

Voice Recognition Robot with Real Time Surveillance and Automation

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Abstract: Voice recognition is the technology in which a single voice command can perform a real world operation. The concept of voice recognition is deals with the conversion of input voice signal into its corresponding text through an android application and transmission of this text message through Bluetooth connectivity as a means of communication platform. In the other hand a controller circuit can receive a text signal through Bluetooth module and as per the coding mechanism it performs real world operation. This paper also enhance the concept of real-time surveillance and automation where an obstacle detection and avoidance mechanism along with lighting and horn operates through predefined voice command. Our purposed technique will act as a helping hand for disable people and also useful in industrial automation robot to perform certain particular task.

IndexTerms - Android application, Arduino, Bluetooth module, Motor driver, Speech Recognizer, Ultrasonic.

I. INTRODUCTION

Robot is a machine which includes electrical, mechanical, communication as well as computing sections to perform certain particular task in an effective way. Robotics is the technology which suppressed a requirement of human participation in any specific work. Voice recognition robots are those system which works according to a predefined voice command. Firstly a voice command is processed through android platform and conversion of voice to text takes place inside a system. The development of this android application is based on drag and drop programming technique and is developed with MIT app inventor. This platform is easy as compared to other development platform and we use Google database as a speech recognizer for an effective system response. The requirements for establishing communication network are Bluetooth and internet connectivity. The control mechanism of robot is based on various commands like right, left, backward, forward, light on, horn please and so on. This commands are processed through smart phone and the real world operation has been achieved through control circuit that will interface with motor mechanism. The automation implemented with Bluetooth technology is having low cost as compared to other communication platform like Zigbee, GSM (Global System for Mobile communication), General packet Radio Service (GPRS) and also the installation process is simple [1]. According to the Research Bluetooth system is faster than the wireless and GSM system [1]. Additionally we had connected motor driver and relay driver module as interfacing with arduino for achieving an effective platform for driving output loads. This paper also focused on real time surveillance and automation concept in which an obstacles detection and avoidance mechanism is initiated with the help of ultrasonic sensor HCSR04. An ultrasonic sensor has been used to measure the distance between the target and the real position of robot. This concept is achieved when an ultrasonic wave transmitted and returned back after reflecting from a given target and this time period is said to be echo time and it helps to calculate distance. The movement of robot has been decided according to the distance measurement by ultrasonic sensor. This platform can be achieved through programming on Arduino IDE (Integrated Development Environment) and load it to arduino Atmega 328. Speech recognition is that technology in which the system understand the words but not its meaning [2].



Figure 1: Block Diagram

II. ARDUINO ATMEGA328

Arduino Uno is a microcontroller based on atmega328. It contains 14 digital input/output pins whereas 6 pins are pulse width modulation (PWM) output, 6 analog pins for sensor interfacing, 16 MHz ceramic resonator[3] and it contains all the required circuitry inside a single module and the operation is more easy as compared to other microcontroller circuit.



Figure2: Arduino Uno atmega328 [4]

Table 1: Arduino uno atmega328 specification

Operating voltage	5V
Input voltage	7-12V
DC current per I/O pin	40mA
DC current for 3.3V pin	50mA
Flash memory	32KB of which 0.5 KB used by bootloader
SRAM	2 KB
EEPROM	1 KB

III. BLUETOOTH MODULE HC-05

Bluetooth module (HC-05) act as interfacing with an arduino circuit for establishing communication platform. Mainly this module is used in our project for serial data reception from an android application. Practically this module works with in the range of 50 meters.



Figure3: Bluetooth module HC-05 [5]

IV. PCB DESIGN OF L293D MODULE

L293D is a H-bridge motor driver IC and having operating voltage up to 36v from 5v and provides by-directional drive current of up to 600mA. This IC control two dc motors, their directions and also achieve speed controls using pulse width modulation (PWM) [6]. In our project we designed motor driver module through PCB (Printed Circuit Board) design and each module contain two ICs of L293D.

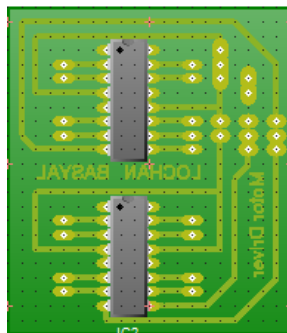


Figure4: PCB design real world view

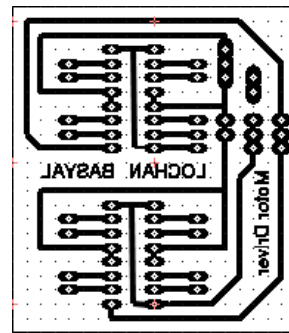


Figure5: PCB design artwork view

V. CONTROL CIRCUIT MODULE

This module include relay driver mechanism with transistor BC547 and buzzer act as horn for robot and we can operate any output system through relay with applying digital pulse through an arduino. This portion of our project will drive lighting and horn mechanism of robot.

