DEVELOPMENT OF A VOICE-ACTIVATED ROBOTIC VEHICLE FOR AUTOMATED NAVIGATION

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ABSTRACT
The goal of this project is to use voice instructions sent via an Android application on a smartphone to operate a robotic vehicle. Bluetooth technology facilitates the wireless communication link created between the car and the Android app. This voice-controlled robotic vehicle was built primarily to analyse human speech and respond to preprogrammed orders. Here, the most fundamental orders are stop, turn right, turn left, forward, and reverse. The car will be operated wirelessly using Android smartphone technology, which is quite easy to use and, from an economic standpoint, highly viable or inexpensive.
The Arduino Uno development board will be used to build the primary processing unit, and commands will be digitalised with the aid of a Bluetooth device that is interfaced with the processor. Two DC motors will be used to build the moving mechanism, and each motor will be operated separately by a motor driving circuit that uses a H Bridge IC. The Bluetooth RF transmitter transforms the orders sent from the Android application via the phone microphone into digital signals, with a range of around 50 feet.

I. INTRODUCTION

1.1 Introduction

The goal of the project work outlined in the abstract is to create a robot car that a human may operate using voice commands. These systems are typically referred to as Speech Controlled Automation Systems (SCAS). Since this is a prototype module, a rudimentary robotic vehicle will be built to demonstrate the fundamentals of voice-controlled machine technology, even though sophisticated robots are used in this sector for a variety of purposes. This little gadget was created with the intention of implementing voice-activated control action in a machine. There are several themes based on voice-controlled devices that create a communication link between a mechanism and a smartphone, and the robot may be controlled remotely by a mobile phone.
An excellent interface for controlling the robot remotely is a smartphone. Numerous useful features are included in it. An Android application is utilised in this design to accomplish the necessary duty. Using Bluetooth technology, the application and robot link to make the control process easier. The module will receive the commands after they are transmitted via the channel. Voice-controlled robotic vehicles (VCRVs) are designed to listen to user orders and respond accordingly. In this case, accent training is necessary for the system to begin comprehending voice instructions, which are codes that have been added.
The primary goal of building a VCRV is to interpret human speech and respond to preprogrammed orders. The most fundamental voice commands are stop, right, left, forward, and reverse. An Android smartphone is to be used for wireless control of the vehicle. The project's objective is to create a robotic car using cutting-edge smartphone technology in a straightforward and cost-effective manner. Currently, the person operating the vehicle controls all aspects of the vehicle manually. However, voice-controlled real-time vehicles may soon overtake traditional cars in the near future. Voice control technology will be used for all vehicle functions, including starting, stopping, speeding up, accelerating, applying brakes, shifting gears, controlling the lighting system, turning on and off the wipers, and more.
Intelligent logic circuits can now execute all harmful duties more effectively than humans thanks to the development of new technology. Although these robots were first operated manually, they may now be operated using gestures and voice commands. The interaction between a computer and a human voice may be used to describe voice recognition technology.
This creates the communication channel between humans and technology. The goal of this effort is to simplify the controlling system and improve the robot's overall security. An sophisticated mobile phone is used to manage the spoken directions. Several tests are used to determine the feasibility of the voice control sent over a separation.
Consumer electronics have advanced significantly during the last ten years. The idea of a smart house will be realised via a number of "intelligent" gadgets,

including air conditioners, cell phones, home theatres, and security systems.

1.2 Block Diagram

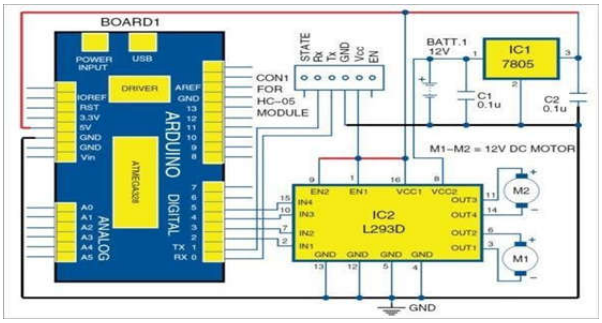


Figure: Block Diagram of Voice Controlled Robotic Vehicle using Smart Phone

1. The Arduino is the heart of the system, hear an Arduino UNO R3 is used in this project, It is used for processing the data and provides necessary actions needed.

2. 3-Terminal 1A Positive Voltage Regulator which is making them useful in a wide range of applications.

