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Obstacle Avoiding Voice Controlled Bluetooth Car Using Arduino

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ABSTRACT: This paper is aimed on designing a flexible and cost-effective wireless automation system using Arduino. The Bluetooth module is used to detect the command given by the user. Then the data is transmitted to the Arduino through the Bluetooth module and after processing the input given by the user the relevant action is done in the vehicle by the use of the driver module which controls the wheels and thus the movement of the vehicle appears.

KEYWORDS: Arduino Uno R3, Bluetooth module, obstacle detection

I. INTRODUCTION

Today, science and technology has improved a lot. It has its major impact in communication which has allowed better social interactions. The invention of devices like mobile phones and computers has influenced the lives of many people. The rise in technology has caused dramatic decrease in the death rate. Vehicle automation has developed drastically with the development in technology. Vehicle automation is the control of vehicle. It decreases the mechanical stress. In olden days, the physically challenged people need others to help for their movement and in case of absence of others they can't be able to do anything. Traditional wheel chair used also need others help for people without hands.

This paper deals with designing a smart way of automation in the vehicle which helps in the movements of the disabled person without the help of others. Through this system, only the voice of the user to control the entire vehicle movement is used. We use mobile phones to recognize the voice of the user and transmit the data to the Arduino board which plays a major part in the vehicle automation through a Bluetooth module. Arduino is an 8 bit micro controller based on AT mega 328. Arduino is a standalone and an open source. It does not need to write tons of programs to work with Arduino. It is user friendly with 1414 digital I/O pins, 6 analog inputs, a 16 MHz ceramic resonator, a USB connector, a power jack, an ISCP header, a RESET button and supports microcontroller. It is connected to the computer by the use of an USB cable. Here, a Bluetooth module for communication is used.

The advantage of using the Bluetooth module is that it is compatible with most of the phones. But it also has its own disadvantage that it has lower range of connectivity. It covers about several meters only.

II. LITERATURE SURVEY

Speech recognition technology for conversion of speech into text is implemented to help the people who are handicapped and cannot drive their own vehicle [1]. In future, they can drive their own vehicle safely from sudden hit-and-run cases due to automatic braking or slow down feature. An Arduino interfacing with Bluetooth module is to provide the communication channel with device through which we will give the voice commands. For the circuitry, programmed Arduino will give control over the motors that use to run the robotic vehicle. Ultrasonic sensors interfaced with Arduino help in automatic slowdown or braking of a vehicle on sudden obstacle detection, and after a delay, it will help in the avoidance of the obstacle.

Real time obstacle detection and obstacle avoidance are the two major issues in a robotic car. A system structure in which a robotic car with user control and automatic mode is proposed [2]. The robot has many hardware components and software component. The robot and android device communicate with each other through Bluetooth technology.

A robot which operates on the voice input and evacuate the human presence over specified area via voice command is proposed [3]. The voice control technique consists of an Android app which communicates with the robot via Bluetooth module. The robot will also detect the obstacle and notifies the user to avoid the obstacle.

Controlling of machineries using speech recognition through the conversion of speech to text was not possible earlier. This technology is used by the handicapped ones who cannot drive the vehicle on their own [4]. The use of sensors will provide greater safety from sudden hits due to the auto braking system and slow down feature.

This paper uses an efficient recognition method of controlling a robotic vehicle through connected speech input [5]. The speech recognizer platform uses an Android smart phone which communicates with the robot using Bluetooth Connectivity. The robot also detects obstacles and informs the user to use a different command. This technique is useful for applications such as assistive robots for people with disabilities or in industrial applications such as work robots.

Android mobile phone controlled Bluetooth robot using Arduino and obstacle detection is presented [6]. The robot controlling devices are connected to the Arduino board which transmits signals to the interfacing board L293D and controls the motor driving system. IR sensor is used for obstacle detection.

III. SYSTEM DESIGN

The overall design of the system is explained through the block diagram shown below. It describes all the components needed to implement a system. Figure 1 shows the block diagram of Obstacle avoiding Voice controlled system.