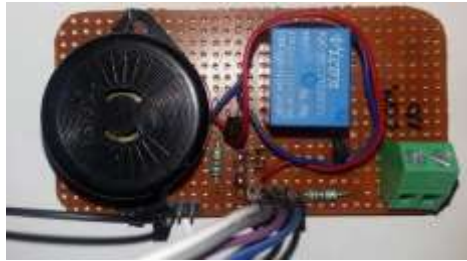


Figure6: Control circuit module

VI. ULTRASONIC SENSOR HCSR04

The interfacing mechanism between an arduino and ultrasonic sensor HCSR04 is to measure distance between a target and real position of sensor and this can be achieved by calculating the time duration between transmission and reception of ultrasonic wave. This module contain 4 terminal vcc, trigger, eco and gnd.



Figure7: Ultrasonic sensor HCSR04 [7]

VII. ANDROID APPLICATION

Android application is our first interfacing medium for voice signal and has been developed by using MIT app inventor platform based on drag and drop programming. The operation of this application is based on bluetooth and internet connectivity. We has been used google voice recognizer module during application design and it use google database having awesome operating performance. Application can convert voice command into its corresponding text message and displayed on the screen. This message is transmitted to an electronic hardware circuit through bluetooth connectivity and hence system performs realworld operations as comparing with if stament.



Figure8: Android Application

VIII. PROTEUS SIMULATION SOFTWARE

Proteus simulation software 7 is used to verify the circuit connection in virtual world. Through this platform we can draw a circuit and then upload the programming file in hexadecimal format and this file is generated after the compilation of program in Arduino IDE. In this simulation we used an arduino as interfacing with L293D IC as motor driver. The communication platform established through virtual terminal and we have been found a circuit operates according to a program.

