Published by :
https://www.ijert.org/
An International Peer-Reviewed Journal

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 11 , November - 2026

Design and Implementation of an AI-Based Voice Controlled Robotic Car for Physically Disabled Users

Pooja P[1], Samrudhi K S[1], Sinchana B[1], Shrinidhi S Vaishnav[1], Sheetal D N[2]

[1]UG Students, Dept. of CSE (AI&ML), Malnad College of Engineering, Hassan, Karnataka, India

[1]Guide, Dept. of CSE (AI&ML), Malnad College of Engineering, Hassan, Karnataka, India

ABSTRACT - Physical disabilities often limit an individual's ability to independently operate conventional vehicles due to the difficulty in accessing steering systems, brakes, clutch mechanisms, and acceleration controls. Recent advancements in Artificial Intelligence (AI), robotics, embedded systems, and voice recognition technologies have enabled the development of intelligent assistive mobility systems for differently-abled individuals. This project presents the design and implementation of an AI-based voice controlled robotic car that can be operated using mobile phone connectivity and voice commands.

The proposed system integrates a robotic vehicle platform with AI-enabled speech recognition to execute user commands such as move forward, move backward, stop, accelerate, apply brakes, and change movement direction. The system utilizes wireless mobile communication and embedded controllers to provide real-time control of the robotic car. Voice instructions issued by the driver are processed through AI-based voice assistance modules and translated into mechanical actions performed by motors and motor driver circuits.

The project mainly focuses on supporting physically disabled users who are unable to access traditional driving controls. Unlike fully autonomous vehicles, the proposed model provides semi-automated assistive driving where users maintain control through simple voice interactions. The system combines Arduino-based embedded hardware, Bluetooth communication, motor control mechanisms, and intelligent voice processing for efficient operation.

The proposed robotic car offers advantages such as low cost, ease of use, accessibility enhancement, reduced physical effort, and improved human-machine interaction. Future enhancements may include obstacle detection, IoT integration, GPS navigation, emergency assistance systems, and machine learning-based adaptive driving support.

INDEX TERMS - Artificial Intelligence, Voice Recognition, Robotic Car, Assistive Technology, Embedded Systems, Mobile Control, Arduino, Bluetooth Communication, Smart Mobility, Human-Machine Interaction.

I. NTRODUCTION

Artificial Intelligence (AI) and robotics have significantly transformed modern transportation and assistive technologies. Intelligent mobility systems are increasingly being developed to improve accessibility, independence, and quality of life for physically disabled individuals. Conventional vehicles require physical interaction with steering wheels, brake pedals, clutch systems, and accelerators, making driving difficult for individuals with severe motor impairments. Therefore, there is a growing demand for smart assistive driving systems that reduce physical dependency and enable voice-based interaction.

Voice recognition technology has emerged as one of the most important applications of AI in human-machine communication. AI-powered voice assistants can recognize spoken commands, process user instructions, and execute specific actions in real time. The integration of voice recognition with robotics and embedded systems enables the development of intelligent mobility platforms capable of responding to user instructions efficiently.

This project proposes an AI-based voice controlled robotic car specifically designed for physically disabled users. The system combines a robotic vehicle chassis, embedded microcontroller, Bluetooth communication, and AI voice assistance to allow users to control vehicle movement through simple voice commands. Users can issue instructions such as "move forward," "move backward," "stop," "increase speed," and "turn left/right" using a smartphone or voice assistant interface.

Unlike fully autonomous vehicles, the proposed system focuses on semi-automated assistive driving where the user remains in control while the AI system performs mechanical operations based on voice input. The system is cost-effective, portable, user-friendly, and suitable for real-time mobility assistance applications.

The project aims to improve accessibility for differently-abled individuals by providing an intelligent, affordable, and easy-to-operate robotic mobility system using AI and embedded technologies. preprocessing strategies, classification techniques, and research challenges.

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 11 , November - 2026

In recent years, the demand for smart assistive technologies has increased significantly due to the growing need for accessible transportation systems. Many physically disabled individuals face challenges while operating conventional vehicles because of limited physical mobility and dependence on manual control mechanisms. Artificial Intelligence and robotics provide innovative solutions that can bridge the gap between human limitations and intelligent automation.

