Voice Controlled Car Using Arudino-UNO, Bluetooth Module and Ultrasonic sensor

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Abstract - ***In this paper we proposed a system which is to create a vehicle that can be operated by voice commands and an Android application. The movement of vehicle is facilitated by a servo motor located in its head, and it features an obstacle detection system that causes it to stop when an obstacle is encountered. To enable the user to control the vehicle with ease, the Android application provides buttons and voice command options. The proposed system also involves a preliminary session to guide the user on how to use the code to operate the controller efficiently. Overall, the proposed system is designed to offer a convenient and user-friendly way of controlling the vehicle.***

***Key Words*: Arduino UNO, Bluetooth module, Image processing, human-robot interaction, speech recognition, voice commands.**

1.INTRODUCTION

The objective of our system is to create a voice-controlled vehicle, which is commonly known as Speech Controlled Automation System (SCAS). This proposed system is intended in such a way that it can be operated through voice commands. The robot can be remotely controlled via a mobile phone, using an Android application. The Bluetooth technology is used for the connection between the vehicle and the application. The purpose of the voice-controlled vehicle (VCV) is to respond to the commands given by the user. However, before the device can understand the commands, accent training is required, and the codes need to be added to the system. The mobile phone serves as an interface that provides many features to remotely automate the robot.

The main purpose of creating a Voice Controlled Vehicle (VCV) is to enable it to respond to pre-programmed commands that are spoken by a human. The basic commands include moving backward, forward, right, left and stopping the robot. The Voice Controlled Vehicle (VCV) is controlled wirelessly through an Android smartphone, utilizing advanced smartphone technology to create a simple and affordable vehicle. In traditional vehicles, all actions, such as starting and stopping, applying brakes, gear transmission and acceleration, require human intervention. However, with the introduction of new technologies, conventional vehicles can be transformed into a new form of vehicle that can integrate with these advancements. The voice recognition technology has enabled these vehicles to be controlled via voice. Voice recognition technology enables interaction between computers and the human body language, thereby creating a message link between machinery and humanity. The aim of this proposed system is to enhance the overall security of the vehicle and to streamline its control mechanism [1].

The system utilizes a sophisticated smartphone to interpret voice commands, allowing for remote control of a miniature vehicle. Various tests are conducted to evaluate the effectiveness of the voice control, including assessments of its performance over distance. The potential applications of this technology include industries, hospitals, and environmental laboratories [2]. One of the biggest challenges faced globally is providing adequate human labor, but this device can empower individuals to control their own wheelchair using only their voice via Bluetooth. It also has safety features that can detect and act accordingly of any obstacles, as well as alert emergency services in the case of fire or smoke. The proposed system has been developed that incorporates all of these features into a single module [3].

The aim of this proposed system is to create a robot that can be controlled through voice commands. The hardware components of the robot include its mechanical design, motors, and electronic devices required for proper joint movement. On the other hand, the software aspect consists of sophisticated procedures that convert the voice commands into an order of target points and control algorithms that make the vehicle move according to the desired specifications. The vehicle's writing mechanism is achieved through speech recognition technology, which can be activated using either a microphone or an android application [4].

One of the key benefits of personal robotic assistants is reducing manual efforts required in daily tasks. In this proposed system, an Intelligent Personal Assistant (IPA) is designed to perform various tasks for senior or disabled individuals. The system is voice-controlled and specially designed to aid those who need it most [5].

Another describes a simple hardware implementation that uses an internet cloud server to recognize and recognize language, objects, and faces. The speech signal commands are converted into text and transmitted to the vehicle via Bluetooth network [6].

The objective of this system is to create a robotic vehicle controlled by voice commands using Arduino. The system is based on Arduino to wirelessly control the vehicle using Radio Frequency technology [7][8]. An Android smartphone is programmed with a voice command that converts speech to text and communicates with the control device via Bluetooth. The vehicle has an ultrasonic sensor that sense obstacle at every interval and analyses it to detect an object. If the vehicle detects the object, it calculates the distance between itself and the object and will act accordingly [9] [10]. Another paper presents the development of a four-wheeled voice assistant controlled by an Android mobile phone via Bluetooth [11]. The article also discusses the development of software for voice control of the vehicle. The software includes a program window and a recognition window where the operator can verify the recognition and interpretation of voice commands. Libraries of words that the operator can use to accomplish the fixed objectives are defined, and a sequence of actions is provided for the operator to follow for voice control. Additionally, the article considers commands that may be needed in the case of interactive correction of actions [12].

