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Voice Control Car

Prof. Mrs. Sayyad F. S.[1], Mr. Abhishek P. Chame[2], Mr. Ganesh A. Ghumare[3], Mr. Parth S. Giri[4], Mr. Sunil L. Kalu[5]
Professor, Department of Computer Engineering[1]
Students, Department of Computer Engineering[2-5]
Vishweshwarayya Abhiyantriki Padvika Mahavidyalaya, Almala, India

Abstract: *A voice-controlled car project aims to create a system that allows users to control vehicle functions using voice commands, enhancing driving experiences and promoting safer interactions with in-vehicle systems through advancements in natural language processing and automotive technologies.*

Keywords: Voice Control, IoT, Microcontroller, Bluetooth Module (HC-05), Motor Driver, DC Motors

I. INTRODUCTION

A voice-controlled car is a smart vehicle that operates using voice commands. It uses speech recognition technology with a microcontroller (like Arduino or Raspberry Pi) to control movement wirelessly via Bluetooth or Wi-Fi. This project enhances automation and accessibility, with applications in robotics, smart vehicles, and assistive technology

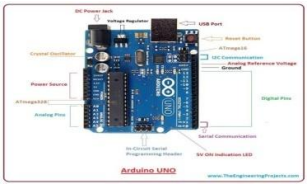
II. LITERATURE REVIEW

Speech Recognition Technology – Early studies used hardware-based voice recognition modules (e.g., HM2007), while modern systems utilize AI-based speech processing like Google Speech API and OpenAI Whisper for improved accuracy.
Microcontroller-Based Control – Research has implemented microcontrollers such as Arduino, Raspberry Pi, and ESP32 to process voice commands and control motor drivers for movement.
Wireless Communication – Bluetooth (HC-05/HC-06) and Wi-Fi (ESP8266/ESP32) modules have been widely used for seamless remote control and voice command transmission.
Obstacle Detection & Safety – Studies integrate ultrasonic or IR sensors to enhance navigation, prevent collisions, and improve real-world applicability in autonomous mobility

III. METHODOLOGY

The voice-controlled car operates using speech recognition, where voice commands are processed by a microcontroller (Arduino/Raspberry Pi) and transmitted via **Bluetooth/Wi-Fi** to control the motors.
Hardware component related information:
DC Gear Motor: Electrical energy into mechanical energy using a magnetic field and a coil.

ARDUNIO UNO: An open-source, single-board microcontroller based on the ATmega328P, featuring 14 digital and 6 analog pins, and programmable via USB with the Arduino IDE.



Bluetooth module: a small circuit that enables wireless communication between devices over short distances, tipicallty used for connecting peripherals or exchanging data.

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Motor Driver: It is used to control the operation of motors based on input signals.

Working Principle

The voice-controlled car operates on **speech recognition technology,** where a **microcontroller (Arduino/Raspberry Pi)**processes voice commands received via **Bluetooth or Wi-Fi.** The recognized commands (e.g., "move forward**,**" "turn left") control the **motor driver (L298N)**to drive **DC motors,** enabling movement. Additionally, **ultrasonic or IR sensors** detect obstacles to ensure

IV. RESULTS

The **voice-controlled car** successfully responds to **speech commands**, enabling smooth movement in different directions (**forward, backward, left, right, stop).** Wireless communication via **Bluetooth/Wi-Fi** ensures real-time control, and **sensor integration** enhances obstacle detection for safe navigation. The system demonstrates **efficient automation**, making it useful for **smart vehicles and assistive mobility applications**

V. CONCLUSION

The voice-controlled car represents a significant advancement in automotive and smart technology. By integrating voice recognition systems, IoT, and AI, these cars provide a hands-free, efficient, and safer driving experience. They enhance accessibility for individuals with disabilities and improve convenience by enabling functions like navigation, climate control, and entertainment through simple voice commands.

Despite its advantages, challenges such as background noise interference, accuracy of voice recognition, and cybersecurity threats remain. Future advancements in AI and machine learning will continue to improve voice recognition accuracy and enhance security features. Overall, voice-controlled cars pave the way for a more connected and intelligent driving experience, aligning with the future of autonomous and smart vehicles.

VI. ACKNOWLEDGMENT

We express our sincere gratitude to everyone who contributed to the successful completion of this project on Voice-Controlled Cars. We extend our heartfelt thanks to our mentors, professors, and technical guides for their invaluable insights and continuous support throughout the research and development process.

We would also like to acknowledge the contributions of our peers and team members, whose dedication and collaboration played a crucial role in refining our ideas and implementation. Additionally, we appreciate the advancements in speech recognition, AI, and IoT technologies, which made this project possible.

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