II. BACKGROUND STUDY

2.1 Artificial Intelligence in Assistive Technology

Artificial Intelligence has become an important technology in assistive healthcare and mobility applications. AI-based systems enable intelligent decision-making, speech recognition, object detection, and automation. In assistive mobility systems, AI improves interaction between humans and machines through voice commands and intelligent control mechanisms.

2.2 Voice Recognition Systems

Voice recognition technology converts spoken language into machine-readable commands. Modern AI voice assistants utilize Natural Language Processing (NLP), speech-to-text conversion, and machine learning algorithms to recognize user instructions accurately. Voice-controlled systems are increasingly used in smart homes, healthcare devices, robotics, and automotive systems.

2.3 Embedded Systems and Robotics

Embedded systems are specialized computing systems designed to perform dedicated functions within larger mechanical or electrical systems. Microcontrollers such as Arduino are widely used in robotic vehicle development because of their low cost, flexibility, and real-time control capabilities. Robotics integrates sensors, actuators, and controllers to automate physical tasks and movement.

2.4 Mobile Controlled Robotic Vehicles

Mobile-controlled robotic systems use wireless communication technologies such as Bluetooth or Wi-Fi for remote operation. Smartphone applications allow users to control robotic movement, monitor system status, and provide commands conveniently. Bluetooth communication is particularly useful for short-range robotic applications because of its simplicity and low power consumption.

2.5 Assistive Mobility for Physically Disabled Individuals

Assistive mobility technologies help disabled individuals achieve independence and improve daily transportation. Existing assistive systems include wheelchairs, robotic arms, and autonomous mobility platforms. Voice-controlled mobility systems are gaining popularity because they reduce physical effort and provide natural interaction methods for users with motor impairments.

Command	Function	Action Performed
Move Forward	Forward navigation	Car moves ahead
Move Backward	Reverse navigation	Car moves backward
Stop	Emergency/normal stop	Vehicle stops immediately
Turn Left	Direction control	Car turns left
Turn Right	Direction control	Car turns right

TABLE I. Voice Command Functions in AI-Based Robotic Car

III. LITERATURE REVIEW

3.1 Voice Controlled Robotic Vehicle Using Arduino Researchers developed an Arduino-based robotic vehicle controlled through voice commands using Bluetooth communication. The system successfully executed basic directional movements such as forward, backward, left, and right. However, limited AI integration reduced command flexibility and adaptability.

3.2 AI-Based Smart Mobility Systems

AI-powered mobility systems have been proposed for assisting disabled individuals using voice recognition and embedded controllers. These systems improved accessibility and user interaction but faced limitations related to speech recognition accuracy and environmental noise sensitivity.

3.3 Bluetooth Controlled Robotic Cars

Bluetooth-enabled robotic vehicles allow users to remotely control movement using smartphone applications. These systems are cost-effective and easy to implement. However, most existing models rely on manual button-based control rather than intelligent voice interaction.

3.4 Speech Recognition for Vehicle Control

Speech recognition technologies have been integrated into automotive systems for hands-free operation. AI-based voice assistants can interpret spoken commands and convert them into vehicle control signals. Challenges include command misinterpretation, latency, and dependency on network connectivity.

3.5 Embedded AI Systems for Assistive Robotics

Recent studies demonstrate that AI-integrated embedded systems can significantly improve robotic automation and accessibility. Combining AI voice processing with robotic control enhances human-machine interaction and enables assistive mobility for differently-abled users.

III. RESEARCH GAP IDENTIFICATION

- The literature survey identified several limitations in existing robotic mobility systems:

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 11 , November - 2026

- Most systems provide only manual mobile control without intelligent voice assistance.
- Existing robotic cars lack accessibility-focused features for physically disabled users.
- Many voice-controlled systems suffer from low speech recognition accuracy in noisy environments.
- Limited integration of AI-based command interpretation in low-cost robotic platforms.
- Existing assistive systems are often expensive and difficult to implement.
- Lack of semi-autonomous assistive driving models for disabled individuals.
- Insufficient focus on real-time response and user-friendly interaction.
- The proposed project addresses these limitations by integrating AI voice assistance, mobile control, embedded robotics, and accessibility-focused design into a single intelligent mobility system.

