". The child will be able to feel like they are in full control of the car by doing this, thus giving them the sense of being important. The child programs their own voice into the receiver so that only they can operate the car. The car has an emergency shut down when it reaches the boundary of the 50 foot radius. The child must also be within that 50 foot radius when shouting commands in order for the car to initiate the desired command. The car is relatively cheap to produce because its exterior is made of plastic. The voice recognition technology also is very cheap these days, and since

the receiver only has to have a few words programmed into it, the cost is also reduced. As long as the car is not dropped from a 3 story window, the child would have no problem with its durability. It can withstand crashes against curbs and other such similar obstacles. There is no choking hazard risk in regards with this toy. The on/off switch is located in a safe area where the child's hands won't be near any moving parts. Also, there won't be any sharp edges on the car that can inadvertently cut the child.

2. Literature review:

In current scenario vehicles are manually controlled and all are done by the person who is driving the vehicle. Every action like start and stop, applying brake, gear transmission, acceleration requires human effort. But nowadays new technologies have been developed that can be integrated with the conventional vehicles to new vehicle form. In the technology era, the space between the physical and the digital world is brought closer by the

introduction of gesture concept. For all dangerous tasks, we prefer technology rather than people. Even though these robots are being controlled manually in the early stages, these can now be controlled via voice and gestures. This technology of gesture and voice recognition can be defined by the interaction between the computer and the body language of human beings. This constructs the communication link between technology and mankind. The target of this work is to upgrade the complete security to the robot and to simplify the controlling-mechanism. The voice directions are handled, utilizing an advanced mobile phone. The individual human right hand robot is created on a smaller scale controller based stage and can know about its present area. The viability of the voice control conveyed over a separation is estimated through numerous examinations.

3. Design:

3.1 Block Diagram:

A. Voice and Speech

Voice is a sound which is produced by living beings. Voice uses airflow that comes from lungs. Air makes pressure over vocal folds which vibrate. Normally speech produces a whisper in our throat by using neck, chest, and abdomen this whisper becomes our speech. Our speech is unique for every person and also it helps other people to understand each other's personality, mood and most importantly it helps people to communicate. Sounds propagate using mechanical waves for traveling around gases, liquids and solids. Mechanical waves transfer their energy from one medium to another medium while using vibration. Microphone is a hardware device which can convert analog input to a digital output. Digital data can be understood, modify and store by computers. Computers can recognize speech by using some complex algorithms and good dictionaries for these algorithms. Some systems use the Hidden Markov Model (HMM) and the Mel frequency cepstral coefficients (MFCC) techniques as well as the techniques of frequency spectral decomposition to use these two algorithms.

B. Arduino Communication

To communicate with Arduino we first need to install its free software from the internet and install. The

software is very easy to use and installing it creates just one .uno files on the microprocessors these files confuse the user because there are many different files generating. After installing Arduino it is ready to usage including dictionaries using dictionaries is very easy on the Arduino and Arduino does not requires any configuration setting when programming. User can use USB cable to connect Arduino and after that user can dump his code to Arduino far more easily and quickly than micro-controller

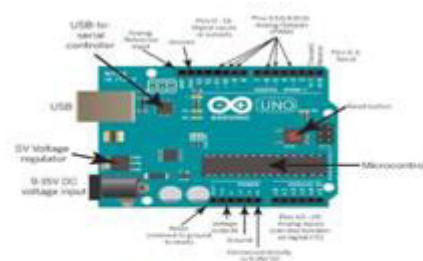


Fig-1: Arduino

C. Bluetooth Communication

Bluetooth is one of the popular devices to communicate in short range it is used on computers, cell phones, head phones and many other devices. Bluetooth devices use 2.4 to 2.5 GHz frequency to communicate with each other. Bluetooth standardized as IEEE 802.15.1 but then it changed that 802.15.1 Bluetooth's range is 2400–2483.5 MHz approximately.

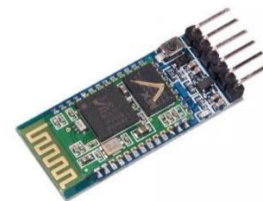


Fig-2: HC-05

The system consists of a transmitter (Android smartphone) and a receiver (robot). Block diagrams of the transmitter and receiver sides are shown in Figs 2 and 3, respectively. The circuit consist of Arduino UNO Board, HC-05/HC-06 Bluetooth Module, L293D Motor Driver IC, a pair of DC Geared Motors of 200 RPM and a 9V Battery.

The TX, RX pins of Arduino is connected to Rx, Tx pins of Bluetooth Module. The Bluetooth Module is supplied with 5V. Similarly, left DC motor is connected to pin no 3 & 6 of L293D and right DC motor to pin no 14 & 11 of L293D. Arduino digital pins 3,4,5,6 is connected to L293D 2, 7, 10, 15 respectively.

