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Voice Controlled Robot Using Android Application and Bluetooth

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ABSTRACT: Robotics is one of the most trending topics in electronics today. Generally robotics are classified into service robotics and industrial robotics. Nowadays all fields are occupied by robotics including, hospitals, agriculture, defense, hazardous environment and office. In this research paper, a system is being proposed, which focuses on the concept of how a robot can be controlled by the human voice. Voice control robot is just a practical example of controlling motions of a simple robot by giving daily used voice commands. In this system an android application is used to recognize human voice and is converted to text. This text is further processed and used to control robot. Keeping in mind the need of the day (requirements of the present day), our goal is to move towards making accessible to the manipulation of everyday objects to individuals with motor impairments. The project is designed to control a robotic vehicle by voice commands and manual control for remote operation. An Arduino UNO used together with a Bluetooth module interfaced to the control unit for sensing the signals transmitted by any Android application. Serial communication data sent from the Android application is received by the Bluetooth receiver interfaced to the Arduino. We will deliberate how to control robot controlled using Wi-Fi module through android application of an android mobile phone. It sends control command via Bluetooth which has certain features like controlling the speed of the motor, sensing and sharing the information with phone about the direction and distance of the robot from the nearest obstacle. Results show that it is indeed possible to learn to efficiently manipulate real world objects with only voice (human voice) as a control mechanism. Our results provide strong evidence that the further development of voice controlled robotics will be successful.

I. INTRODUCTION

As we all know in today's world, one of the most powerful and rapidly developing devices is a smart phone, and all credit goes to powerful processor chips and their mode of communication. Here in our research also we used one such method for communication i.e., Bluetooth. This technology was created by Ericsson telecom vendor in 1994. Bluetooth provides connectivity between devices for file transferring. It's so powerful that it can connect almost seven other devices at the same time and can transfer data simultaneously. It is best suited for the home environment as its working area has a range of about 8-10m. This is the reason why smart phones are becoming so powerful in recent years as it turned smart phones into an all-purpose portable device. Using an android phone as a center for communication between robots and humans is already a very active field of research with several opportunities. Till now, speech recognition proved to be one of the ideal methods for controlling a robot. The system we designed is also based on the same technology as it is the easiest and very efficient way of giving commands. It's simply a technology where the system has to understand words, not its meaning, thus reducing the computational time. In our system, speech recognition is separately handled by the android smart phone i.e., it functions independently from the robot's main intelligence. Speech recognition also allows the user to perform multitasking by letting him/her concentrate on other stuff and giving the command to the machine simultaneously. Robotics is one of the fastest-growing technology in the science field. The main reason behind this is robots act as cheap labor that gives high accuracy of output. Robots also proved to surpass the human limits; thus, those tasks which seem impossible for the humans are now within their reach. There is no limit to the applications where robots can work. Hence, the need to accurately and efficiently controlling the robots is also increasing. There exist hundreds of methods for controlling robots. This research paper aims to focus on one method out of those hundred i.e., audio channels based closed-loop systems, which is again one of the best and most efficient methods to control the robot as it uses speaking to communicate with the devices. In our



research, we built a system which let a simple robotic to move in all four possible directions i.e.; the robot can do the following tasks. It can move forward, backward turn left and right and can stop at any time.

II. PROBLEM DEFINITION

The main objective of the project is to control the robot in a desired position. Also, the main objective of the project is to control the robot by the voice. Human Robotic Interaction is achieved. The goal of voice controlled Robot is to listen and act on the commands received from the user. The proposed system consists of two blocks: transmitter and receiver block. They use Arduino UNO and L293D module and a battery for the power source. Using this application we can control the robotic vehicle by using android app.

III. PURPOSE

The main objective of the project is to move the robot as per our instruction so that it can act as a carrier. As this robot acts on voice instruction thus it can be used in many ways. Human Robotic Interaction is achieved through movement of robot and meeting with robots. The goal of voice controlled Robot is to listen and act on the commands received from the user. Using this application, we can control the robotic vehicle by using android app. let can also be used for remote operation.

IV. METHODOLOGY

To control a robotic car using our voice we a very simple approach 1st all the human commands gets converted into text and for this we use Google's speech to text converter, it's all implemented in the android app that we are using next the text form of command is being transmitted to the Bluetooth module of the robotic car. This Bluetooth module act as a bridge between Arduino and android app for data transmission. After the text command is received by Arduino, it controls the movement of the robot accordingly. As our project was for educational purposes so that we can try this on their own in their studies, so we used a very simple hardware architecture that we used with cost-effective hardware. The architecture consists of the following components:

A) Arduino Uno R3:

It is embedded in Arduino UNO which works on an operational voltage of about (1.8-5.5) V. It is of very low-cost, thus, making it very effective, easily available and very common to find in day to day appliances. To get started, it can be powered by an AC to DC adapter or battery.

The Integrated Development Environment (IDE) of Arduino is a Java-written cross-platform application. It involves a code editor with characteristics such as highlighting syntax, brace matching, and automatic indentation and is also able to compile and upload programs with a single click to the board. An Arduino program or code is called a "sketch."

