



# Robot control through voice recognition using LabVIEW

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## ABSTRACT

*As of today, our goal in technology is to bring the human effort to minimum. In the digital world it would be cool to make a robot which obeys human speech commands and perform tasks. It will be very much fun if we can control robot with our speech. There are movies like iron man where he makes himself a totally different network for himself which is overrated. Let's not go there and stick with what we can do. Actually, the idea of making this came from a movie called I robot, here the people uses robots for the help just by giving commands. The reason we chose voice was there are robots which work on gestures and line robots. But the voice control we used overcomes the flaws in these other ones. Arduino Uno board is used which is an atmega328p microcontroller based prototyping board. The pins are all connected to their respective devices, also two dc motors are used. A power supply source is also connected which may be a battery. L293D which is a speed control pin placed. In this project, user gives specific voice commands to the robot. At the receiving side, a simple VR module receives the commands and forwards them to the Arduino on the robot. Arduino controls the movements of the robot according to received commands. The robot moves forwards, backwards, left and right, and stops according to the voice commands forward, backward, left, right and stop, respectively. By giving the commands the robot will be in movement, also time delay is given to our requirement*

**Keywords**— Voice Recognition, Automaton management, LABVIEW

## 1. INTRODUCTION

Voice controlled robot is a mobile robot, where the motions can be controlled by user giving specific commands. For kids who are lost and old people who cannot dial numbers it will be very helpful they have to just give the command (like call mom or call Raju) Now a there are places where robberies are happening frequently even though the house is completely locked, voice recognition security system can be developed, so that there will

be reduction in this crime rate. It can also be used in toys for kids. A robotic arm is under development for the ones who lost their arms. Also, if used in large scale it is used to develop robots with military application. It can be used to target our enemy without crossing our border. Since there are many smart phones in markets it will have many more applications in the future.

An easy way to control robots is to give voice commands to them. This allows the user to take some rest or to concentrate on other things. At present many ways are used to control robots but the most efficient way is by giving voice commands. There are various voice control mechanisms developed till date and in separate fields. For example, there is a design of a voice controlled robotic gripped arm which is built on official Bangla voice control using neural networks for medical systems. Likewise, A voice-controlled wheelchair makes it easy for physically disabled person who cannot control their movements of hands. The powered wheel chair depends on motors for movement and voice recognition for command. The circuit comprises of an Arduino, Voice recognition module and Motors. In similar manner the one robot we developed is much easier to process through Virtual Instruments.

Arduino uno is the latest version of Arduino boards available with atmega328p microcontroller inbuilt on the board, which makes it easy and efficient to work with L293d is a motor driver IC which can control a set of two dc motors. LabVIEW is one of the latest software which can be easily interfaced with any hardware. It has extensions for different hardware components. LabVIEW interface for Arduino is the extension required to be installed in the system to interface Arduino with lab view and also to run lab view code in Arduino.

## 2. RELATED WORK

SWETHA presents a study of voice command in industrial automation. As mentioned in her publication tests were conducted on the voice recognition in a noisy environment. Compared to the laboratory environment, the signal was affected

by the noise from different sources, such as: electrical motors, machine tools, human operators. An example with noise produced by an induction machine is presented. Finally, some simulation results of voice recognition in a noisy environment are presented. The appropriate control signal for the robot will be provided by the LABVIEW. The usage of LABVIEW for the interpretation of voice signals makes the research easier compared to other sound-based robot control system.

ANKUSH SHARMA in his work stated that the speech recognition system can be defined as the process of converting audio signal captured by microphone into a set of words. In this paper by utilizing the platform of the virtual instrument technology, LabVIEW, a kind of speech recognition system. The object control system applied in the artificial intelligence sector like in the robotics to control the movements of the robot. This in particular is very much helpful for our work.

Richard .c in his work stated that a set of voice commands are functionally equivalent to the set of switches which is used to control wheelchair.so wheel chair control can be easy using voice instead of buttons and it is also used for people who are physically handicapped. This work proved to be greatest change in speech recognition domain which made a way for voice automation.

