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Voice Controlled Wheel Chair Using Bluetooth Module

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Abstract -The integration of voice recognition technology and robotics offers a user-friendly and intuitive way to interact with robots. The project utilizes a microcontroller, a Bluetooth module, and various sensors and actuators to build a functional robot. The microcontroller acts as the brain of the robot, processing voice commands received via the using a Bluetooth module to adjust the robot's movement and actions. To implement the voice control feature, the project employs a speech recognition algorithm that analyzes the voice input and converts it into digital commands. These commands are then transmitted via Bluetooth to the robot, which interprets them and performs the corresponding actions. The robot's movements can include forward, backward, left, and right, as well as other specific actions like picking up objects or turning on/off devices. Furthermore, the project incorporates different sensors to enhance the robot's functionality. For instance, obstacle detection sensors can be used to help the robot avoid obstacles in its path, ensuring safe navigation. Additionally, the robot can be equipped with sensors such as temperature sensors, gas sensors, or light sensors to enable it to perform specific tasks based on the environmental conditions. Numerous possible uses for the voice-controlled robot exist, including home automation, monitoring, and support for persons with impairments.. By utilizing voice commands, users can conveniently control the robot from a distance, eliminating the need for physical interaction.

***Key Words*:** Android, Arduino, Microcontroller, Bluetooth, Wireless Robot, Voice Recognition, DC motor.

1. INTRODUCTION

The "Voice Controlled Robot Using Bluetooth Module" project aims to develop a robot that can be controlled wirelessly through voice commands using a Bluetooth module. The project combines various technologies, including microcontrollers, Bluetooth modules, and sensors, to build a functional and intelligent robot. The main goal of the project is to create a speech recognition system that accurately understands and recognises human requests. The robot can understand the digital commands that are created after the voice recognition system analyses the user's vocal input.. By incorporating a Bluetooth module, the project enables wireless communication between the robot and the user, eliminating the need for wired connections. The project's secondary objective is to enhance the robot's functionality by incorporating various sensors, such as obstacle detection sensors, temperature sensors, gas sensors, and light sensors. These sensors enable the robot to navigate its environment safely and perform specific tasks based on environmental conditions. The "Voice Controlled Robot Using Bluetooth Module" project offers several potential applications, including home automation, surveillance, and assistance for people with disabilities. By utilizing voice commands, users can conveniently control the robot from a distance, making it accessible to a wider range of users.

2. LITERATURE SURVEY

Ijret claims that The ARM Processor LPC2138 is used in the paper on "Voice Operated Intelligent Wheelchair" to control the movement of the

wheelchair by regulating the DC motors. Matlab software is utilised for input signal processing. Using headphones, input is sent to Matlab, and the controller will determine how the two DC motors in the "Challenged Using Arduino" project are operated.

Using voice commands to control a wheelchair's speed The Arduino receives physical input before using vocal commands to control the movements of a wheelchair. The various input techniques are switched between using a switch. Based on the input signal received from any one of the input ways, the Arduino regulates the motion of the wheelchair. Two DC motors are used to move the wheelchair.

Input is provided to IC HM2007 in another work published by ijret. The HM 2007 IC is utilised for voice recognition. The output signal from HM 2007 is supplied to a microcontroller that controls the motion of the wheelchair according on the input received from the user. The wheelchair's motion is controlled by two DC motors. HM 2007 provides greater accuracy.

3. PROPOSED METHOD

The block diagram of the Voice Control Robot (VCR) system showcases the components and their interconnections in order to control the motion of a wheelchair using voice commands. The system utilizes readily available components from the market, making it accessible and feasible for implementation.

At the core of the design is the Arduino microcontroller, which serves as the central processing unit for receiving and interpreting voice commands. The Arduino microcontroller is programmed to understand and respond to specific voice instructions, allowing for seamless control of the wheelchair.

To convert human voice into electrical signals that can be understood by the robot, a speech recognition circuit is employed. This circuit acts as an interface between the user's voice and the Arduino microcontroller, translating spoken commands into actionable signals.

The system offers four primary motion conditions: moving forward, moving in reverse, moving to the left, and moving to the right. Additionally, the user can specify the desired speed of the wheelchair, choosing between slow or fast.