A Bluetooth module, HC-05, which is directly attached to an Arduino Uno, is connected to an Android application called AMR-Voice. The robot executes tasks as commanded through voice control. The Voice Control vehicle proves to be useful in situations where humans cannot reach, such as toxic, fire, or polluted areas, and is particularly beneficial to physically challenged individuals. Due to its small size, the robot can also be utilized for spying or espionage [13]. The Android app is used to provide specific instructions to the vehicle, while the Arduino integrated with the HC-05 Bluetooth module enables the reception of voice commands. The main objective of the Voice Controlled Robot is to listen and act upon the user's commands while achieving Human-Robot Interaction [14].

2. METHODS

A person's unique psychological makeup is an The VCRV was designed and modeled using various parts available in the market. Additionally, the Arduino programming was completed and an application was developed using App Inventor available online. To design this proposed system, we have used the following materials.

1. Acrylic sheet

Acrylic sheet is the base of the vehicle. It holds and provides a strong support to the vehicle.

2. Gear Motors

DC motors are a type of machine that generates mechanical energy from DC. They incorporate an internal mechanism, which can be electronic or electromechanical, that allows for periodic changes in the direction of current flow within the motor.

3. Arduino

The illustration depicts the Arduino UNO, a microcontroller board created by Arduino.cc that is open source. The board contains six Analog pins and 14 digital pins, which can be programmed with Arduino IDE through a Type B USB cable. It is also capable of being powered by an external main volt battery,

4. Servo Motors

The servo motor is employed to generate movement for the ultrasonic motor, which functions as the head of the vehicle.

5. Wheels

A wheel is a durable, circular device that is attached to an axle and rotates when force or gravity is applied. When positioned underneath a load-bearing surface, a horizontal axle causes the wheel to turn, enabling the movement of heavy objects.

6. HC-05 Bluetooth module

The figure illustrates the HC05 module, which is a compact Bluetooth device designed for establishing wireless serial connections using a simple Bluetooth serial port protocol. With a small form factor of just 12.7mm X 27mm, it can streamline the overall design process.

7. Motor Driver

The L298 Driver is a dual-bridge driver capable of handling high voltage and high current loads while accepting standard TTL logic levels. The lower-level transistor emitters of each bridge are linked to the appropriate external terminal, which may be used to attach an external sensing resistor.

8. Ultrasonic Sensor

The ultrasonic sensor is a vital component in a voice-controlled car as it enables the car to operate safely and efficiently by detecting obstacles, assisting with parking, controlling speed, and aiding navigation through tight spaces. With the sensor's ability to measure distances and provide feedback to the Arduino, the car can adjust its movements and respond to its environment, making it a valuable tool for autonomous driving and smart transportation systems.

9. Battery Holder of 3 Pack

The battery holder is essential for providing power to the motor driver and Arduino in a voice-controlled car. Without it, the car would not be able to function.

10. Battery

The battery powers the electronic components of the voice control car using Arduino and motor driver. It needs to have sufficient capacity and provide the required voltage and current. Rechargeable batteries such as Li-ion or LiPo are commonly used, but here we're using Li-ion battery.

11. Jumper Wires

Male to female jumper wires are essential for establishing electrical connections between various components in a car. The male end is plugged into the pin headers on the Arduino board or motor driver, while the female end is connected to the sensor or motor. Proper selection and use of these wires are crucial for the car's proper functioning.

12. Switch

A switch is used to turn the system on or off. It is used to control the flow of electrical current from the battery to the motor driver and other components, allowing for easy control of the car's movements. Proper selection and placement of the switch is important to ensure ease of use and reliable operation of the voice control car.