3. There are two dual channel L293D motor driver to drive the motors for the conveyor belt.

II. DESIGN OF HARDWARE

This chapter briefly explains about the Hardware. It discuss the circuit diagram of each module in detail.

ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 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 a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Arduino board has the following new features:

- 1.0 pin out: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

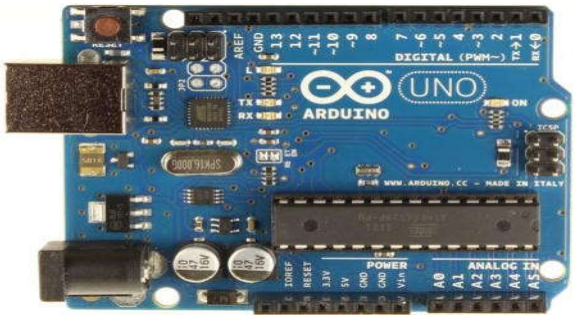


Fig: ARDUINO UNO

POWER SUPPLY:

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as "Regulated D.C Power Supply".

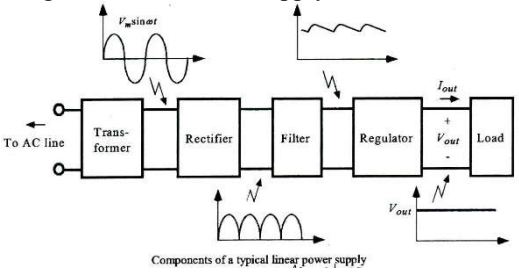


Fig: Block Diagram of Power Supply

HC 05 BLUETOOTH MODULE

This project work consists of two main modules: the android mobile phone and the micro controller with BT board (Bluetooth module). The android mobile phone consists of several Bluetooth apps which enable the user to access the devices by which any device weather it is an electronic circuit or electric machine can be controlled through the android app.The Bluetooth device makes it possible for us to control robot remotely, while smart phone makes it possible for us to control the robot in the visual interface. The android platform includes support for the Bluetooth network stack, which allows a device to wire lessly exchange data with other Bluetooth devices.

The application framework provides access to the Bluetooth functionality through the android Bluetooth APIs. In recent years, the blue-tooth app has become cheap and it is easy to carry and operate and it has more applications in field. Bluetooth uses a low-

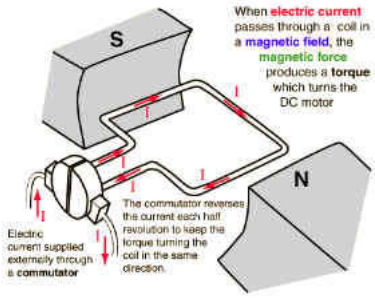
power signal with a maximum range of 50 feet with sufficient speed to enable transmission of data between mobile and the vehicle.

L293D:

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo- Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

DC MOTOR

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearin motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source -- so they are not purely DC machines in a strict sense.



III. CIRCUIT CONNECTIONS AND RESULT

Circuit Diagram

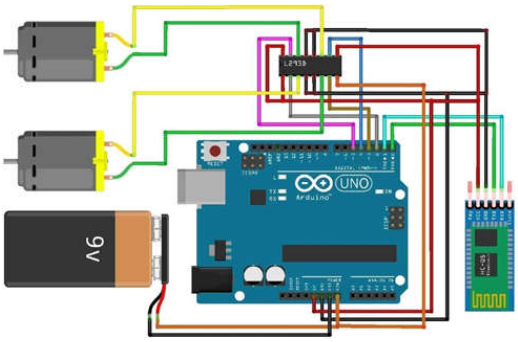


Figure : Circuit Diagram

The controlling device may be any android based Smartphone/tab etc having an android OS. The android controlling system provides a good interactive GUI that makes it easy for the user to control the vehicle. The transmitter uses an android application required for transmitting the data.The receiver end reads these commands and interprets them into controlling the robotic vehicle. The android device sends commands to move the vehicle in forward, backward, right and left directions. After receiving the commands, the Arduino then operates the motors I order to move the vehicle in four directions. The communication between android device and receiver is sent as serial communication data. The Arduino program is designed to move the motor through a motor driver IC as per the commands sent by android device.