### 3. PROPOSED METHOD

It is aimed to control a robot with speech commands. The robot is able to recognize speech commands to move accordingly. Voice recognition module accepts the voice input given by the user, then transfer the signal to the Arduino uno which then activates L293d motor driver which acts as interface between the dc motors and the controlled circuit. Using lab view we can also store the voice commands given by the user and further when the user repeats commands, it matches the predefined commands and send the signal further

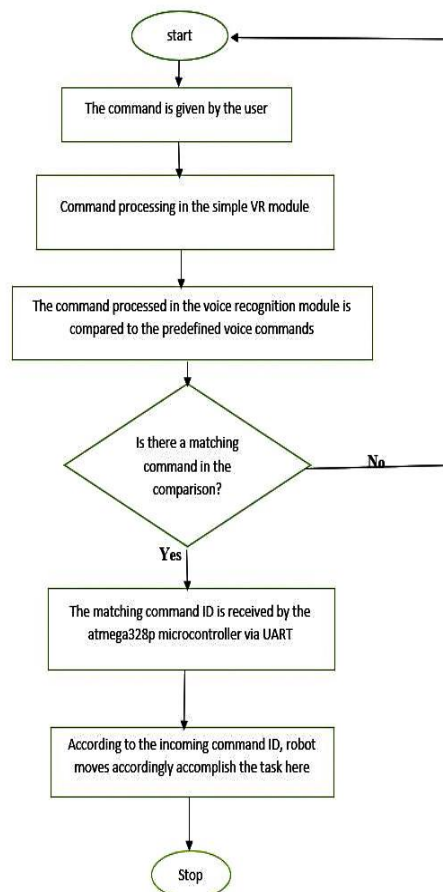


Fig. 1: Flow chart

As we all know the VR module is trained regarding the commands that the mechanism ought to respond consequently. To relinquish a direction to mechanism, 1st the voice command is shipped to the pc employing a mike. The pc acknowledges the command by speech recognition system. And therefore, the laptop converts the voice command to the direction command that predefined and recognizable by mechanism. Once the mechanism get the direction command it moves consistent with spoken command. Once we say voice management, the primary term to be thought-about is speech recognition i.e. creating the system to grasp human voice. Speech recognition may be a technology wherever the system understands the words given through speech. It checks whether the given command matches with existing commands or not If the command matches the predefined commands or trained commands from voice recognition module then it sends signal to Arduino uno to perform operation assigned for that command. If not, mechanism can keep still and sit up for succeeding commands. L293d motor driver is employed here acts Associate in Nursing interface for Arduino uno and DC motors that send the signal to DC motors to begin operating and therefore, the mechanism starts getting such that direction. Thus, the mechanism moves forward, backward, right, left, and stop once the assigned command is given by the user.

During the implementation of the proposed robot, power supply unit is first developed using 7805 to convert 9 volts into 5 volts and LE 33 to convert 5 volts into 3.3 volts. Electrolytic polarized capacitor as well as the bypass capacitors has employed for steady the slow changes and bypass very small period spikes and extremely tiny duration spikes to the ground with no distress the other components. Diodes D1 and D2 are used to prevent back current.

The motor driver controller is based on L293D which is a quad, high current, half bridge driver that is created to provide bidirectional drive currents of up to 600mA at voltages range from 4.5 V to 36V [9]. Input 1 and Input 2 are connected to the digital pin of 2 and 3 for left motor and input 3 and input 4 are connected to the digital pin of 4 and 5 for right motor accordingly. Enable pin of l293D is connected to the digital pin number 6 of Arduino Uno for speed control.

Voice Controlled Robot (VCR) is a voice recognition robot whose motions can be controlled by the user by giving specific voice commands. The speech recognition voice module running on the hardware is capable of identifying the maximum 64 groups, each group consists of 2000 sentences voice commands 'Run', 'Stop', 'Left', 'Right' and 'Back' issued by a particular user.