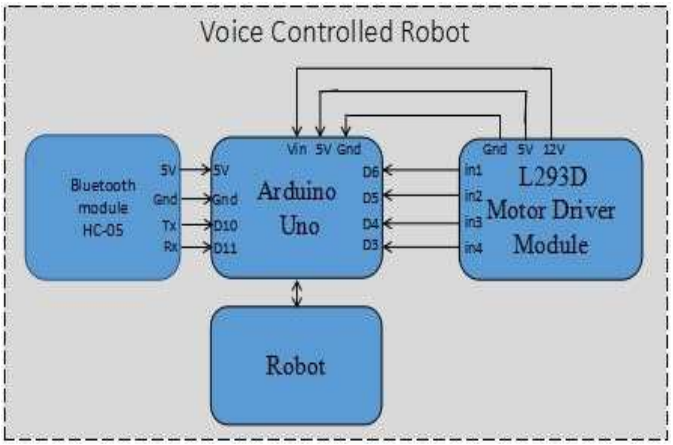
To initiate the system, a supply voltage is applied to the speech recognition circuit, powering the entire setup. When the user gives a command for fast motion, the system supplies a higher current to the motors, resulting in increased speed.

On the other hand, if the user prefers the wheelchair to move at a slower speed, a command for slow motion can be issued, causing the system to apply a low current supply to the motors.

Based on the received voice commands and the specified speed, the Arduino microcontroller generates appropriate signals to control the wheelchair's motion. The directions of the wheelchair include moving forward (both motors in the forward direction), moving in reverse (both motors in the reverse direction), turning left (left motor stopped, right motor in forward direction), turning right (right motor stopped, left motor in forward direction), or stopping (both motors are halted).

By leveraging the natural and frequent use of human voice for communication, the Voice Control Robot (VCR) system provides an intuitive and user-friendly method for controlling the motion of a wheelchair. Its block diagram showcases the integration of components and their functions, facilitating a seamless interaction between the user and the robotic wheelchair.

3.1 BLOCKDIAGRAM



The primary goal of the design is to regulate the wheelchair's motion. Moving forward, moving backwards, moving to the left, and moving to the right are the four conditions of motion that are taken into consideration. The user can choose between the commands for slow and fast speed.

The speech recognition circuit receives a supply voltage when the system first turns on. The mechanism will provide the motors a higher current when things move quickly.

If the user wants the wheelchair to move at a slower speed, the slow speed command can be set by giving the motors a low current supply.

The following list outlines the possible movements and wheel chair directions.

Both motors are set to forward motion. Both motors are operating in reverse.

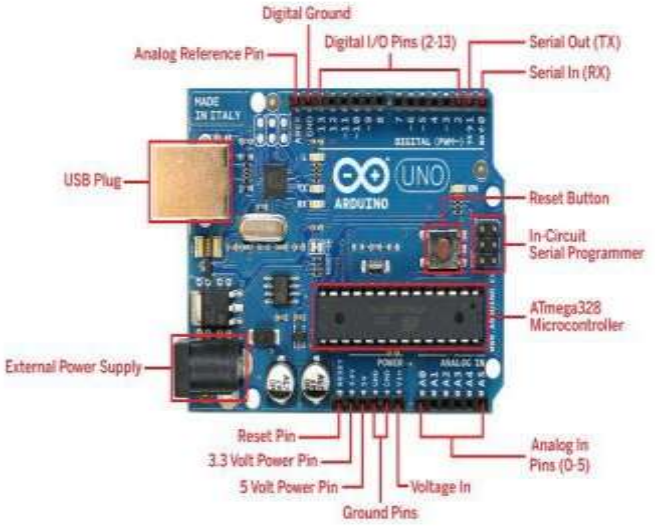
Left: Right motor moving forward while the left motor has halted.

Right: Left motor moving forward while right motor halted.

Both motors have come to an end.

3.2 ARDUINO UNO BOARD

Arduino is an open-source electronic prototyping platform used for microcontroller-based projects. The Arduino Uno, a popular board, has 14 digital I/O pins for connecting and controlling digital components, and 6 analog I/O pins for measuring analog signals and generating analog outputs. It offers a user-friendly interface and is widely used by makers and professionals for a variety of applications.



