AUTOMATIC WHEEL CHAIR

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Abstract:

Mobility assistance plays a crucial role in improving the quality of life for physically challenged and elderly individuals. Traditional wheelchairs require manual effort or constant assistance from caregivers, which can limit independence and comfort. To overcome these limitations, this project presents the design and development of an IoT-based Automatic Wheel Chair system that enables easy and efficient movement through wireless control.

The proposed system is developed using the ESP8266 microcontroller as the central control unit due to its built-in Wi-Fi capability, compact size, and low power consumption. The ESP8266 allows wireless communication and control of the wheelchair through a web-based interface or mobile device. The control commands are processed by the microcontroller and transmitted to the motor driver module for motion control.

The mechanical structure consists of a four-wheel drive mechanism powered by four BO motors. These motors are controlled using a motor driver module that enables forward, backward, left, and right directional movement of the wheelchair. The frame of the wheelchair prototype is constructed using a foam sheet, providing a lightweight yet stable base structure. Connecting wires are used for proper electrical connections between components to ensure smooth and reliable operation.

assistive mobility. With future enhancements such as obstacle detection sensors, voice control integration, and automatic The system is powered by a rechargeable lithium-ion battery, placed in a lithium battery holder and controlled through an ON/OFF switch for safe operation. The use of a battery-powered system ensures portability and eliminates dependency on external power sources.

The developed prototype demonstrates smooth wireless operation, stable motor control, and efficient power management. The integration of IoT technology enhances user independence by allowing remote control and easy. The proposed system provides a low-cost, energy-efficient, and scalable solution for navigation features, the system can be further developed into a fully autonomous smart wheelchair suitable for advanced healthcare and rehabilitation applications.

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1. INTRODUCTION

Mobility assistance systems are essential for enhancing the independence, safety, and quality of life of physically challenged individuals, elderly people, and patients undergoing rehabilitation. Conventional manual wheelchairs require continuous physical effort or assistance from caregivers, which can cause fatigue and reduce user autonomy. Powered wheelchairs available in the market are often expensive and complex. To address these challenges, this project presents the design and development of a low-cost, IoT-based Automatic Wheel Chair system that enables wireless control, smooth navigation, and user-friendly operation.

The proposed system is developed using the ESP8266 microcontroller as the central control unit due to its inbuilt Wi-Fi capability, compact architecture, cost-effectiveness, and low power consumption. The ESP8266 establishes wireless communication between the wheelchair and a mobile device or web-based control interface. Control commands are transmitted over Wi-Fi and processed by the microcontroller, which then sends appropriate signals to the motor driver module for motion control. This wireless architecture eliminates the need for complex wiring interfaces and enhances flexibility and accessibility for users. The locomotion mechanism consists of a four-wheel drive system powered by four BO motors to ensure stability, balanced torque distribution, and smooth directional movement. The motors are interfaced through a motor driver module that controls speed and direction, enabling forward, backward, left, and right movement. The structural framework of the prototype is constructed using a foam sheet, which provides a lightweight yet sufficiently rigid base for mounting all electronic and mechanical

components. Connecting wires are used to establish secure electrical interconnections between the ESP8266, motor driver, motors, battery, and switch, ensuring reliable power distribution and signal transmission.

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The developed prototype demonstrates stable wireless communication, responsive motor control, and smooth manoeuvrability on flat surfaces. The system significantly reduces the physical effort required by users and enhances mobility independence. Experimental testingconfirms reliable performance, consistent directional control, and effective load handling under normal operating conditions.