3 CIRCUIT DIAGRAM & WORKING

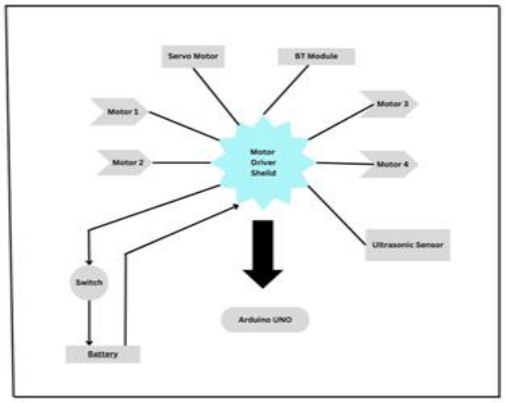

Fig.1: Working of Voice Controlled Car

A voice-controlled car using Arduino Uno and a Bluetooth module enables users to control its movement and perform actions through voice commands. The hardware setup involves connecting the Arduino Uno board to components such as motors, wheels, servo motor, ultrasonic sensor, and Bluetooth module.

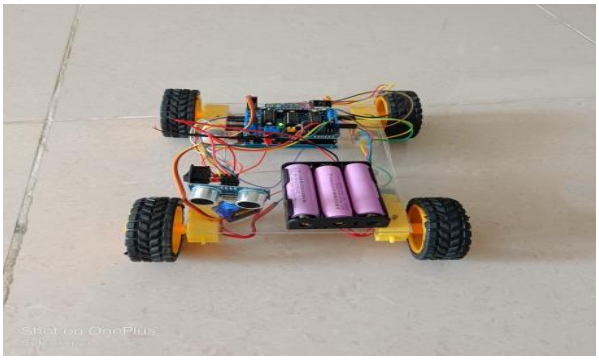

Fig.2: Prototype of Voice Controlled Car

After pairing the Bluetooth module with a smartphone or Bluetooth-enabled device, it receives voice commands wirelessly. The Arduino Uno processes the voice commands using a suitable algorithm or library to convert them into recognizable commands or keywords. Based on the recognized commands, the Arduino Uno sends signals to the motor driver to control the motor's

direction and speed, allowing the car to move accordingly.

Fig.3: Speech to Text Converter

If the command involves turning, the Arduino Uno adjusts the angle of the servo motor to steer the car left or right. Additionally, an ultrasonic sensor can be used for obstacle detection, with the Arduino Uno executing actions like stopping or changing direction to avoid obstacles. The system provides feedback through indicators or displays, and the entire setup is powered by a suitable power source, ensuring stable operation.

Fig.4: Obstacle Detection

4. RESULT AND DISCUSSION

In this proposed system, using the microphone on an Android smartphone, the human voice is detected and analyzed, and then converted into English words through the use of Artificial Intelligence software and the operating system codes of Android. Interdisciplinary in nature, the discipline of speech recognition focuses on the creation of technologies and processes that allow computers to recognise and translate spoken language into text. The names automatic speech recognition, computer speech recognition, and speech to text are all used to describe this field. Electrical engineering, computer science, and linguistics are just a few of the fields that are combined with knowledge and research for this project.

Speech recognition technology has a lengthy history marked by various periods of significant innovation. In recent times, this field has greatly profited from progress in big data and deep learning. The evidence of these advances can be found not just in the abundance of academic papers on the subject but, more crucially, in the widespread adoption of different deep learning methods by the industry, which has helped in the design and implementation of speech recognition systems across the world.

The proposed system was completed as per the specified requirements and demands. Basic movements of the vehicle can be controlled through voice commands. The suggested solution is mainly based on a Voice Managed car that enables voice commands to be accepted via an Android application in order to operate the car. An Android app that has been downloaded and installed on the user's mobile device allows them to voice-command the Voice Controlled Vehicle. The Android software conducts the speech recognition, after which it delivers the appropriate command to the voice-controlled robot car.

5. CONCLUSION

The "Voice Controlled Vehicle" proposed system boasts a lot of present and future applications. To enhance its effectiveness, additional features can be incorporated into this proposed system in the future.

This system's uses span a wide number of industries, including the military, home security, search and rescue operations, businesses, healthcare, and more. Using the tools at hand, we were able to effectively build a straightforward model of a voice-controlled automobile. It benefits human life because it is easily implemented. The Voice Control Vehicle is very helpful for monitoring and for people with disabilities. It uses simple voice instructions to function, making it simple to use. Its compact size makes it ideal for clandestine actions like espionage and surveillance. In the future, a

webcam could be added to the robot for security reasons. When identifying speech commands, the voice recognition software is precise and incredibly sensitive to background noise.

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