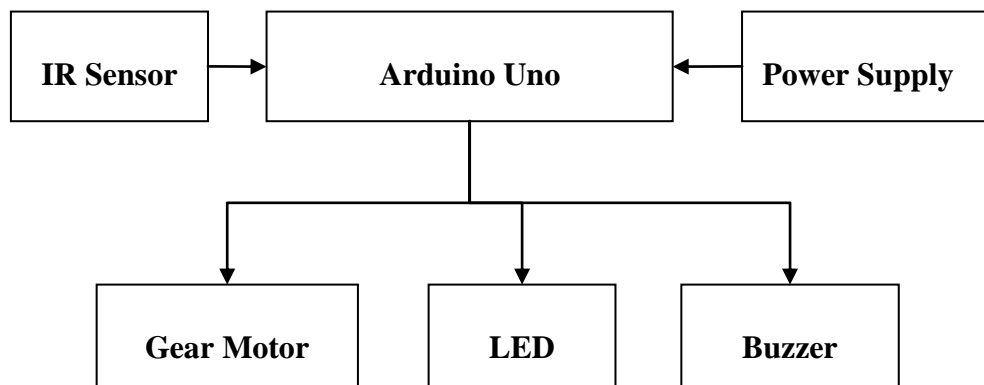


Figure 1 Block Diagram of Obstacle avoiding Voice controlled system

The Arduino Uno is a microcontroller board built on the ATmega328. It has 14 digital I/O pins (6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and can be connected to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno does not use FRDI USB-to -serial driver chip unlike other boards. Figure 2 below shows the pin diagram of Arduino Uno R3.

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module. It is intended for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration in wireless communication. This serial port Bluetooth module has a fully capable Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and Adaptive Frequency Hopping Feature. The Bluetooth module HC-05 is a MASTER/SLAVE module.

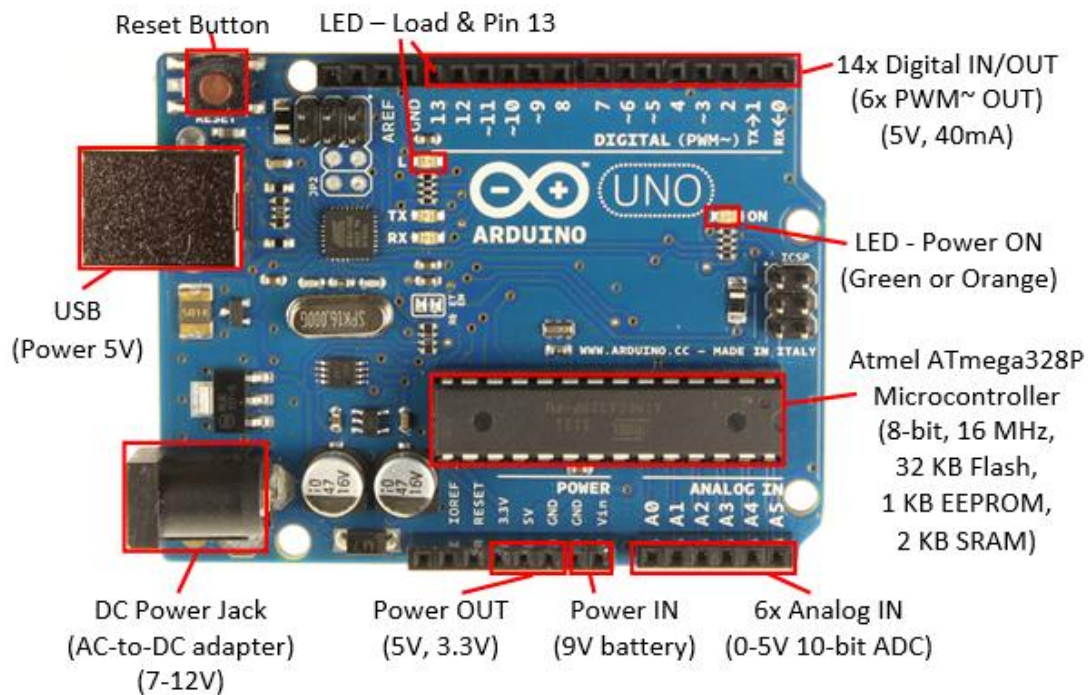


Figure 2 Pin diagram of Arduino Uno R3

BLUETOOTH MODULE - HC-05 Module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. Figure 3 below shows HC-05 Bluetooth Module.