Firstly, voice by user is given as input to the voice recognition module. Then Simple VR module receives these voice commands and transforms them into digital signals using Analog Digital Converter (ADC). The next step is to compare voice commands to the ones recognized before, i.e. forward, backward, left, right etc... If they match, it transmits each letter value which is corresponding for commands as binary. This binary information is later received by ATmega328p microcontroller. After matching and comparison is finished here, transmitter sends information signals to via URAT. Microcontroller compares value serials to values here. Lab view front panel screen display the direction of the robot moment and also the amplitude of the input speech. Acquiring sound LED's on the screen of front panel in labview indicates the time for which the command can be taken by the system. Lastly, robot moves to the commands given by the user accordingly like it

moves forward, backward, right, left and stop when the command from user matches the commands already trained by simple VR.

#### 4. HARDWARE

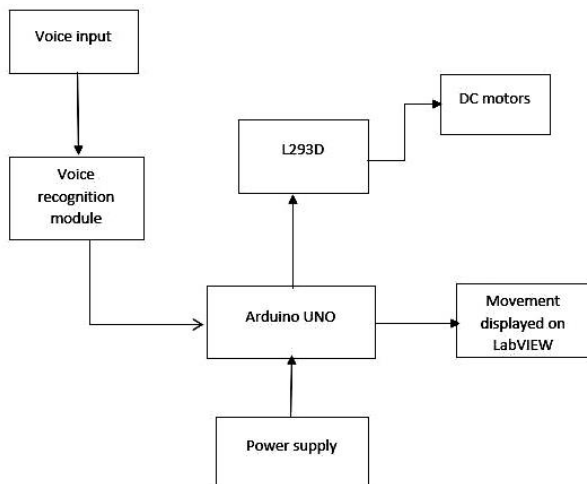


Fig. 2: Block Diagram

#### 4.1 Voice Recognition

Voice recognition is a technique that facilitates natural and convenient (HMI) using voice recognition module. It extracts and analyses voice features of human delivered to a machine or computer through the mic. To design a home automation system that responds to voice commands and allows controlling the on/off status of electrical devices like lamp, air conditioner, television and door in a house. The system allows controlling various devices using the following commands: ‘open the door’, ‘close the door’, ‘turn on the air conditioner’, ‘turn off the air conditioner’, ‘switch on the lights’, ‘switch off the lights’ etc. It processes the input voice received and compares it with the pre-defined or pre-existing commands that the modules is trained for.

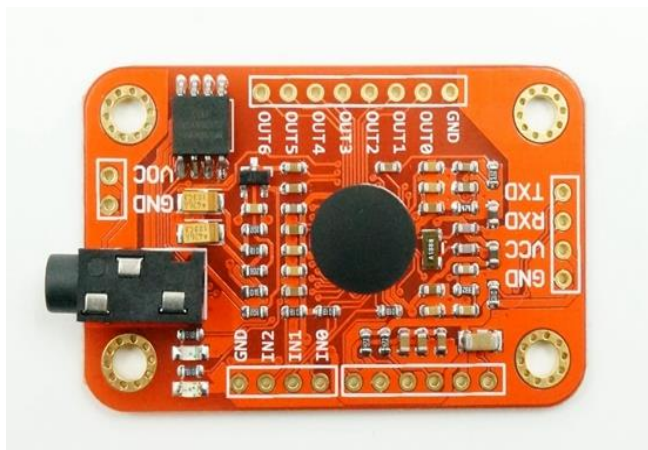


Fig. 3: Voice Recognition Module

#### 4.2 Arduino Uno

We connect the board to the computer through a USB cable which does a dual purpose of supplying power and acting as a Serial port to interface the Arduino and the computer. It can also be powered by a 9V-12V AC to DC adapter. The ATmega328 chip can be newly bought, removed and replaced if damaged which is not possible with other versions. The board operates at 5V throughout, i.e. digital pins output or read 5V and analog pins read in the range 0-5V. The Uno features 14 Digital I/O pins and 6 Analog I/O pins. Extra Add-on hardware is built for Uno. Special hardware is available for Internet, Bluetooth, Motor control etc.

