

# ARDUINO BASED VOICE CONTROLLED ROBOT

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**Abstract**—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 app is used as a medium for the transmission of human commands to micro-controller. A controller can be interfaced with the Bluetooth module through the UART protocol. The speech is received by the android app and processed by the voice module. Voice is then converted to text. [1] The microcontroller will further process this text, which will take suitable action to regulate the robot. The objective is to design a robotic car whose basic movements such as moving forward, turning to left or right can be controlled by the human voice. The Hardware Development board used here is the ATmega Arduino board. The software part is done in Arduino IDE using Embedded C. Hardware is implemented, and software porting is done. Generally, recognition of human voice using some kind of module cost way too much. After performing an ample amount of studies on controlling robots, we came to the conclusion that yes, there exists a simple and very efficient way to manipulate robots through our voice. This is an ergonomic approach for the ease of robotic application. Such types of robots will provide great helping hands while performing multiple tasks. The result of our studies also shows that there still exists plenty of space for further research and development. [2]

## I. INTRODUCTION

As we all know in today's world, one of the most powerful and rapidly developing devices is a smartphone, 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 smartphones are becoming so powerful in recent years as it turned smartphones 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 smartphone 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. Furthermore, it's even more robust as anyone can control the robot with their command providing you, even more, convenience to household people. Just giving directions for controlling a robot just by talking to it makes it simpler to operate while improving the efficiency and efficiency of working with that device.

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. This system is not similar to any other system in which robots are fed with lots of words that in the future, they can recognize words with themselves. In our research, we built a system which let a simple robotic car to move in all four possible directions i.e.; the robotic car can do the following tasks. It can move forward, backward, turn left and right and can stop at any time.

## II. 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 micro-controller of car and android app for data transmission. After the text command is received by micro-controller, it controls the movement of the robotic car accordingly.

As our project was for educational purposes so that students

can try this on their own in their studies, so we used a very simple hardware architecture that we used we cost-effective hardware.

The architecture consists of the following components:

1) Arduino Uno R3:

The micro-controller of Arduino Uno r3 is ATmega3298P.

1.1) ATmega3298P:

It is a single-chip microcontroller. It contains a modified Harvard architecture 8-bit RISC processor core. It also has a 32kb ISP flash memory with read-while-write capabilities. Other than this, it includes one kB EEPROM, 2 KB SRAM, 23 general-purpose I / O lines, 32 general-purpose operating registers, three versatile timer / compare modes, inner and external interrupts. It is embedded in Arduino UNO which works on an operational voltage of about (1.8-5.5)V. It is a very low-cost micro-controller, thus, making it very effective easily available and very common to find in day to day appliances.

The Arduino Uno is an ATmega328-based microcontroller board. It has 14 digital I/O pins, six analog inputs, 16 MHz ceramic resonators, USB connection, ICSP header, a power jack, and reset button. It involves all the assistance the microcontroller requires. It can simply be linked with a USB cable to a laptop. To get started, it can be powered by an AC to DC adapter or battery.

The Uno varies from all previous boards because to serial driver chip it does not use the FTDI USB. Rather, it features the Atmega16U2 programmed as a USB to serial converter (Atmega8U2 up to version R2). 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." [3]

2) 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 [4]. It operates on (3.3-6)V supply which means when the Tx pin of the Arduino board will connect to the Rx pin of Bluetooth module, we must use a voltage divider (Rx pin support 3.3V) otherwise the module will just crash out. There is no such condition for the Tx pin of the module as it supports exactly the same power supply as that of the Arduino board. For connecting module to the android app, we must use the default password of the module which is either "0000" or "1234". [5]

3) L298 H 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 H-bridge motor driver is responsible for providing direction to our robotic car. The operational voltage of L298 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. [6]

This also helps us in controlling the speed of motor driver i.e., if the jumper is present motor drivers run at maximum speed on the other hand if the jumper is absent we can connect a PWM input(0-255) numeric value to control the speed of the motors.

4) 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.