The proposed Automatic Wheel Chair offers a cost-effective, scalable, and energy-efficient assistive solution suitable for home, hospital, and rehabilitation environments. With future enhancements such as obstacle detection sensors, ultrasonic-based collision avoidance, voice command integration, GPS tracking, smartphone application control, and automated path navigation algorithms, the system can be upgraded into a fully autonomous smart

wheelchair aligned with modern healthcare and assistive technology advancements

2. LITERATURE REVIEW

J. Simpson and R. Taylor in year 2016 [1], suggested that electrically powered wheelchairs significantly improve user mobility and reduce physical strain compared to manual wheelchairs. Their study focused on integrating microcontroller-based control systems with DC motor-driven platforms. The research concluded that automated control enhances manoeuvrability and reduces caregiver dependency in indoor environments**.**

M. Brown and L. Davis in year 2017 [2], developed a wireless-controlled wheelchair system using Wi-Fi modules to enable remote navigation through smartphones. The study emphasized that wireless communication eliminates the need for complex wired joysticks and allows flexible operation. Experimental results showed stable connectivity within indoor ranges and reliable response time for directional commands

R. K. Jain and P. Deshmukh in year 2017 [3], presented a study on motor driver circuits used in mobility devices. The researchers explained that motor driver modules act as an interface between low-power microcontrollers and high-current DC motors. Their findings highlighted that proper current regulation and heat dissipation techniques improve motor efficiency and system lifespan

A. Verma and S. Kulkarni in year 2018 [4], proposed a microcontroller-based smart wheelchair with directional control features. The system used four DC motors for balanced movement and better stability. The research concluded that multi-motor configurations distribute load evenly, resulting in smoother turns and improved traction on flat surfaces

P. Raj and M. Nair in year 2018 [5], studied user-interface designs for assistive mobility systems. They emphasized the importance of simple control mechanisms such as mobile-based control panels and web interfaces. Their research indicated that intuitive control systems significantly enhance usability for elderly and disabled users..

3. METHODOLOGY

The methodology of this project focuses on the design, development, and implementation of an IoT-based Automatic Wheel Chair for assisting physically challenged and elderly individuals through wireless mobility control. The system integrates embedded control, motor actuation, wireless communication, and portable power management to achieve smooth and reliable wheelchair movement.

3.1 BlockDiagram
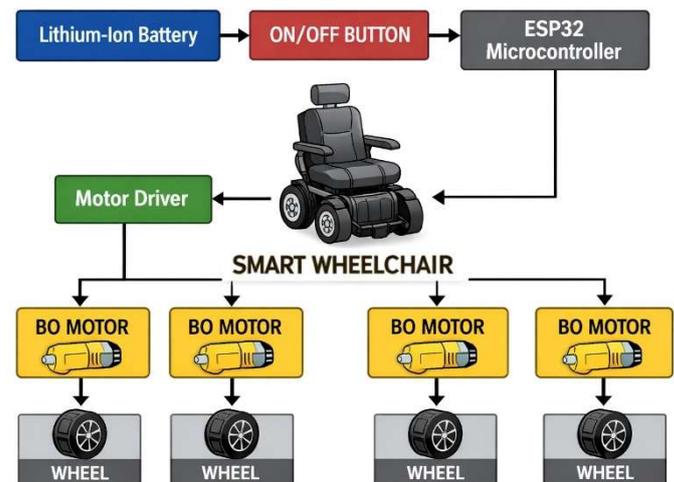
3.2 Circuit Diagram
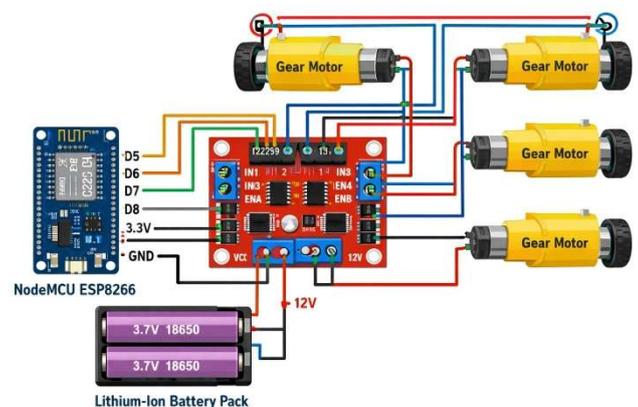
4. Hardware Architecture

Hardware Requirement:-
1. ESP8266 Microcontroller Module
2. Motor Driver Module
3. BO Motors (4 Units)
4. Wheels (4 Units**)**
5. Lithium-Ion Battery
6. Lithium-Ion Battery Holder