The Arduino has power supply of 5V initially but to run the motors extra power supply has to be given so we add +9V battery to the Arduino connected to the VIN pin and the digital I/O pins are connected to the L293d motor driver. The Txn and Rxn pins of Arduino are connected to the Txn and Rxn of Bluetooth module and the inputs and output pins of motor driver are to the digital pins of Arduino uno. The GND pins of are connected to the Battery and Motor and Bluetooth. The Txn and Rxn of voice module are connected to the L239d motor Txn and Rxn pins in order to implement command received the motor will send the command to the Arduino and performs according to the command given. The Bluetooth module contains an UART pin which is connected to digital pin D0 and D1 of Arduino. The VR module is connected to Arduino and Bluetooth module in order receive and transmit the command so that the drivers run accordingly to the command given.

#### 4.3 L293D

It is a typical motor driver allows DC motor to drive either direction. They are rated for 3 to 9V. So, we will connect external 9V power supply to the Vcc2 pin. We need to supply 5 Volts for the L293D’s logic circuitry. Connect Vcc1 pin to 5V output on Arduino. Make sure you common all the grounds in the circuit. Now, the input and enable pins (ENA, IN1, IN2, IN3, IN4 and ENB) of the L293D IC are connected to six Arduino digital output pins (9, 8, 7, 5, 4 and 3). Note that the Arduino output pins 9 and 3 are both PWM-enabled. Finally, connect one motor to across OUT1 & OUT2 and the other motor across OUT3 & OUT4. You can interchange your motor’s connections, technically, there is no right or wrong way.

#### 4.4 DC Motor

Motors are used for powering up devices that are commonly seen in our daily life. The principle behind the working of DC motor is when a current carrying conductor is placed in a magnetic field, it experiences a torque and has a tendency to move. In other words, when a magnetic field and an electric field interact, a mechanical force is produced.

DC motor namely consists of two major parts.

#### 4.5 Stator

This is the stationary part which keeps the field windings, gets the supply and forms the outside portion of the motor. The DC motor’s stator consists of 2 or more magnet pole pieces and that too permanent. Here, a coil is wound on a magnetic component to form the stator.

#### 4.6 Rotor

This is the inner rotating part which carries out the mechanical rotations. This part consists of windings connected to the external supply circuit via commutators. Ferromagnetic materials are used in the construction of stator and rotor and an air-gap separates the parts.

#### 4.7 LabView

Programs that take weeks or months to write using conventional programming languages can be completed in hours using LabVIEW because it is specifically designed to take measurements, analyze data, and present results to the user. And because LabVIEW has such a versatile graphical user interface and is so easy to program with, it is also ideal for simulations, presentation of ideas, general programming, or even teaching basic programming concepts. Graphical programming allows you to concentrate on the flow of data within your application, because its simple syntax doesn't obscure what the program is doing. The LabVIEW program development environment is



different from standard C or Java development systems in one important respect: While other programming systems use text-based languages to create lines of code, LabVIEW uses a graphical programming language, often called "G," to create programs in a pictorial form called a block diagram.

## 5. RESULTS

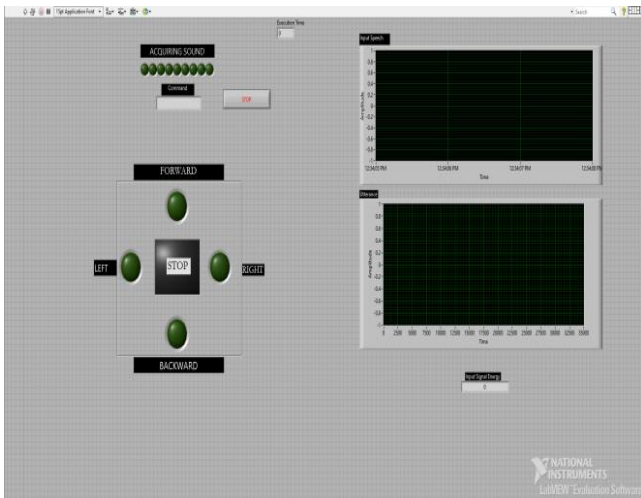


Fig. 4: Front Panel

Acquiring sound LED's present in the front panel shows us the time until which it accepts the command. It performs the command once the series of LED's glow. A particular LED will glow on the match of voice command given by the user. Input speech box in front panel gives speech amplitude.