B) HC-05 Serial Bluetooth:

HC-05 is a serial port protocol Bluetooth module i.e., it serially communicates with micro-controller. For Bluetooth connectivity, there exist many devices like HC-06, HC-05, etc. If we compare both modules, HC-06 can work only as a slave while HC-05 can perform both task i.e., slave as well as work as master thus it can accept connection from other devices and can also provide the connection to other devices. In our project, we are using it in slave mode, which means it will accept the connection from the android application. For connecting module to the android app, we must use the default password of the module which is either "0000" or "1234".

C) L293 D Bridge Motor Driver:

One of our hardware architecture's most significant parts is the motor driver. Its function can be understood as a controller that controls the rotation of the DC Motors; thus, this D bridge motor driver is responsible for providing direction to our robotic car. The operational voltage of L293 is (5-35) V. The module has two screw terminal blocks for the motor A and B and another screw terminal block for the Ground pin, the VCC for motor and a 5V pin which can either be an input or Output. This depends on the power supply which we are providing i.e., if the supply is $\leq 12V$ it will provide output and if supply is $\geq 12V$ it will take input to safeguard other components from being burned out. This also helps us in controlling the speed of motor driver.

D) DC MOTOR:

An electric motor accomplishes almost every mechanical motion we see around us. Electrical machines are a means of energy conversion. Motors generate electrical energy and mechanical energy. The motor driver is one of the most basic components that can be found in hundreds of home appliances we use in everyday life. Examples, where applications include motors, are food blender, automobiles, hydroelectric power generator, and many more.

V. BLOCK DIAGRAM

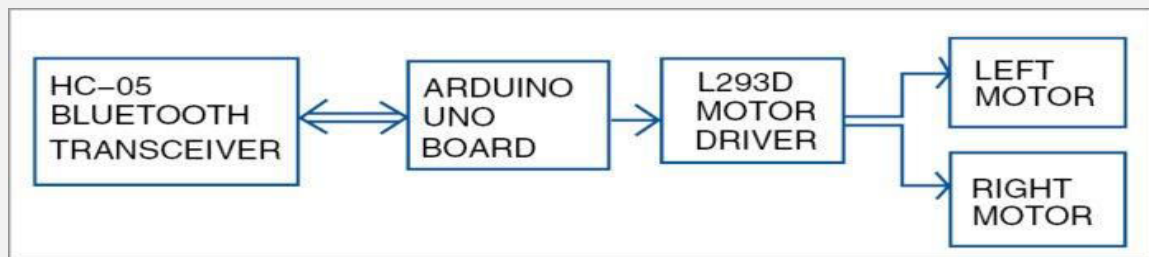


Fig 1

VI. IMPLEMENTATION

In this proposed system, a smart phone is used as a speech recognition device. For this, we will be using an android application that will recognize human speech using Google Speech Recognition and will ultimately convert it into the text using Google Speech to Text API. Following are the steps to do so:

- 1) Download the app “Arduino Bluetooth Control” from google play store.
- 2) Make sure HC-05 is paired to your smart phone & to make it paired use password “1234”. Then chose the HC-05option in the app searching list.
- 3)Now click on the voice command
- 4)Articulate “Forward” to make the car move in the forward direction.
- 5) Speak “Backward” to make the car move backward.
- 6)Speak “Left” to turn the car towards left.
- 7)Articulate “Right” to let the car turn in the right direction.
- 8)Say “stop” to stop the car.
- 9)Disconnect the Bluetooth connection after use

VII. SYSTEM EVALUATIONS

Advantages:

- The robot is small in size, so space required for it is small.
- We can access the robot from distance as it acts on voice instruction.
- As we are using smart phone which is attached to the robot so it will transfer items in hospitals and malls and can be useful in contact less portability of items.
- Cost of system is low as we are using smart phone which is nearby available to everyone

Disadvantages:

- Even the best speech recognition systems sometimes make errors. If there is noise or some other sound in the room the number of errors will increase.
- Speech Recognition works best if the microphone is close to the user will tend to increase the number of errors.
- In Speech recognition system, there is a possibility of unauthorized usage. Since this doesn'tdepend upon which person is speaking.



VIII. APPLICATIONS

- The robot is useful in places where humans find difficult to reach but human voice reaches.
- It is the one of the important stage of Humanoid robots.
- Command and control of appliances and equipments.
- Speech and voice recognition security systems
- The robot can be used for surveillance or reconnaissance.

IX. FUTURE SCOPE

As we know nothing in this world is perfect everything is trying to make itself better and more effective compared to others. So on the same note, this technology also requires lots more development. Thus expanding its applications farther where at present we can't think of. With modification and insertion of camera it can act as surveillance robot and video communications especially in hospitals between patient and their relatives.

X. CONCLUSION

The goal of this article is to provide an equipment circuit that enables individuals to use their voice to control robots or other home machinery. The smart phone is nowadays are growing into more and more powerful devices, which have the capacity to interact with other appliances through Bluetooth, wifi, etc. Bluetooth being a cheap mode of communication, provide a powerful mode of connection. All our research and projects about controlling devices using voice pay off and finally leads us to the conclusion that Yes, it is possible for human beings to control their day to day appliances just by their voice.

XI. ACKNOWLEDGEMENT

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