



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

VOICE CONTROLLED AI ROBOT

Shraddha G. Waghmare ^{*1}, Anjusha R. Baraskar ^{*2}, Akshita T. Somkuwar ^{*3}, Akash K. Kangale ^{*4}, Prof. Dr. S.S. Thakare ^{*5}

¹Student, Electronics and Telecommunication Engineering, Government College of Engineering, Yavatmal, Maharashtra, India

² Assistant Professor, Electronics and Telecommunication Engineering, Government College of Engineering, Yavatmal, Maharashtra, India.

Abstract: This paper presents a review of a voice-operated robotic vehicle designed to function through spoken commands using an Android-based application and a microcontroller. The system employs Bluetooth communication to establish a connection between the mobile application and the robot, enabling users to control its movements either through voice input or on-screen controls. The robotic movement is governed by a microcontroller interfaced with two DC servo motors. Instructions from the application are transmitted via Bluetooth, converted into digital signals, and processed by the controller to execute actions. The system operates effectively within an approximate range of 100 meters. The main objective of this project is to develop a robotic vehicle capable of performing specific tasks based on user voice commands. Initial configuration involves programming to ensure smooth and accurate functioning. This method enhances user interaction while improving overall operational performance and efficiency. **Keywords** Robot, Design, Fabrication, Sensor, Automation, Voice-Controlled Robotic Vehicle..

I. INTRODUCTION

In recent years, developments in robotics and artificial Intelligence (AI) have significantly expanded the Functionality and application areas of robotic systems. One Of the key advancements is the incorporation of voice control Into robotic platforms, which provides a more natural and Hands-free mode of interaction for users. Voice-enabled Robotic systems represent an important step forward in Human-machine communication, allowing individuals to Operate machines using spoken instructions. This not only Simplifies the control process but also increases the Adaptability of robots in various environments. Such systems Are especially useful in situations where physical interaction Is difficult or limited, including assistance for individuals With mobility challenges, optimization of industrial Operations, and improvements in smart home technologies. Controlling robots through voice commands enhances Accessibility and creates a more intuitive interaction Experience. This paper focuses on the design and Implementation of a voice-controlled robotic vehicle, Emphasizing the integration of speech recognition Technology into robotic systems. The goal is to develop a System capable of accurately understanding and executing Voice commands, ensuring smooth and efficient operation.

II.METHODOLOGY

The system architecture consists of several interconnected Components that work together to enable voice- based control Of the robotic vehicle. Voice commands provided by the user Are processed through an Android application and transmitted Via a Bluetooth module to the Arduino Nano microcontroller. The microcontroller interprets these commands and sends Appropriate signals to the motor driver, which controls the Operation of the motors. A power supply unit provides the Necessary energy for system operation. This structured design ensures efficient communication between components and Enables accurate execution of user commands.

Arduino Uno:

Arduino Uno functions as the central controller of the robotic System. It is based on the ATmega328P microcontroller and Provides multiple input/output capabilities, including 14 Digital pins (with several supporting PWM output) and

analog Input pins. It also features serial communication support (UART), a 16 MHz crystal oscillator, USB connectivity, Power input options, and a reset function, making it suitable For controlling robotic operations efficiently.

L293D Motor Driver:

The L293D motor driver IC is used to control the operation of Two DC motors simultaneously. It operates on the H-bridge Principle, allowing bidirectional movement of motors. The Microcontroller sends pulse signals to the driver, which Regulates motor speed and direction accordingly.

HC-05 Bluetooth Module:

The HC-05 module enables wireless communication between The robot and external devices. It operates using Serial Port Protocol (SPP), allowing easy interfacing with Microcontrollers or computers through serial communication. The module supports master-slave configuration, ensuring Flexible connectivity for control applications.

Power Supply:

The system is powered using a switch-mode power supply (SMPS) along with a dedicated adapter for the controller. Additionally, a 3.7V, 2000mAh lithium-ion battery is used to Drive the motors, ensuring stable and efficient power Distribution.