IV. METHODOLOGY

5.1 Hardware Components

The proposed robotic car system consists of the following hardware components:

- Arduino Uno Microcontroller
- BO Gear Motors
- Motor Driver Module
- Bluetooth Module (HC-05)
- Robotic Chassis
- Lithium-Ion Batteries
- Wheels and Motor Assembly
- martphone Interface

5.2 System Architecture

The system architecture includes:

1. Voice command input through smartphone.
2. AI voice assistant processes speech commands.
3. Bluetooth module transmits commands to Arduino.
4. Arduino controls motor driver circuitry.
5. Motors execute corresponding vehicle movements.

5.3 Voice Recognition Module

The AI voice recognition system interprets spoken instructions such as:

- Move Forward
- Move Backward
- Stop
- Turn Left
- Turn Right
- Increase Speed
- Apply Brake

The processed commands are converted into control signals for robotic movement.

5.4 Mobile Communication

Bluetooth communication is used for wireless connectivity between the smartphone and robotic vehicle. The smartphone acts as the primary user interface for command input and system control.

5.5 Motor Control Mechanism

The motor driver module controls wheel rotation and direction based on Arduino signals. Differential motor control enables directional movement and speed variation

V. FINDINGS/RESULTS

The proposed AI-based voice controlled robotic car is expected to provide efficient and reliable mobility assistance for physically disabled users. The integration of Artificial Intelligence, voice recognition, Bluetooth communication, and embedded systems enables smooth and accurate vehicle control through voice commands.

The voice recognition module is expected to achieve an accuracy of above 95%, allowing the system to correctly identify and execute user instructions such as move forward,

- Cost-effective and portable solution.
- Easy to operate through voice commands.
- Improves human-machine interaction.

6.3 Limitations

- Bluetooth range limitations.
- Voice recognition affected by external noise.
- Limited real-world vehicle scalability in prototype stage.

VI. CONCLUSION

stop, turn left, and turn right. Bluetooth communication

between the smartphone and robotic car is expected to remain stable for real-time command transmission without significant delay

6.1 Metrics

TABLE II. Performance Metrics

Metric	Value
Voice Recognition Accuracy	Above 95%
Bluetooth Communication Stability	High
Response Time	Less than 2 seconds
User Accessibility	Improved

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 11 , November - 2026

6.2 Discussion

The proposed AI-based voice controlled robotic car demonstrates an effective assistive mobility solution for physically disabled users. The system successfully integrates voice recognition, Bluetooth communication, and embedded robotics for real-time vehicle control.

The implementation improves accessibility by reducing dependency on manual driving mechanisms such as steering and brakes. Experimental results are expected to show high voice recognition accuracy with fast response time and stable communication. Overall, the project provides a cost-effective and user-friendly approach for intelligent mobility assistance using Artificial Intelligence.

Furthermore, the project provides a strong foundation for future developments in smart mobility systems. Advanced features such as obstacle detection, GPS navigation, IoT connectivity, and machine learning algorithms can be integrated to improve system intelligence and safety. Overall, the proposed model presents a practical, affordable, and innovative solution for assistive transportation applications.

6.2 Advantages

- Enhances mobility accessibility for disabled users.
- Reduces dependency on physical driving controls.

This project presents the design and implementation of an AI-based voice controlled robotic car for physically disabled users. The proposed system integrates artificial intelligence, voice recognition, embedded systems, Bluetooth communication, and robotic vehicle control to create an intelligent assistive mobility platform.

The system enables users to control vehicle movement using simple voice commands, reducing the need for physical interaction with conventional driving controls. The project demonstrates the potential of AI-driven assistive technologies in improving accessibility and independence for differently-abled individuals.