Figure 3 HC-05 Bluetooth Module

INTERFACING HC-05 WITH ARDUINO

V_{cc} and GND of the module is connected to the V_{cc} and GND of Arduino. The TXD pin is connected to RXD pin of Arduino and RXD pin connects to TXD pin of Arduino i.e. digital pin 0 and 1. The user can use the on board LED. But here, LED is connected to digital pin 12 externally for betterment of the process. Figure 4 below shows the Interfacing of HC-05 Module with Arduino.

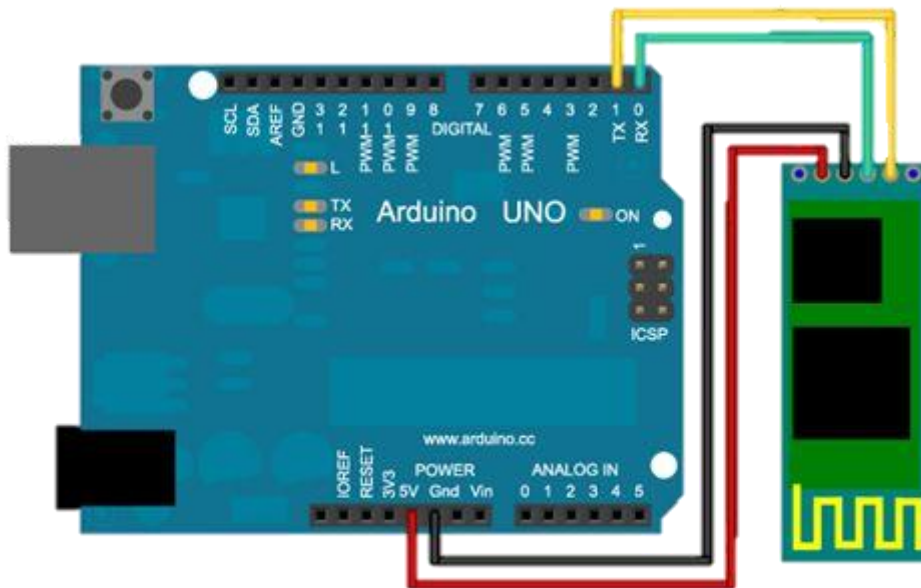


Figure 4 Interfacing HC-05 Module with Arduino

SOFTWARE DESCRIPTION

- Slave default Baud rate: 9600, Data bits: 8, Stop bit: 1 Parity: No parity.
- Auto-connect to the last device on power as default.
- Permit pairing device to connect as default.
- Auto-pairing PINCODE: "1234" as default.

IV. L298n MOTOR DRIVER

This module is based on the very popular L298n Dual H-Bridge Motor Driver Integrated Circuit. The circuit allows to easily and individually control two motors of up to 2A each in both directions. It is ultimate for robotic applications and appropriate for linking a microcontroller to necessitate just a couple of control lines per motor. It can also be interfaced with simple manual switches, TTL logic gates, relays, etc. The features of L298n Dual H-Bridge Motor Driver includes

- Motor supply: 7 to 24 VDC
- Control Logic: Standard TTL Logic Level
- Enable and Direction Control Pins
- Heatsink for IC
- Power-On LED indicator
- 4 Direction LED indicators

The L298 is an integrated monolithic circuit in a 15- lead Multi Watt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver intended for normal TTL logic levels. It drives inductive loads such as relays, solenoids, DC and stepping motors. The inputs enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are coupled together and the corresponding external terminal can be used for linking of an external sensing resistor. An additional supply input is provided so that the logic works at a lower voltage.