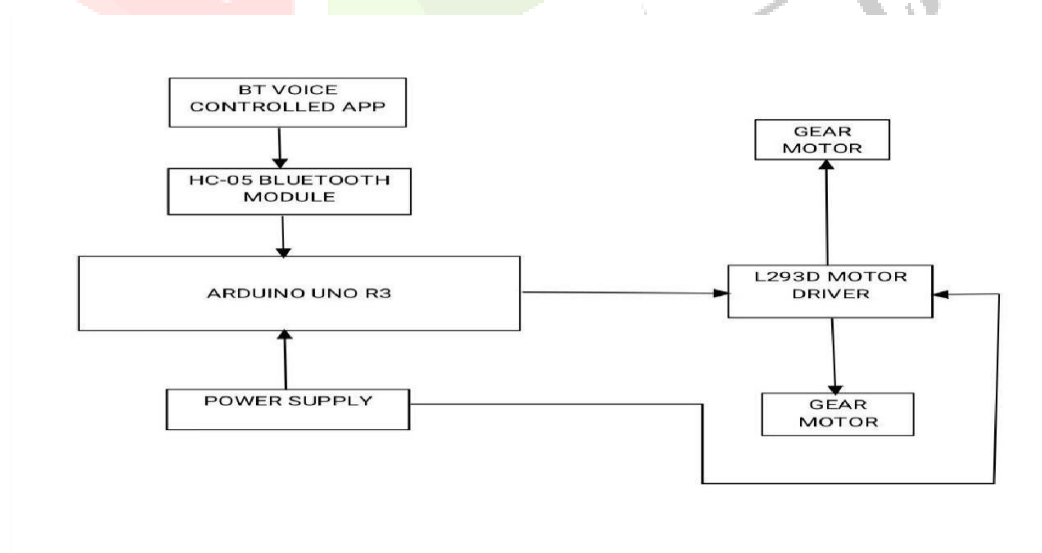


Fig 1: System Architecture

III. MODELLING AND ANALYSIS

The flowchart illustrates the operational sequence of the voice-controlled robotic system. The process begins With system initialization, after which the robot continuously waits for a user voice command. Once a command is Detected, the system processes it sequentially. If the command corresponds to “F,” the robot moves forward. If Not, the system checks for the “L” command, which results in left movement. Similarly, the “R” command directs The robot to move right, while the “B” command triggers backward movement If the system identifies the “S” command, it stops all motor activity. After executing the respective action, the System returns to the initial waiting state, allowing continuous real-time response to user inputs. This loop Ensures smooth and Ensure smooth and responsive navigation based on voice instructions.

