

# Voice Control Wheel Chair

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## ABSTRACT

The proposed project introduces a voice-controlled wheelchair designed to assist physically disabled and elderly individuals in achieving independent mobility. The system uses voice recognition technology to interpret user commands and control the movement of the wheelchair. A microcontroller processes the voice input and sends signals to motor drivers, enabling directional movement such as forward, backward, left, and right.

The integration of voice control eliminates the need for manual operation, making it highly beneficial for users with limited mobility. The system can also be enhanced with IoT and obstacle detection features for improved safety and monitoring. This project provides an efficient, user-friendly, and cost-effective solution for smart mobility assistance.

**KEYWORDS:** *Voice Recognition, Smart Wheelchair, IoT, Assistive Technology*

## INTRODUCTION

Mobility plays a vital role in the daily lives of individuals, especially for those with physical disabilities or age-related limitations. Traditional wheelchairs require either manual operation or joystick-based control systems, which may not be suitable for users with severe disabilities affecting their upper limbs.

With rapid advancements in embedded systems and artificial intelligence, there is an increasing demand for intelligent mobility solutions that can adapt to user needs. Voice recognition technology offers a natural and intuitive way for humans to interact with machines. By incorporating voice control into wheelchairs, users can operate the system without physical effort, making it highly beneficial for individuals with limited motor abilities.

The voice-controlled wheelchair system is designed to recognize predefined voice commands and translate them into motion instructions. The system improves accessibility, reduces dependency on caregivers, and enhances the overall user experience. It aligns with the vision of smart healthcare and assistive technologies,

providing a practical solution for real-world challenges faced by disabled individuals.

Furthermore, the system contributes to the development of smart healthcare infrastructure by integrating automation and intelligent control. It also aligns with modern trends in assistive technology, where user convenience, safety, and efficiency are prioritized. Another important aspect is the reduction of dependency on caregivers. Users can move independently, perform daily activities, and navigate their surroundings without assistance. This enhances confidence and improves mental well-being.

Overall, the system represents a step toward smart healthcare solutions. It combines automation, accessibility, and user convenience to address real-world challenges faced by disabled individuals.

Overall, the system represents a step toward smart healthcare solutions. It combines automation, accessibility, and user convenience to address real-world challenges faced by disabled individuals. Furthermore, the system can be integrated into smart city infrastructure,

**LITERATURE SURVEY** Several studies have been conducted in the field of smart wheelchairs and assistive devices. Early systems primarily relied on manual operation or joystick-based controls, which required physical interaction and limited usability.

Researchers have explored alternative control methods such as gesture recognition, brain-computer interfaces, and eye-tracking systems. While these technologies are innovative, they often require complex hardware and are expensive to implement.

Voice-controlled systems have gained attention due to their simplicity and ease of use. Many projects use smartphone-based voice recognition or dedicated modules to process commands. These systems are relatively affordable and easier to implement. However, existing systems face several challenges. Background noise can interfere with voice recognition, reducing accuracy. Some systems also suffer from delays in processing commands, which affects performance.

This project aims to overcome these limitations by providing a reliable and efficient voice-controlled wheelchair. It focuses on improving accuracy, reducing response time, and ensuring user safety.

Some research also highlights the importance of integrating machine learning algorithms to improve voice recognition accuracy. These algorithms can adapt to different speech patterns and accents over time. Other studies emphasize the need for safety mechanisms such as obstacle detection and emergency stop features. These additions are essential for real-world applications. Comparative analysis of existing systems shows that cost and complexity are major factors affecting adoption. This project aims to balance performance and affordability. Overall, the literature survey indicates that while significant progress has been made, there is still scope for improvement in terms of reliability, safety, and user experience.

## PROPOSED SYSTEM

The proposed system consists of a voice recognition module, microcontroller, motor driver, and DC motors. These components work together to provide seamless control of the wheelchair. The voice recognition module captures user commands and converts them into digital

signals. These signals are then sent to the microcontroller, which acts as the brain of the system. It processes the commands and determines the appropriate action. The motor driver module receives signals from the microcontroller and controls the motors accordingly. The motors drive the wheels, enabling movement in different directions based on user commands.

The system is designed to be modular, allowing easy addition of new features. For example, ultrasonic sensors can be added for obstacle detection, ensuring safety during movement. Similarly, IoT modules can enable remote monitoring.

Overall, the proposed system is efficient, flexible, and scalable. It provides a practical solution for assistive mobility while allowing future enhancements.

The system architecture is designed to minimize latency and ensure quick response to user commands. This is important for smooth and safe operation.

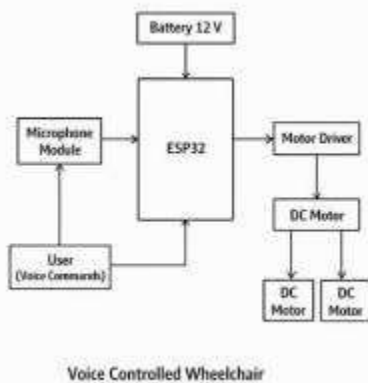
It also supports customization, allowing developers to modify commands and features based on user requirements. This makes the system adaptable to different use cases.