The L293D IC Pins 2, 5, 12, 13 is GND pins and 9, 1, 16 is supplied with 5V. But pin 8 of L293D is directly supplied with 9V. The Arduino Wireless Voice Controlled Robot consists of a transmitter and a receiver section. The transmitter end consists of Smartphone Bluetooth and the Android app installed on it. Similarly, the Receiver section has Arduino board as a processor, HC-05 Bluetooth Module as a wireless communication module, L293D for driving motors, and a pair of DC geared as a part for moving robot.

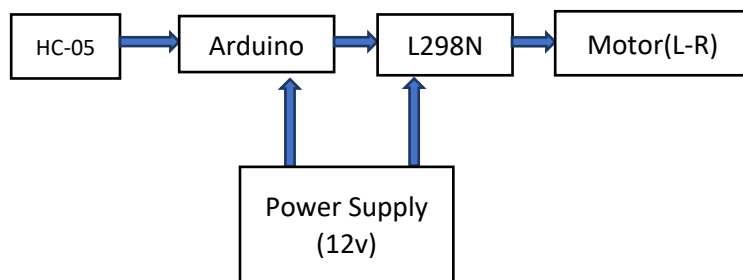


Fig-3: Block Diagram

4. Existing System :

The current systems are robots like line follower robot, edge averting robot, DTMF robot, gesture controlled robot. These type of robots are not efficient since they require more power to run, cost is also very high. In the existing system they don't use voice commands, making it not possible for physically handicapped people to drive. The voice commands are interpreted via an offline server in real time. The commands are at once transmitted to the server directly by the means of a wired network. The car is built primarily on a platform based on a microcontroller. Some of the fields that can likewise be equally enhanced are the effect of the mouth-microphone range on the robotic, the overall performance (scope) of the robot and the effect of noise

on the translation of speech to textual content. In the existing system Bit-Voicer Server is used, it's a database for speech processing and automation synthesis. It was designed to make voice operation possible with simple gadgets having low processing power. Microcontrollers usually do not have enough storage and computing ability to perform sophisticated speech treatment and synthesis. By doing the tough work Bit-Voicer Server removes the consequences of these limitations so that the microcontroller can assign its key functionality to most of its origin sources.

5. Proposed Technology:

In this proposed device we perform a variety of research on control style variants for robots. It shows that it's feasible to study to successfully manipulate actual world objects with solely voice (human voice) as a control mechanism. The reason of this lookup is to provide simple robotic hardware architecture so that this shape can focal point on Bluetooth connection infrastructure. It is also beneficial for academic robotics due to the fact human beings can construct their personal robots with low cost. When the app is operating in the system, a microphone on the mobile is used to identify user voice commands. Commands are interpreted and the program utilizes Google's speech-recognition software to translate voice to text within the app. The text will then be sent with the aid of Bluetooth to the receiver part. when shouting commands in order for the car to initiate the desired command.

The microcontroller Arduino UNO R3 has 32kB of ISP flash memory, 2kB of RAM and 1kB of EEPROM. The panel incorporates serial communication connectivity with UART, SPI and I2C. The MCU will operate at 16MHz clock speed. The digital Arduino I / O pins 3, 4, 5 and 6 are programmed as output pins in this design. For serial communication with the Bluetooth unit, pins 0 and 1 of Arduino are used. Text obtained with the aid of Bluetooth is forwarded to Arduino UNO microcontroller panel by the usage of UART serial conversation protocol. Displays the voice commands used to monitor the robots and their functions.

The voice commands to the robotic device are dispatched via Bluetooth with the aid of an Android device. These commands are received on the robotic device by using Bluetooth module set up on it. The motor driver circuit is



used to manipulate the velocity of the car. The complete circuitry is powered by the usage of a 12V rechargeable battery hooked up on the system.

6. Hardware Implementation:

We took a Robodo 4 wheel robot car chassis kit to build like a car. For that robot we are attaching the Arduino and the Bluetooth HC-05 module by a scotch tape or glue or double tape so it can't replace. We use Bluetooth module to build a path between hardware module and the mobile phone. Make connections to the Arduino, Bluetooth Module and the L298N module. Then connect Motors wires to L298N Module. Transmitter of Bluetooth is connected to the Arduino of Receiver terminal and the Analog Inputs of Arduino pins are given to the L298N module which is an motor drivers. Bluetooth module BT HC-05 is connected through Arduino and the power supply given to Bluetooth module is 5v.

Follow these steps. connect the red wire to Vcc(5v) to the +5V power from the Arduino. connect the black wire to the ground. connect the green wire to the TX of the Bluetooth module and Receiver of Arduino. Connecting L298N Motor to Arduino. Connect left side two positive wires of the motors to the L298n out1 and two negative wires of the motors are connected to L298n motors of out2 In the same way connect other side of the motor wires. Connect 12v terminal of L298n module to the battery of the positive terminal. Now connect ground to ground connection to the Arduino and from that connect another wire to the Negative terminal of the battery. Connect 5V terminal of the L298n Module to the 5V terminal of the Arduino. Connect In1, In2, In3, In4 pins to the Arduino analog pins of 6, 5, 4, 3 pins respectively.