Arduino Uno Board

3.3. HC-05 BLUETOOTH MODULE

The HC-05 module is a compact Bluetooth serial port module designed specifically for wireless serial connections. With its small size measuring around 3 cm in length and operating on 3.3V power with 3.3V signal levels, it simplifies the overall design process and is compatible with Arduino and other microcomputers. This versatility makes it ideal for various applications. The HC-05 module offers both Master and Slave modes of operation, providing flexibility for different scenarios.

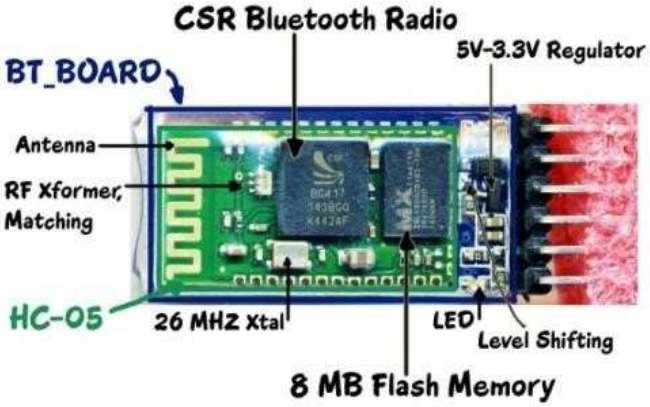
Typically, the HC-05 modules are soldered onto larger boards as they do not come with pins. To enhance usability, breakout boards are recommended, as they provide convenient interfaces for these sub-modules. These breakout boards mount the HC-05 module on a slightly larger board, making it easier to integrate into projects.

The HC-05 module operates in two modes: Command Mode and Data Mode. In Command Mode, AT commands can be sent to the module for configuration and control purposes. In Data Mode, the module transmits and receives data to and from other Bluetooth modules, enabling wireless communication between devices.

On the other hand, the L293D motor driver is a specialized integrated circuit that allows bi-directional drive current for two motors. It features 16 pins, with 4 inputs from the microcontroller and 4 output pins to control the motors (2 for each

motor). The L293D motor driver is commonly used in robotics and automation projects, providing a convenient solution for driving motors in both forward and reverse directions.

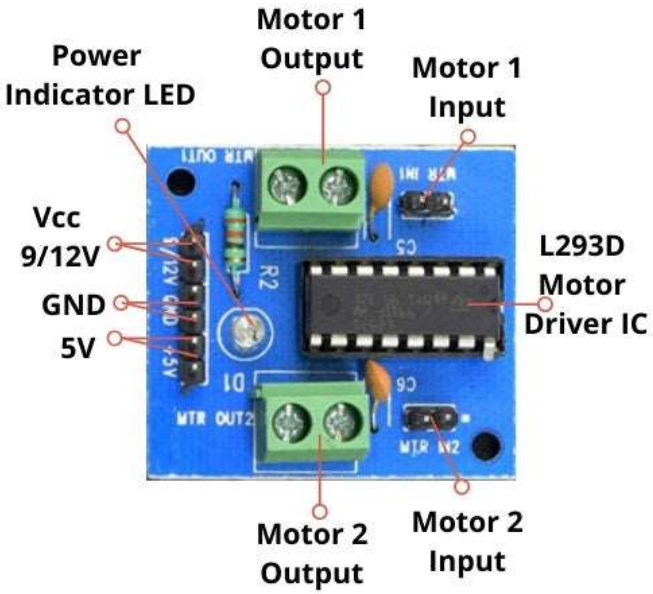
By combining the HC-05 Bluetooth module and the L293D motor driver, you can create more advanced projects that involve wireless control of motors. These components offer a reliable and efficient solution for building Bluetooth-enabled motor control systems