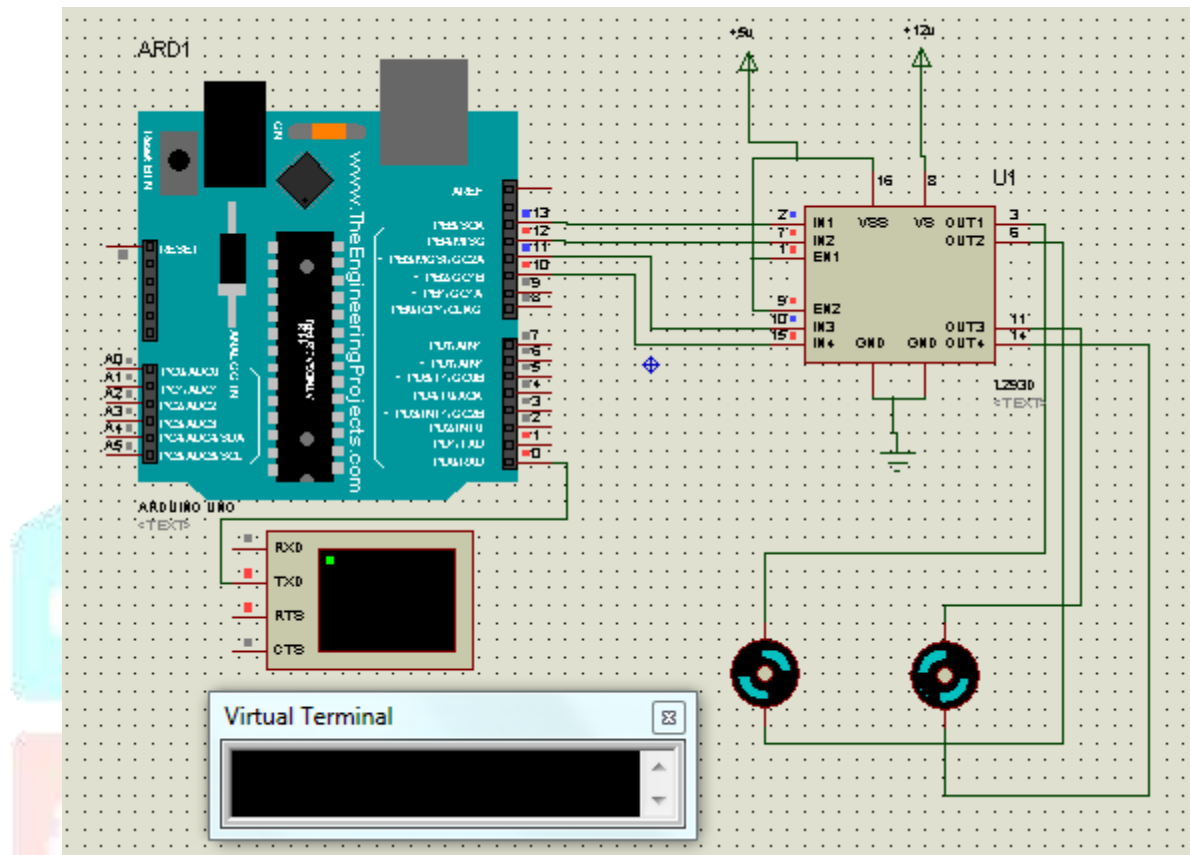


Figure9: Simulation of Motor mechanism through proteus

IX. PROGRAMMING CONCEPT OF ROBOT

Communication platform established in our project is Bluetooth and is based on serial data transmission and reception. In the case of serial data available, program read the bytes from Bluetooth and in the next step string processing is executed. After that program check the string received with predefined voice command and executed a statement when it is equal. Function definition has been demonstrated through this paper which describes robot movement mechanism. Figure 10 shows the code for ultrasonic sensor interfacing with an Arduino, Similarly Figure 11 shows the code for string processing, Figure 12 shows code for voice command execution, figure 13 shows the concept of automation which carry the lighting and horn mechanism control through a voice command. In this program voice is defined as string and similarly distance, duration and safety distance as integer, long and integer as data type declaration and this parameters are represented by its short form as shown in the Figure 10. Ultrasonic sensor has been used for obstacles detections and avoidance condition that is applied on our robot. This sensor contains four pins for the Vcc (supply voltage of dc 5V), Ground (GND), trigger pin and echo pin. We can measure the distance as per the pulse received from the digital pin 6 of an arduino and that will be used as an echo pin on our project, similarly the digital pin 7 represents trigger pin. When there is an obstacle detection, immediately robot became stop and get back and takes left direction as per the code depict on figure 10. The robot will get stopped before 10 centimetres distance from the obstacles and after completing its further movement then the condition of safety distance is break from the loop in programming. As in the real world operation when user give the voice command through an android application and in the case when string check condition becomes true then program executes as per the function call inside that particular condition and finally which demonstrates the real world operation means robot movement in particular direction. The real time distance surveillance has been carried by an ultrasonic sensor.

```
void loop() {
digitalWrite(7, LOW);
delayMicroseconds(2);
digitalWrite(7, HIGH);
delayMicroseconds(10);
digitalWrite(7, LOW);
dur = pulseIn(6, HIGH);
dist= dur*0.034/2;
safetyDist = dist;
if (safetyDist <= 10)
{
stop_please();
delayMicroseconds(1000);
back();
delayMicroseconds(1000);
left();
delayMicroseconds(1000);
break;
}
}
```

Figure10: Ultrasonic sensor interfacing

```
while (Serial.available()){
delay(9);
char c = Serial.read();
voice += c; //voice = voice + c
}
if (voice.length() > 0) {
Serial.println(voice);
}
```

Figure11: Code for string processing

```
if(voice == "let's move") {front();}
else if(voice == "back"){back();}
else if(voice == "right"){right();}
else if(voice == "left"){left();}
else if(voice == "stop"){stop_please();}
```

Figure12: Code for voice command execution

```
//-----Automation concept-----//
else if(voice == "light on")
{digitalWrite(9, HIGH);}
else if(voice == "horn please")
{digitalWrite(8, HIGH);}
else if(voice == "light off")
{digitalWrite(9, LOW);}
else if(voice == "stop horn")
{digitalWrite(8, LOW);}
```

Figure13: Code for automation concept

X. SYSTEM MODELLING

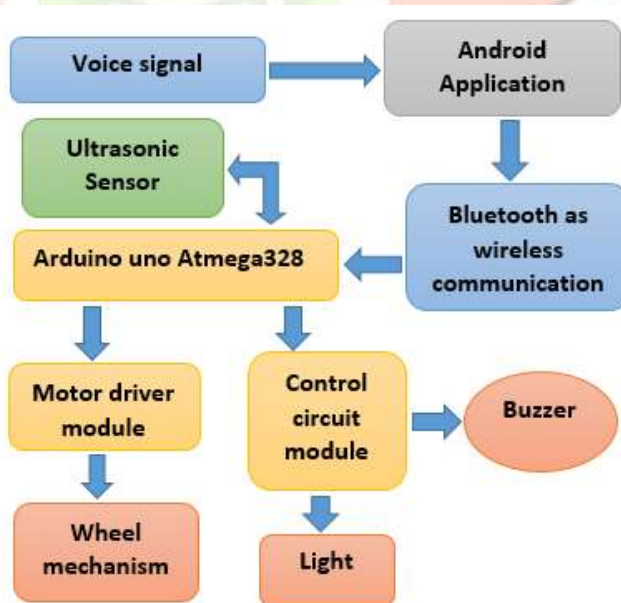


Figure 15: System Modelling

System Modelling demonstrates an overall mechanism of our proposed Methodology. Figure 15 depict the different section of our project which includes two main thing these are an android application and a robot having wheel mechanism, light and buzzer. The wireless communication setup in this methodology is serial communication in which one bit at a time is transmitted and can be processed by controller which creates the platform for implementation of our proposed system.

XI. HARDWARE IMPLEMENTATION



Figure 16: Hardware Testing



Figure 17: Hardware Implementation

XII. CONCLUSION WITH FUTURE WORK

Voice recognition robot is a technology that deals with the operations based on predefined voice command. A real time obstacles detection and avoidance mechanism has been achieved by using ultrasonic sensor and also the concept of automation is demonstrated with the operation of lighting and horn mechanism of robot with voice command. This technique also be enhanced by applying surveillance camera with raspberry pi and broadcasting of real-time video through an internet and assessed by web server. This approach is helpful for disable person, surveillance system as well as industrial robot for performing any task.

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