V.DC GEAR MOTORS

A DC motor is a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common type rely on the forces produced by magnetic fields. All types of DC motors have either electromechanical or electronic mechanism, to periodically change the direction of current flow of the motor. DC

motors were the first type widely used. They could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The [universal motor](#) can operate on direct current but is a lightweight motor used for portable power tools and appliances.

A gear motor adds mechanical gears to alter the speed/torque of the motor for an application. Usually such an addition is to reduce speed and increase torque. A DC motor without gears is useful in many applications.

VI.RESULTS AND DISCUSSION

Figure 5 below shows the hardware setup of Obstacle avoiding Voice controlled Bluetooth car using Arduino. Through this system, only the voice of the user to control the entire vehicle movement is used. Mobile phone is used to recognize the voice of the user and transmit the data to the Arduino board which plays a major part in the vehicle automation through a Bluetooth module.

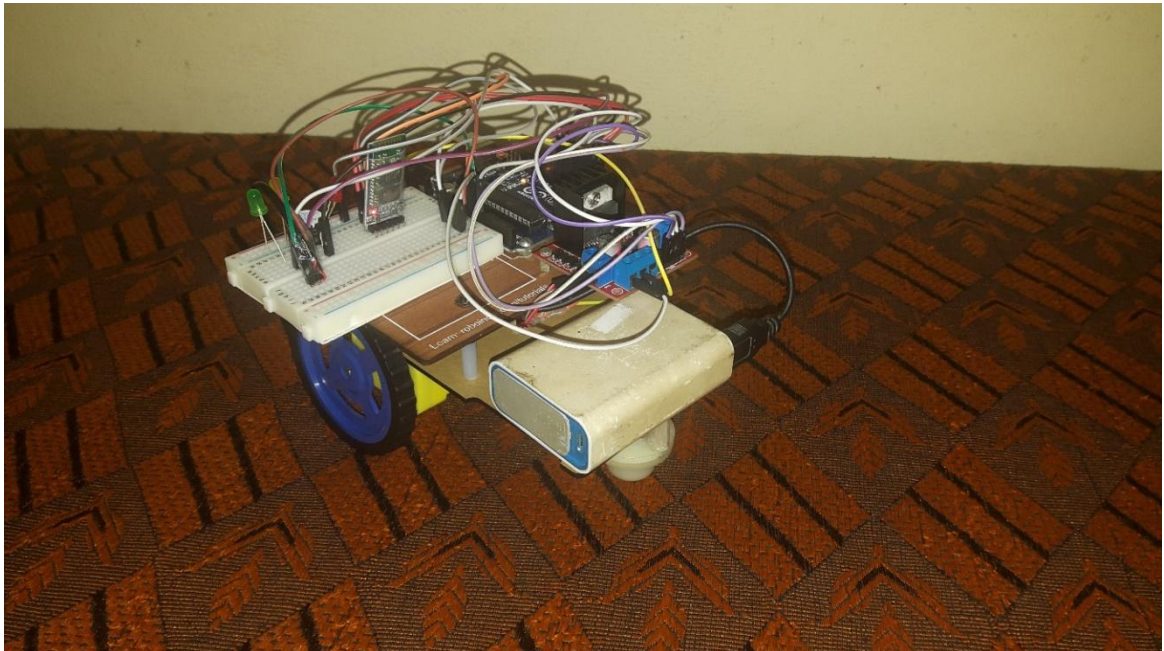


Figure 5 Hardware Setup

VII.CONCLUSION

In this paper an obstacle avoiding voice controlled Bluetooth car using Arduino is implemented. This works on the voice command of the person whose voice is been observed and transferred by a mobile through Bluetooth connection. The vehicle automatically stops while the obstacle is detected and again it function as per the command given.

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