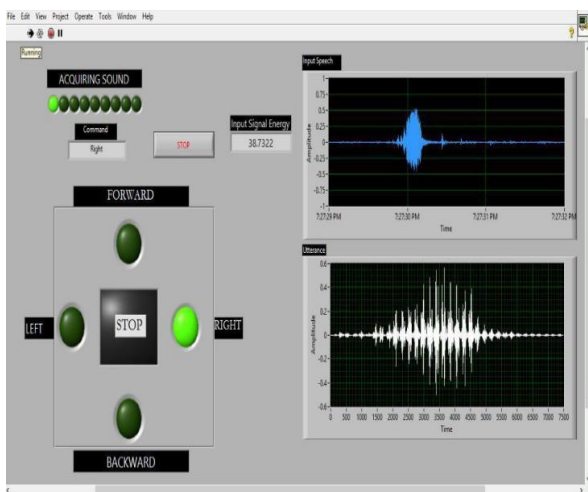


Fig. 5: Result for Right Command

If the Right LED is glowing it indicates that the command given by the user matches the predefined command that has been assigned to Right LED. Now the robot will move right side. And it also indicates the speech command received by the system. A

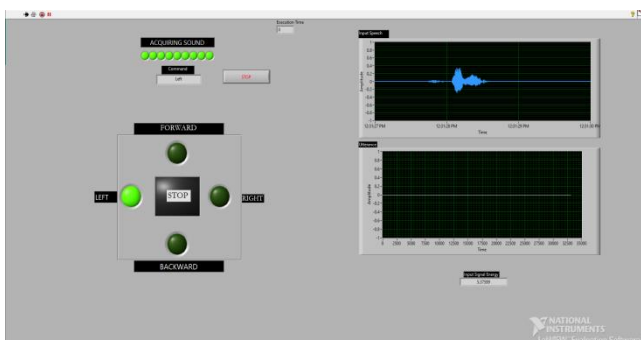


Fig. 6: Result for Left Command

If the Left LED is glowing it indicates that the command given by the user matches the predefined command that has been assigned to Left LED. Now the robot moves Left side. Same is applicable to forward and backward. After some delay it or after giving next command when the acquiring LED's start glowing it is ready to take next command as input to perform robot movement. Similarly, forward, backward and stop commands work according to the speech recognition and voice commands given by the user. according to the command the variation in result is displayed and robot obeys the command.

## 6. CONCLUSION

Hereby it can be concluded that the robot moves according to the speech commands given and matched with the predefined commands stored in the voice recognition module. It is found that the voice recognition module consumed less memory as there are only a few commands stored in it. As speech is the input for the project, this can be used by any person with or without technical knowledge and make the use of the robot according to the needs. Use of LabVIEW makes this project compatible to any device and can be altered according to the requirement of the customer without much effort. Many industries, hospitals can be helped in large scale by bringing this out, as the motors we used will run with the help of battery or some small power supply, which can be taken as a reference. We ran some tests by adjusting the frequency to avoid minor disturbances and for its efficient working also time delay is given where it can be adjusted. Moreover, we also analyzed the test result to rectify the problems and limitations in our approach.

The project can be further improvised by adding IR Sensor which detects the obstacle presence (if any) and can be used to stop the robot. In order to store more commands a higher version of voice recognition module can be used. Instead of microphone a Bluetooth earpiece device can be used to improve the performance. The voice recognition capability of robot can be improvised using Natural Language Processing (NLP). The commands list can be improvised using Artificial intelligence giving the robot versatility. Voice based feedback can also be added.

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