VOICE CONTROL CAR USING MACHINE LEARNING

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ABSTRACT

The "Voice-Controlled Car Using Machine Learning" project aims to create an innovative and user- friendly vehicle control system by integrating machine learning technology. This system provides a hands-free driving experience, making it safer and more convenient for drivers. The project involves developing a smart car prototype equipped with various sensors and microcontrollers. Machine learning algorithms are implemented to recognize voice commands and translate them into specific actions for the vehicle, such as accelerating, braking, turning, and even parking. The core components of the system include a speech recognition module, a control interface, and a real-time data processing unit. The project not only demonstrates the potential of machine learning in the automotive industry but also promotes a more accessible and user-centric approach to vehicular control.
Keywords: “Speech Recognition”, command interpretation”, audio processing”, Wake word Detection”.

1. INTRODUCTION

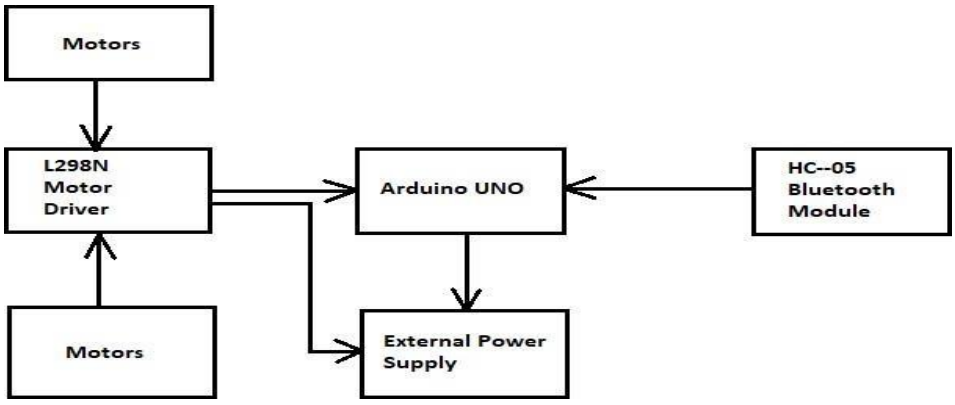
In the age of smart technology, the integration of voice commands into everyday devices has revolutionized human-machine interaction. From virtual assistants to smart home appliances, the convenience of controlling devices through voice commands has become a hallmark of modern innovation. Inspired by this trend, our project seeks to bring the power of voice control to the realm of robotics, specifically in the form of a voice-controlled car. In this project, we will delve into the intricacies of designing and building a voice-controlled car using Arduino as the central control unit. Through a series of carefully crafted components and programming logic, we will enable the car to respond to a variety of voice commands, allowing users to dictate its movements with simple vocal instructions. Optimize the system for resource efficiency, considering computational requirements for real-time processing. Ensure user safety by incorporating fail-safes and accurate execution of commands related to driving functions. Provide user-friendly feedback mechanisms, such as voice prompts, to enhance the overall user experience. These goals and objectives collectively aim to create a reliable, responsive, and user-friendly voice-controlled car using machine learning.

2. SYSTEM DESCRIPTION

This project describes the implementation of a voice-controlled robotic car using Arduino. In this project, the user gives specific voice commands to the robot through an Android app installed on the smart phone. At the receiving side, a Bluetooth transceiver module receives the commands and forwards them to the Arduino on the robotic car. 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.

3. FUNCTIONAL BLOCK DIAGRAM

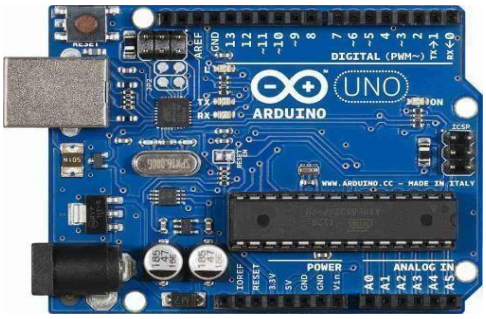
Given below is the block diagram for the overall connections between the different components used in making the autonomous voice-controlled car. The L298N module is used to control the rotation of the motors on both sides of the car. The HC-05 module captures the voice instructions which passes onto the L298N module via Arduino and the required operation is thus performed.



4. HARDWARE SYSTEM:

Arduino UNO:

The Arduino Uno is an open-source microcontroller board based on the Microchip Atmega 328P microcontroller. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino nano and Leonardo.



HC-05 Bluetooth Module:

HC-05 module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.