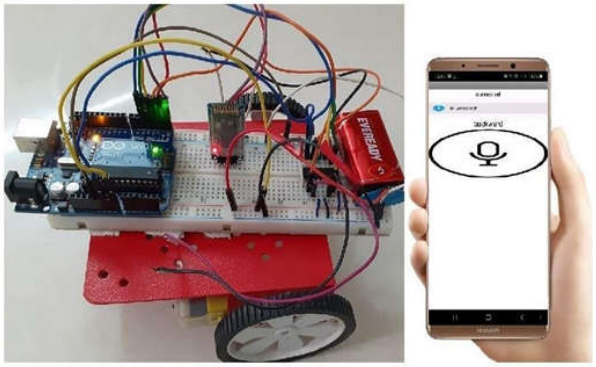


Figure : voice controlled robotic vehicle

Advantages

1. It is easy to use.
2. It work on simple voice command.
3. The size of this robot is small.
4. It is user friendly.
5. It reduce man power.
6. Low power consumption.
7. Reliable, low cost.
8. Accident can be also avoided by using this robot.

APPLICATIONS

1. The robot is useful in places where humans find difficult to reach but human voice reach. Such asin fire situations, in highly toxic areas.

2. The robot can be used for monitoring or investigation.
3. The voice controlled robotic car can be easily drive by unskilled driver by using voice commands with the help of android application in smart phone.

IV. CONCLUSION AND FUTURE SCOPE

Conclusion

The voice-activated robot is a simple software-programmable project. This prototype used an Android application and human voice commands. This robot is advantageous to human existence since it is simple to implement. The Voice Control Robot is helpful for monitoring and for disabled individuals. It is easy to use because it operates with basic voice commands. It is helpful in places that are inaccessible to people. This robot can have a webcam installed for security reasons. The speech recognition software is quite sensitive to background noise and can distinguish spoken commands with an accuracy of 76%.

Future Scope

Beneficial for security systems that use voice recognition.
1. Beneficial for military applications.
2. It is possible to construct an automatic target system.
3. This robot is helpful in places that are inaccessible to people, such as situations that are extremely hazardous or in the event of a fire.
4. The robot's range may be increased by utilising other technologies, such as GPS or Zigbee.
5. The robot may be used for monitoring.

REFERENCES

Arduino based voice controlled robot – IEEE Xplore - by A Chaudhry – 2019
Cited by 3 — 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.
Date Added to IEEE Xplore: 30 January 2020
DOI: 10.1109/ICCCIS48478.2019.8974532
Date of Conference: 18-19 Oct. 2019
• https://www.javatpoint.com/arduino-uno
• https://www.farnell.com/datasheets/1682209.pdf
•https://docs.arduino.cc/resources/datasheets/A000066-datasheet.pdf
•http://www.handsontec.com/dataspecs/L298N%20Motor%20Driver.pdf
• https://lastminuteengineers.com/l298n-dc-stepper-driver-arduino-tutorial/
• https://www.google.com/search?q=arduino+uno&oq=arduino+uno&aqs=chrome.0.69i59.3565j0j1&sourceid=chrome&ie=UTF-8
• https://www.maxbotix.com/articles/how-ultrasonic-sensors-work.htm
• https://www.cuidevices.com/blog/the-basics-of-ultrasonic-sensors
• https://www.google.com/search?q=ultrasonic+sensor&oq=ultrasonic+sensor&aqs=chrome..69i57j69i59l2.10036j0j1&sourceid=chrome&ie=UTF-8
• https://islproducts.com/design-note/dc-motor-dc-gear-motor-basics/
• https://www.engineersgarage.com/insight-how-geared-dc-motor-works/
• https://www.engineersgarage.com/insight-how-geared-dc-motor-works/
• https://www.powerelectric.com/motor-resources/motors101/what-are-gear-motors-used-for
• https://www.esa-automation.com/en/gearmotors-types-and-industrial-applicationsgearmotors-types-and-industrial-applications/
• https://www.instructables.com/Tutorial-for-MD-L298-Motor-Driver-Module/
• https://components101.com/misc/buzzer-pinout-working-datasheet
• https://www.pcboard.ca/leds-and-led-ribbon/leds/5mm-leds/5mm-super-bright-red.html
• https://www.make-it.ca/5mm-led-specifications/
•https://web.archive.org/web/20220814210801/https://blog.tentree.com/10-benefits-of-cleaning-up-your-local-beach/
• https://theoceancleanup.com/rivers/