7. ON/OFF Switch
8. Foam Sheet (Frame Structure)
9. Connecting Wires
10. PCB / Breadboard
11. Jumper Wires
12. Screws and Mounting Accessories
13. DC Power Jack / Battery Connector
14. LED Indicator (Power Status)
15. Nuts and Bolts for Motor Fixing

6. Applications
• Mobility assistance for elderly people.
• Support system for physically disabled persons.
• Hospitals and rehabilitation centers.
• Indoor navigation assistance.
• Educational and research projects on assistive robotics

7. Future Scope
• Integration of ultrasonic sensors for obstacle detection.
• Addition of speed control using PWM technique.
• Bluetooth-based mobile application control.
• Emergency stop button for enhanced safety
• Battery level monitoring system with display.
• GPS tracking system for user safety.
• Voice control system for hands-free operation. • Stronger metal frame implementation for real-life usage

8. ADVANTAGES
• Reduces physical effort for elderly and disabled persons.
• Provides wireless remote operation through Wi-Fi.
• Simple and user-friendly control system. • Smooth directional control (Forward, Backward, Left, Right, Stop).
• Compact, lightweight, and economical prototype.
• Low power consumption using lithium-ion battery.
• Easy maintenance and simple circuit desi**gn.**

9 LIMITATIONS
• Requires Wi-Fi connectivity for remote operation.
• Battery backup is limited to charging capacity.

• Prototype frame made of foam sheet is not suitable for heavy load.
• Semi-automatic system (requires user control).
• Limited speed and load capacity in current model

8. CALCULATION
By this project, we have successfully developed an Automatic Wheel Chair using the ESP8266, which helps in reducing physical effort and provides independent mobility for physically challenged and elderly persons. The movement of the wheelchair is controlled wirelessly through Wi-Fi communication. The direction and motion of the wheelchair are controlled through programmed instructions given to the ESP8266

This project demonstrates the practical implementation of IoT and embedded systems in assistive technology. It provides a smart, cost-effective, and user-friendly mobility solution for individuals who require assistance in movement.

9. PROTOTYPE MODEL:
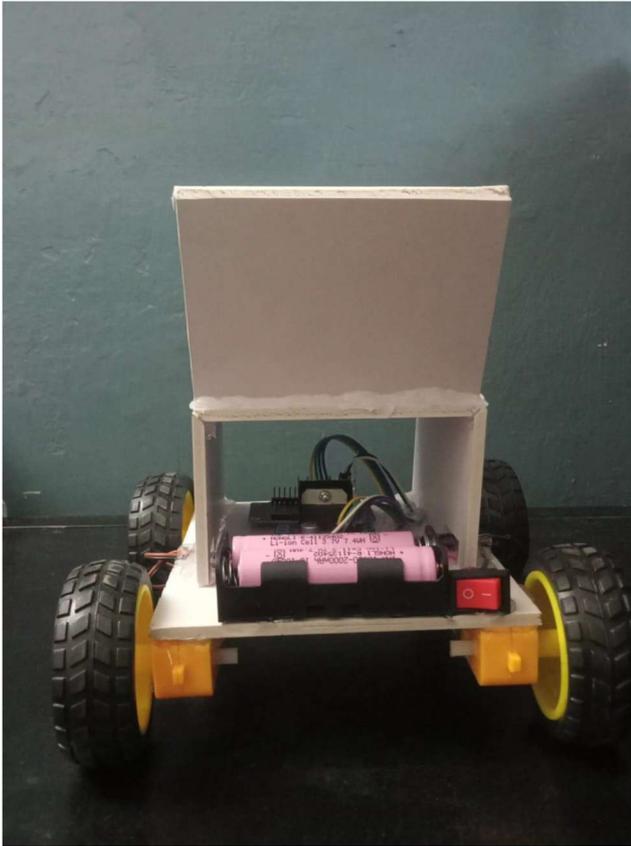
10. REFERENCE

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