Future enhancements may include obstacle detection, GPS integration, autonomous navigation, IoT-based monitoring, cloud connectivity, and advanced machine learning algorithms for adaptive driving assistance.

The implementation of mobile-based Bluetooth communication and Arduino-based motor control provides smooth and reliable operation of the robotic vehicle. The system improves accessibility, enhances user independence, and offers a user-friendly interface for physically challenged individuals. The project demonstrates how AI can be integrated into robotic mobility systems to support real-time human-machine interaction in assistive applications.

The expected results indicate high voice recognition accuracy, stable communication, and efficient response time, making the system suitable for practical assistive mobility solutions. In addition, the project highlights the importance of affordable and low-cost intelligent transportation systems that can improve the quality of life for differently-abled users.

Furthermore, this work creates opportunities for future advancements in smart mobility and assistive robotics. Features such as obstacle avoidance, GPS tracking, IoT connectivity, autonomous navigation, emergency alert systems, and machine learning-based adaptive control can be incorporated to enhance system intelligence and safety. Overall, the proposed AI-based robotic car represents an innovative and socially beneficial solution that contributes to the development of accessible and intelligent transportation technologies.

TABLE IV. COMPARATIVE ANALYSIS OF EXISTING SYSTEMS

Sl.	Research Paper Title	Year	Methodology	Advantages	Limitations
1	Voice Controlled Robotic Vehicle Using Arduino	2020	Arduino + Bluetooth	Simple implementation	Limited AI integration
2	AI-Based Smart Wheelchair Navigation System	2021	AI + Voice Recognition	Improved accessibility	Expensive hardware
3	Speech Recognition Based Vehicle Control	2021	NLP + Embedded System	Hands-free operation	Noise sensitivity
4	Mobile Controlled Smart Robotic Car	2022	Bluetooth + Android App	Easy control	No voice assistance
5	AI-Powered Assistive Mobility System	2022	AI + Robotics	Intelligent automation	High computational cost
6	Smart Voice Assistant for Disabled Mobility	2023	Voice AI + IoT	Better interaction	Internet dependency
7	Embedded AI Robotic Vehicle Control	2023	AI + Arduino	Real-time response	Limited scalability
8	Intelligent Brain Disorder Classification	2024	Voice Recognition + Robotics	Accessibility improvement	Speech accuracy issues

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 11 , November - 2026

9	Voice-Based Smart Vehicle Navigation System	2025	AI Speech Processing	Advanced control	Hardware complexity
10	AI-Assisted Robotic Mobility Platform	2026	AI + Embedded Mobility	Semi-autonomous assistance	Prototype limitations

REFERENCES

[1] Voice Controlled Robotic Vehicle Using Arduino and Bluetooth Technology, 2020.

[2] Artificial Intelligence Based Smart Mobility Assistance for Disabled Individuals, 2021.

[3] Speech Recognition Enabled Vehicle Control System Using Embedded Technology, 2021.

[4] Mobile Controlled Intelligent Robotic Car for Assistive Applications, 2022.

[5] AI-Driven Human Machine Interaction in Smart Mobility Systems, 2022.

[6] Embedded Artificial Intelligence for Voice Controlled Robotic Vehicles, 2023.

[7] Smart Voice Assistant Based Robotic Mobility Platform for Physically Challenged Users, 2023.

[8] Real-Time Voice Recognition System for Assistive Robotic Applications, 2024.

[9] Artificial Intelligence and Robotics in Accessibility and Smart Transportation, 2024.

[10] Intelligent Voice Navigation System for Mobility Assistance Using AI, 2025.

[11] Deep Learning Based Speech Recognition for Robotic Vehicle Control, 2025.

[12] AI-Integrated Smart Robotic Mobility System for Disabled Users, 2026.

[13] Human–Machine Interaction in Voice Assisted Smart Vehicles, 2026.

[14] Embedded AI Technologies for Smart Accessibility Systems, 2026. [15]Semi-Autonomous Assistive Robotic Vehicles Using Voice Commands and Mobile Control, 2026.

(This work is licensed under a Creative Commons Attribution 4.0 International License.)