The inclusion of wireless communication technologies such as Bluetooth and Wi-Fi enhances connectivity and control options. Users can integrate mobile applications for additional control.

## IMPLEMENTATION

The implementation of the system involves both hardware assembly and software development. All components are connected and configured to work together efficiently. The voice recognition module is first trained to recognize specific commands. This ensures that the system responds only to predefined instructions, reducing errors. Commands such as forward, backward, left, right, and stop are programmed. When a user gives a command, the module processes the voice input and sends a signal to the microcontroller. The microcontroller interprets the command and sends control signals to the motor driver. The motor driver activates the motors, causing the wheelchair to move in the desired direction. Proper synchronization between components ensures smooth and accurate

movement. Testing is an important part of implementation. The system is tested under different conditions to ensure reliability. Adjustments are made to improve accuracy and performance. Calibration is performed to ensure accurate voice recognition and motor control. This helps in minimizing errors during operation. The system is tested in both indoor and outdoor environments to evaluate performance under various conditions. This ensures robustness. Debugging techniques are applied to identify and fix issues in hardware and software. This improves system stability. Final testing ensures that the system meets all functional requirements and operates safely and efficiently.



**Fig. 1: Block Diagram**

The block diagram represents the working principle of a voice-controlled wheelchair system. It shows how different components interact with each other to convert voice commands into physical movement of the wheelchair. The system begins with the user, who gives voice commands such as forward, backward, left, right, and stop. These commands act as the primary input for the system and are captured using a microphone module. The user interface is simple and does not require any physical effort, making it suitable for disabled individuals. The microphone module plays a crucial role in capturing the user's voice. It converts sound signals into electrical signals that can be processed by the system. The module may include noise filtering features to improve the

## HARDWARE IMPLEMENTATION

The hardware components form the physical structure of the system. The microcontroller acts as the central unit, controlling all operations.

The voice recognition module captures voice input from the user. It is connected to the microcontroller, which processes the signals and determines the action to be performed.

The motor driver is responsible for controlling the motors. It receives signals from the microcontroller and adjusts motor speed and direction accordingly. DC motors are used to drive the wheels of the wheelchair.

A battery is used to supply power to all components. Proper power management is important to ensure efficient operation and longer battery life.

Additional components such as ultrasonic sensors, LCD displays, and buzzers can be added to enhance functionality. These components improve safety, provide feedback, and make the system more user-friendly.

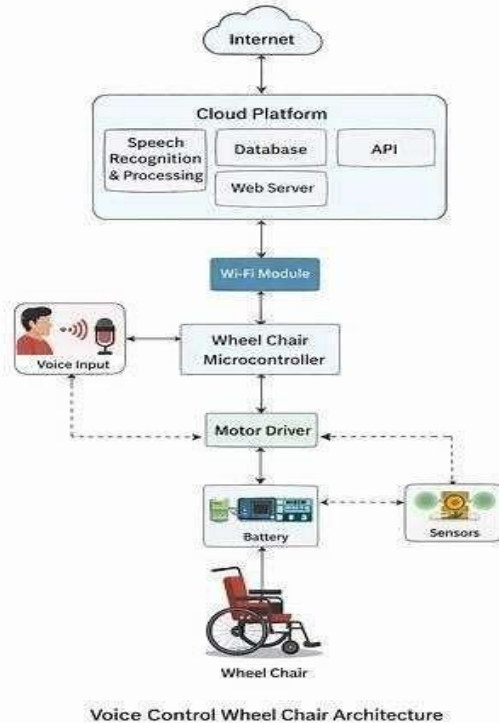
The hardware design ensures proper insulation and protection of components to prevent damage. This increases durability.

## SOFTWARE IMPLEMENTATION

The software controls the logic and functioning of the system. It is developed using platforms like Arduino IDE, which allows programming of microcontrollers. The program continuously monitors input from the voice

recognition module. When a command is detected, it is matched with predefined instructions stored in the system. Each command corresponds to a specific motor action. For example, the forward command activates both motors, while the left command adjusts motor speeds for turning. Error handling is included in the software to prevent incorrect movements. The system ignores unrecognized commands and ensures safe operation. If IoT features are included, the software can also handle communication with cloud servers. This allows remote monitoring and control, making the system more advanced.

can be implemented using readily available components. It enhances independence and reduces reliance on caregivers. By integrating voice recognition technology, the system provides a natural interface for users. This makes it accessible even for individuals with no technical background. Future improvements can include advanced features such as obstacle detection, GPS tracking, and AI-based voice processing. These enhancements will further improve safety and efficiency.



## CONCLUSION

The voice-controlled wheelchair is a modern solution for improving mobility among physically challenged individuals. It eliminates the need for manual operation and provides a more convenient method of control. The system is easy to use, cost-effective, and

Overall, the project demonstrates the potential of combining technology with healthcare to create meaningful solutions that improve human life.

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