6.1 Android Application:

Steps to Develop Android App. Go Play Store install Arduino Bluetooth Control. Open Arduino Control app and Go to settings and enable Voice commands Configuration. Click on voice commands Configuration the you can see vocal Command1, vocal command2, ... on so on. Click on that and give Vocal Command as Forward and Data to send as F. Give the second

command as Backward and Data to send as B. Give the third command as left and Data to send as L. Give the fourth command as right and Data to send as R. Give the fifth command as stop and Data to send as S. Now close the app and open again now here you can see that at top right there you should click on last second button there you should connect your Bluetooth device. Click on microphone icon and give the command so that it follows according to our commands.

7. Working:

Voice Commands are processed by phone, and speech-to-text conversion is done within the app using Google's speech-recognition technology. The text is then sent to the receiver side via Bluetooth. Text received via Bluetooth is forwarded to the Arduino Uno board using UART serial communication protocol. Arduino code checks the text received. Whenever the text is a matching string, Arduino controls the movements of the robot accordingly in forwarding, backward, Turning Right, Turning Left & Stop.

8. Results:

Human voice is identified using a microphone in the android smart phone. This voice is analyzed and converted into English words using the android operating system codes and software. Speech recognition is the inter-disciplinary sub-field of computational linguistics that develops methodologies and technologies that enables the recognition and translation of spoken language into text by computers. It is also known as automatic speech recognition (ASR), computer speech recognition or speech to text (STT). It incorporates knowledge and research in the linguistics, computer science, and electrical engineering fields. From the technology perspective, speech recognition has a long history with several waves of major innovations. Most recently, the field has benefited from advances in deep learning and big data. The advances are evidenced not only by the surge of academic papers published in the field, but more importantly by the worldwide industry adoption of a variety of deep learning methods in designing and deploying speech recognition systems.

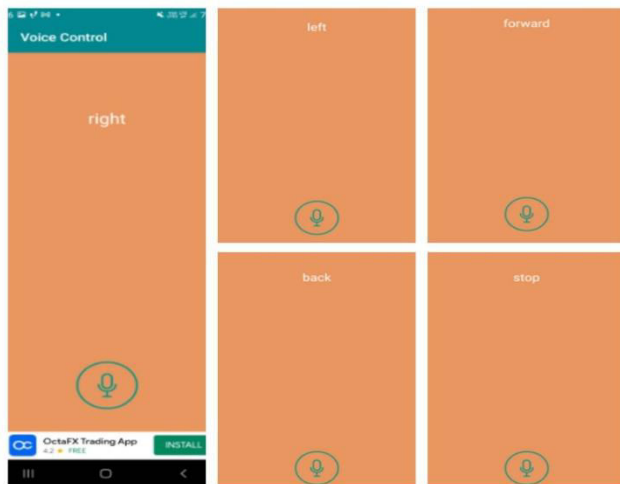


Fig-5: Commands in Android application

The assembly image for voice control robot using Arduino software. The project was completed according to the specification and needs. Simple movements can be controlled with the voice. The proposed system is basically based on Voice Controlled Robotic Vehicle helps to control robot through voice commands received via android application. The Voice Controlled Vehicle is controlled through voice commands given by the user who is operating the project. These voice command needs to be given through an android app which is installed on the users android mobile. Speech recognition is done within the android app and then a respective command is sent to the voice controlled robot vehicle. Microcontroller fitted on the Vehicle decodes these commands and gives an appropriate command to the motors connected to the vehicle.

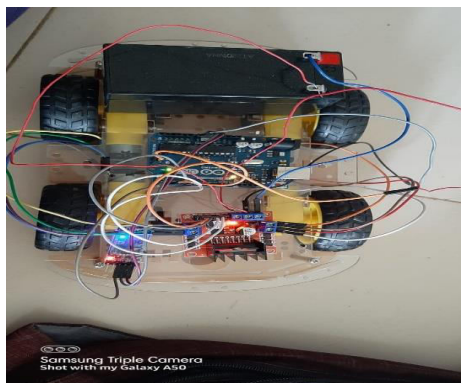


Fig-6: Output

9. Conclusion:

The “Voice Controlled Robotic Vehicle” project has many applications and in present and future. The project can be made more effective by adding features to it in the future. The project has applications in wide variety of areas such as military, home security, rescue missions, industries, medical assistance etc. We were successful in implementing a simple model of voice controlled robotic vehicle using the available resources. The implementation of this project is easy, so this robot is beneficial for human life. The voice control robot is useful for disable people and monitoring purpose. It works on simple voice command, so it is easy to use. It is useful for those areas where humans can't reach. The size of this robot is small, so we can use this robot for spying purpose. It can be used for surveillance. We can implement web cam in this robot for security purpose. The voice recognition software has an accuracy and for identity a voice command and it is also highly sensitive to the surrounding noise.

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