HC-05 Bluetooth Module

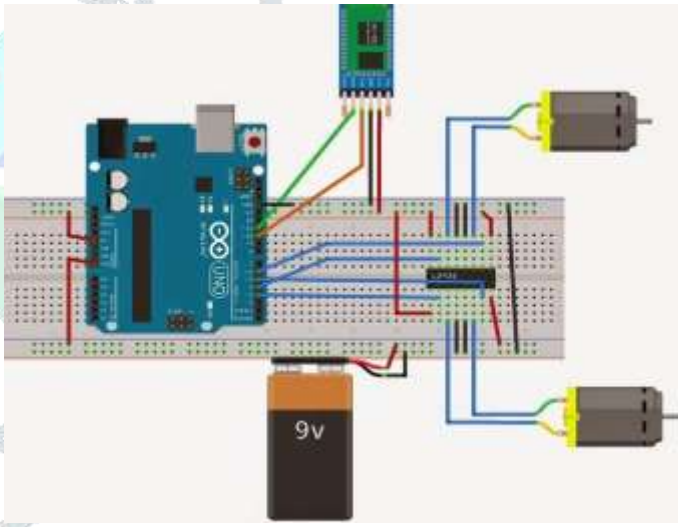
3.4. L293D MOTOR DRIVE

The motor driver is a 16-pin component that enables bi-directional drive current for two motors. It interfaces with the microcontroller through 4 input pins and provides 4 output pins to control the motors (2 pins for each motor). This allows for precise motor control in both forward and reverse directions



L293D Motor Drive

4. CIRCUIT CONNECTION DIAGRAM



Circuit Connections

5. WORKING

Introducing a simplified voice control robot solution! This user-friendly system requires no complex coding or algorithms. By downloading the "BT Voice Control for Arduino" app from the Google Play Store, you gain access to a powerful tool.

The app is designed to convert voice commands into text and seamlessly transfer the text to the connected Bluetooth device. On the Arduino board, a Bluetooth module receives the text as individual

characters and stores them as a string in the assigned memory.

To streamline operation, several pre-programmed words (such as "forward," "reverse," "right," "left," and "stop") are integrated into the Arduino. When the received text matches these predefined words, the Arduino executes the corresponding command assigned to each word.

For monitoring purposes, the Arduino can be connected to a laptop, enabling the visualization of serial communication. This allows you to observe the working process and review the words received through the Bluetooth connection.

With this unique voice control robot solution, you can enjoy the simplicity of easy-to-understand coding, straightforward algorithms, and a convenient Android app for controlling your Arduino-based robot using voice commands

6. RESULT

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Voice Controlled Robotic Vehicle

7. ADVANTAGES

• Empowering the disabled: This voice-controlled robot provides an opportunity for individuals without legs to gain independence by controlling the robot using voice commands.

• Compact and minimal hardware: The system requires less hardware, making it compact and portable, allowing for easy integration into various robotic applications.

• Cost-effective: This solution is economical, as it utilizes readily available component and does not rely on expensive specialized equipment.

• Reduced manpower: With the voice control feature, the need for direct physical interaction or manual control is minimized, reducing the reliance on manpower for operating the robot.

• User-friendly interface: The system offers a user-friendly interface through the Android app, making it accessible and easy to understand for users of different skill levels.

8. DISADVANTAGES

• Noise interference: The system may encounter challenges in noisy environments, as background noise can interfere with accurate voice recognition and command execution.

• 7-segment driver damage: There have been instances of common anode 7-segment drivers getting damaged, which can affect the proper display of numerical information on the robot.

While this unique voice-controlled robot solution offers advantages such as empowering individuals with disabilities, compact hardware, cost-effectiveness, reduced manpower, and user-friendly operation, it is important to consider the potential challenges of noise interference and occasional damage to the 7-segment drivers. These disadvantages can be mitigated through proper noise reduction techniques and careful handling of the hardware components

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9. CONCLUSIONS

The "Voice Controlled Robot Using Bluetooth Module" project presents an innovative solution to the challenge of developing intuitive ways to interact with robots. By incorporating voice recognition technology and wireless communication, the project aims to provide a user-friendly and intuitive method of controlling robots, offering numerous practical applications in various domains.

7. FUTURE SCOPE

It is feasible to make this wheelchair even more advanced by lowering its power requirements or by devising a method of automatically charging the battery while the wheelchair is in motion.

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