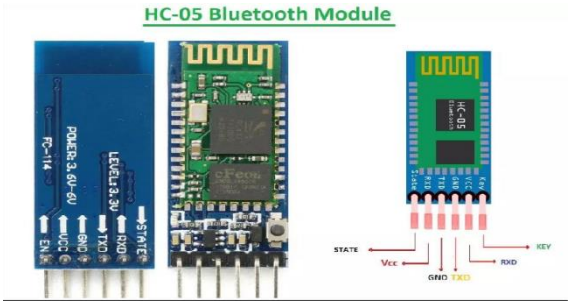


Fig: HC-05 Bluetooth Module

C: L293D motor driver shield

The L298N is an integrated monolithic circuit in a 15- lead Multiwatt and PowerSO20 packages. It is a high voltage, high current dual full-bridge de-signed to accept standard TTL logic level sand drive inductive loads such as relays, solenoids, DC and stepping motors.

Fig: : L293D Motor Driver

D: Ultrasonic Sensor:

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect across boundaries to produce distinct echo patterns.

E. Servo Motor:

A servo motor is a type of electric motor that can rotate or move to a specific position, speed, or torque based on an input signal from a controller. It consists of a suitable motor coupled to a sensor for position feedback and a controller that regulates the motor's movement according to a desired setpoint.

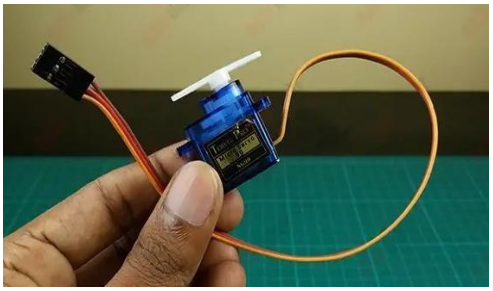


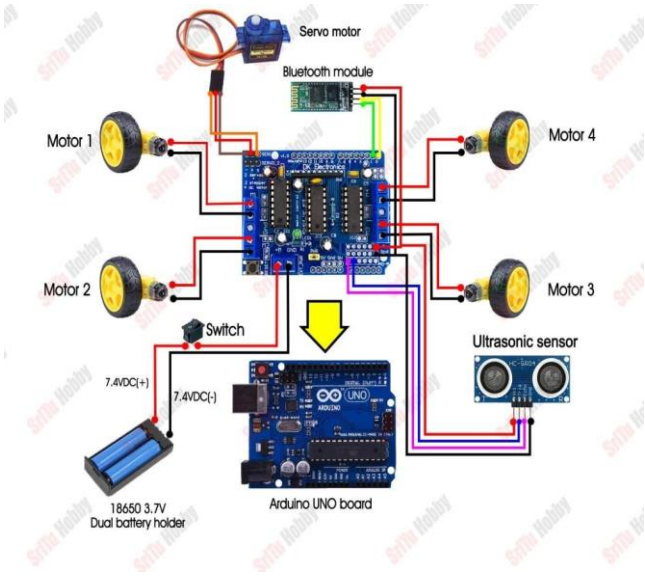
Fig:Servo Motor

5. OPERATION

This project describes the implementation of a voice-controlled robotic car using Arduino. In this project, the user gives specific voice commands to the robot through an Android app installed on the smart phone. At the receiving side, a Bluetooth transceiver module receives the commands and forwards them to the Arduino on the robotic car. 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. Text received via Bluetooth is forwarded to Arduino Uno board using UART serial communication protocol.

Arduino program voice control checks the text received and, if it is a matching string, Arduino controls the movements of the robot accordingly. HC-05 module is an easy-to-use Bluetooth Serial Port Protocol (SPP) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module has a fully-qualified Bluetooth V2.0+EDR (enhanced data rate) 3Mbps modulation with complete

2.4GHz radio transceiver and baseband. Pin description. HC-05 Bluetooth module has six pins, as detailed below.Enable. When enable is pulled low, the module is disabled. This means the module will not turn on and will fail to communicate. When enable is left open or connected to 3.3V, the module is enabled, that is, it will remain on and communication will also take place.



6. CONCLUSION

The robotics is becoming more reliable and adopting many new methods as well as development. In this paper development of a prototype is presented although a lot more further future developments and researches are needed to make the developed robot into a complete product for consumers. Commercial production of this robot can be possible of following future researches and updates can be done for more improvement of the robot. The developed robot are able to move in any direction according to the voice command received from the user by android phone and bluetooth .Voice commands has able to control the robot to move forward, backward, left and right. There is a voice command "Autonomous" which can instantly make the robot to move fully automatically without hitting any obstacle using ultrasonic sensor. Instant stopping of the robot from any kind of movement can be done by the voice command "Stop" at any time. The developed robot has ability to interact with its user using the prerecorded human voice file. For each command, different individual response's audio files are recorded and stored as wav files on SD card. When user will command any instruction the robot will generate the related human voice as response on amplifier from micro SD card. Further future development can be conducted by developing a system which will be able to receive voice command through direct voice recognition hardware to recognize the voice command and no android app will be needed for controlling the robot. The developed device used prerecorded human voice sound to communicate with user but artificial intelligence implemented for interception purpose so that the robot will be able to interact more appropriately by analyzing the testing environment and user's behaviors.

7. REFRENCES

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