### III. IMPLEMENTATION:

In this proposed system, a smartphone 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. [7] The converted text will act as the code for the microcontroller which will be sent to it via Bluetooth & for this purpose HC-05 is used i.e., the HC05 will act as the receiver (Rx) which will receive the code from a smartphone and transmit(Tx) it to the decode circuit. [8]

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 smartphone & to make it paired use password "1234". Then chose the HC-05 option 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

### IV. 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 smartphone is nowadays are growing into more and more powerful devices, which have the

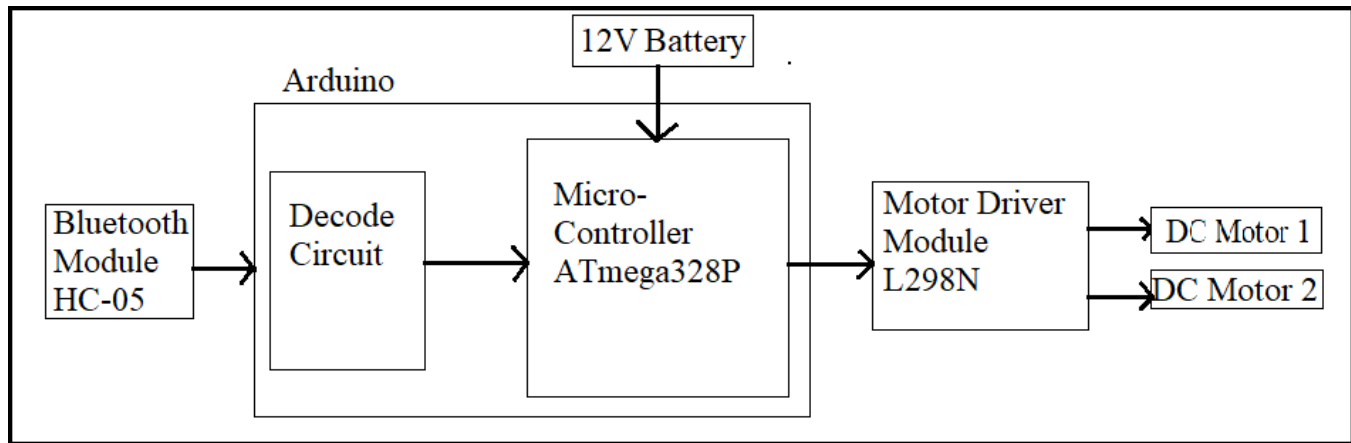


Fig. 1. Block Diagram

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. [9]

#### V. 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.

#### REFERENCES

- [1] R. Piyare and M. Tazil, "Bluetooth based home automation system using Android phones," in *IEEE 15TH International symposium on consumer electronics (ISCE)*, 2011, pp. 14–17.
- [2] R. Pahuja and N. Kumar, "Android Mobile Phone Controlled Bluetooth Robot," *www.ijser.in ISSN*, vol. 2, no. 7, pp. 2347–3878, 2014, Using 8051 Microcontroller" proceedings of.
- [3] J. Potts and S. Sukittanon, *Exploiting bluetooth on android mobile mobile devices for home security application*, *proceedings of Southeastcan*, Orlando, Florida, USA, 2012.
- [4] "Speech recognition and its application in voicebased robot control system, Luo Zhizeng; ZhaoJingbing Intelligent Mechatronics and Automation," *Proceedings*, 2004.
- [5] "A study on precise control of autonomous driving robot by voice recognition, Sung-Won Jung ; Ki-Won Sung ; Moon-Youl Park ; Eon-Uck Kang ; Won-Jun Hwang ; Jong-Dae Won; Woo-Song Lee ; Sung-Hyun Han Robotics (ISR)," *44th International Symposium*, pp. 2013–2013, 2013, Publication Year. [Online]. Available: onDOI:10.1109/ISR.2013.6695640
- [6] J. Potts and S. Sukittanon, *Exploiting Bluetooth on Android mobile devices for home security application*, *proceedings of Southeast can*, Orlando, Florida, USA, 2012.
- [7] S. D'Amello, L. McCauley, and Markham, "A mechanism for human - robot interaction through informal voice commands," *IEEE International Workshop*, 2005, James Robot and Human Interactive Communication. Publication Year. [Online]. Available: DOI:10.1109/ROMAN.2005.1513777
- [8] "A study on real-time control of mobile robot with based on voice command, Byoung-Kyun Shim ; Yoo-Ki Cho ; Jong-Baem Won;Sung-HyunHan Control Automation and Systems (ICCAS)," *11th International Conference on Publication Year*, pp. 2011–2011, 2011.
- [9] R. Pahuja and N. Kumar, "Android Mobile Phone Controlled Bluetooth Robot," *www.ijser.in ISSN*, vol. 2, no. 7, pp. 2347–3878, 2014, Using 8051 Microcontroller" proceedings of.