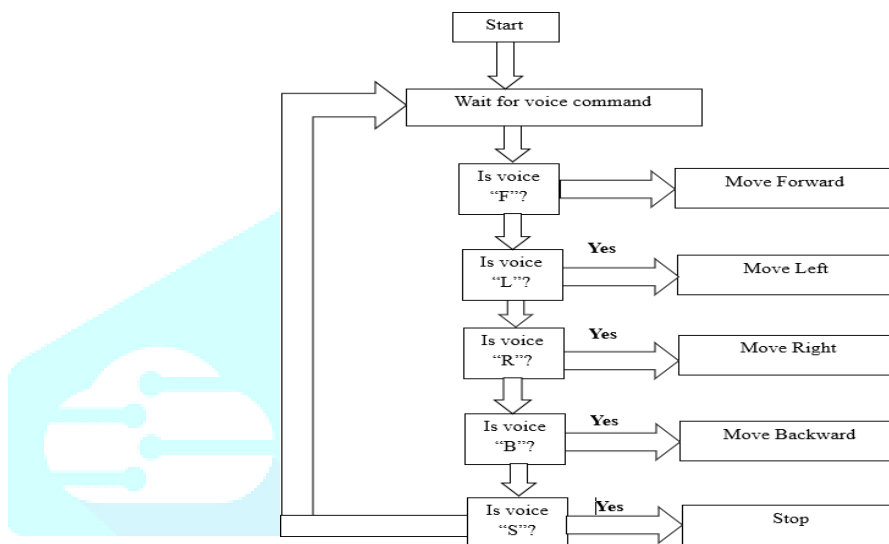


Fig2. Flowchart

RESULTS AND DISCUSSION

The review indicates that voice-controlled robotic systems Have significantly improved in terms of accuracy, reliability, And user interaction. Most implementations utilize Android Applications, Bluetooth modules, and Arduino-based Controllers to translate human speech into robotic actions. The Findings show that commonly used commands such as Forward, backward, left, right, and stop are processed Efficiently, with speech recognition systems converting audio Input into text and microcontrollers executing commands with Minimal delay. Bluetooth-based systems perform effectively Within a limited range, while IoT-based approaches extend Control capabilities over long distances via internet Connectivity. This comparison highlights the difference Between local wireless control and cloud-based remote Operation. However, several challenges remain, including Background noise affecting speech recognition accuracy, Limitations in Bluetooth communication range, and Synchronization issues between command processing and Motor execution. To overcome these challenges, researchers Recommend integrating advanced speech recognition Technologies, IoT-enabled modules for remote accessibility, And additional sensors such as ultrasonic devices for obstacle Detection. Overall, the studies demonstrate that voice-Controlled robots are highly effective and applicable in areas such as assistive technologies, industrial automation, security Systems, and surveillance operations.



Fig3. Voice Controlled AI Robot

IV. CONCLUSION

This review highlights the rapid progress and increasing Importance of voice-controlled robotic systems in modern Technology. The analyzed studies demonstrate that combining Speech recognition with microcontrollers such as Arduino, Along with communication technologies like Bluetooth and IoT, enables efficient and user-friendly robotic control. Conventional Bluetooth-based systems provide reliable Performance for short-range applications and basic motion Control. In contrast, IoT-based solutions, including those Integrated with platforms like Google Assistant and IFTTT, Allow users to control devices remotely through cloud Connectivity, significantly expanding operational range and Flexibility. The findings further indicate that voice- controlled Robots are capable of delivering accurate, smooth, and Responsive movements, especially when supported by Additional components such as motor drivers and ultrasonic Sensors. These systems show strong potential in various Domains, including assistive technologies, industrial Automation, surveillance, and smart environments. Despite These advancements, certain challenges remain, such as Reduced speech recognition accuracy due to environmental Noise and limitations related to hardware performance. To Address these issues, future developments should focus on Incorporating AI-based speech processing, GPS-enabled Navigation, and enhanced IoT integration. Overall, the study Confirms that voice-controlled robotic systems represent a Growing and impactful field with significant opportunities for Innovation and real-world applications

REFERENCES

1. ai Priya T.S, Pokuri Mounika, Tejashwini P.V, Nisarga K, Sangeetha, "Voice Controlled Personal Assistant Robot", International Advanced Research Journal in Science, Engineering and Technology (IARJSET), Vol. 10, Issue 4, April 2023. Gupta, S., Saini, R., Shukla, S., Mehta, U., & Srivastava, S. "IoT Based Voice Controlled Robot Using Arduino". Industrial Engineering Journal, 53(4), 170-172, 2024
2. MR. V. Naga Mahesh, E. Kavya, G. Jahnavi, K. Manasa, "Voice Controlled Robot", International Journal (ISSN 2457-0362), Volume 14, Issue 10, October 2024.
3. Kunal K. Pote, Pranav S. Jadhav, Aditya R. Jagtap, Dr. Ravindra G. Dabhade, Mr. Bhagvan S. Bodke, "Voice Controller Robotic Vehicle", Journal of Emerging Technologies and Innovative Research (JETIR), Volume 12, Issue 4, April 2025.

4. Sumeet Sachdeva, Joel Macwana, Chintan Patel, Nishant Doshi, "Voice-Controlled Autonomous Vehicle Using IoT", 2019,
 5. Ali A. Abed, "Design of Voice Controlled Smart Wheelchair", 2015.
 6. MA Bhikule, MS Mankame, MS Khot, MY Nhawkar "Obstacle Avoidance and Voice Control Unit for Autonomous Car", 2021.
 7. Saleem Ullah, Zain Mumtaz, Shuo Liu, Mohammad Abubaqr, Athar Mahboob, Hamza Ahmad Madni, "Single-Equipment with Multiple-Application for an Automated Robot Car Control System", 2019.
 8. G Azam and MT Islam" Design and Fabrication of a Voice Controlled Wheelchair for Physically Disabled people", 2015.
- M. Saravanan, B. Selvababu, A. Jayan, A. Anand, A. Raj, "Arduino Based Voice Controlled Robot

