

Development of an Eco-Friendly Electric Mobility Vehicle for Physically Challenged Individuals

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Abstract: *The Design and Development of an Electric Mobility Vehicle for Physically Challenged Peoples focuses on creating a safe, affordable, and easy-to-use electric vehicle specially designed for a single handicapped user. The main aim of this project is to help physically challenged people move independently outside their homes without depending on others. In this project, a compact electric mobility vehicle is designed using basic mechanical and electrical concepts. The mechanical design includes fabrication of the frame, steering mechanism, rotating wheels, gears, and proper balancing to ensure stability and comfort for the user. The vehicle is designed to be lightweight and strong so that it can be used on normal roads and pathways. The electrical system uses a rechargeable battery as the power source and an electric motor to drive the wheels. Electrical components such as wires, switches, motor controller, and battery connections are carefully selected and assembled to provide smooth and reliable operation. The vehicle is simple to control, energy-efficient, and environmentally friendly since it runs on electric power. This project aims to provide a low-cost mobility solution that improves the independence, confidence, and quality of life of physically challenged people. The developed electric mobility vehicle can be useful for daily outdoor movement and can be further improved with advanced features in the future.*

Keywords: *Electric Mobility Vehicle, Physically Challenged People, Rechargeable Battery, Electric Motor, Mechanical Design, Fabrication, Steering System, Assistive Technology, Sustainable Transportation*

I. INTRODUCTION

Mobility plays an important role in the daily life of every individual. For physically challenged people, moving from one place to another is often difficult due to physical limitations and the lack of affordable assistive transportation. Many disabled individuals depend on others for short-distance travel, which reduces their independence and confidence. Existing mobility solutions such as manual wheelchairs require physical effort, while advanced electric wheelchairs are expensive and not affordable for everyone.

Electric mobility vehicles provide a practical solution to this problem by using electric power instead of human effort. These vehicles are easy to operate, eco-friendly, and suitable for short-distance travel. With the advancement in battery technology and electric motors, it has become possible to design compact and efficient electric vehicles at a low cost. Such vehicles can significantly improve the quality of life for physically challenged people by allowing them to move independently.

This project focuses on the design and development of a single-person electric mobility vehicle specifically for handicapped users. The vehicle is powered by a rechargeable battery and driven by an electric motor. Mechanical concepts such as fabrication, steering mechanism, gears, rotating wheels, and proper balancing are applied to ensure safety and comfort. Electrical components like battery, motor, wiring, and control switches are integrated to provide



smooth operation. The goal is to develop a simple, reliable, and affordable electric mobility solution for daily outdoor movement.

II. PROBLEM STATEMENT

Physically challenged people face difficulties in independent outdoor movement due to the absence of affordable, easy-to-use, and safe personal mobility vehicles. Existing solutions are either manual and physically demanding or electrically powered but costly and complex. Therefore, there is a need to design and develop a low-cost, battery-powered electric mobility vehicle that is simple to operate, mechanically stable, and suitable for single-person use to support independent movement.

III. LITERATURE SURVEY

Several studies have focused on the development of electric wheelchairs and mobility scooters for disabled individuals. Traditional electric wheelchairs provide powered movement but often involve complex control systems and high manufacturing costs. These designs are mainly suitable for indoor use and may not perform well on uneven outdoor surfaces.

Research on low-cost electric vehicles highlights the use of simple mechanical structures and basic electrical components to reduce cost and maintenance. Many projects suggest the use of DC motors and rechargeable batteries due to their reliability, availability, and ease of control. These systems provide sufficient power for short-distance travel while maintaining energy efficiency.

Some existing designs focus on solar-powered or hybrid mobility vehicles to improve sustainability. However, such systems increase complexity and initial cost. For daily usage, battery-powered electric vehicles remain the most practical and widely accepted solution.

Studies on mechanical design emphasize the importance of proper steering mechanisms, wheel alignment, and gear selection to ensure smooth movement and user safety. A stable chassis and balanced weight distribution are critical for preventing accidents and improving user comfort.

From the literature review, it is clear that there is scope for designing a simple, affordable, and efficient electric mobility vehicle using basic mechanical fabrication and electrical components, specifically targeted at physically challenged users for outdoor mobility.

IV. SYSTEM OVERVIEW

The electric mobility vehicle consists of both mechanical and electrical subsystems working together. The mechanical system includes the vehicle frame, wheels, steering system, gears, and supporting structures. These components are designed to provide stability, smooth movement, and easy handling for the user.

The electrical system includes a rechargeable battery, electric motor, motor controller, wiring, and control switches. The battery supplies power to the motor, which drives the wheels. The user controls the vehicle using simple switches or throttle mechanisms.

The system is designed for single-person use with a focus on safety, comfort, and ease of operation. The vehicle can be used for short-distance outdoor travel such as roads, pathways, and public areas.

V. PROPOSED SYSTEM

The proposed system is a **single-person electric mobility vehicle** designed specifically for physically challenged users. It uses a rechargeable battery and an electric motor to eliminate the need for manual effort. The design focuses on simplicity, affordability, and user safety.

Key Features of the Proposed System:

Mechanical Design

- Strong and lightweight frame fabricated using suitable materials



- Proper steering mechanism for easy turning
- Rotating wheels with good traction and stability
- Gears used to transmit power efficiently from motor to wheels

Electrical System

- Rechargeable battery as the main power source
- Electric motor for driving the vehicle
- Wiring and switches for power control
- Motor controller to regulate speed and direction

User-Friendly Operation

- Simple controls suitable for physically challenged users
- Comfortable seating arrangement
- Low maintenance and easy charging

The proposed system provides an economical and eco-friendly mobility solution that helps physically challenged people move independently and safely. The design can be further enhanced in the future by adding smart features such as obstacle detection or speed control.

VI. WORKING PRINCIPLE

The electric mobility vehicle works on the basic principle of converting electrical energy from a rechargeable battery into mechanical energy using an electric motor. The rechargeable battery acts as the main power source of the system. When the battery is charged, it stores electrical energy which is supplied to the motor through electrical wires and control switches.

When the user switches ON the vehicle or operates the speed control, electrical power flows from the battery to the motor through the motor controller. The motor controller regulates the amount of power supplied to the motor based on user input, allowing smooth control of speed and direction. The electric motor then starts rotating and produces mechanical torque.

This rotational motion from the motor is transmitted to the wheels through a gear mechanism or coupling system. The gears help in reducing speed and increasing torque, which is required to move the vehicle smoothly, especially when carrying the weight of the user. The rotating wheels convert this mechanical energy into linear motion, allowing the vehicle to move forward or backward.

The steering mechanism allows the user to control the direction of the vehicle. By rotating the steering handle, the front wheels change direction, enabling left or right turns. The mechanical structure and proper wheel alignment ensure balance and stability during movement. The braking system helps in safely stopping the vehicle when required.

Overall, the coordinated operation of the battery, motor, controller, gears, wheels, and steering system enables the physically challenged user to move independently with minimal effort. The system is designed to be simple, reliable, and energy efficient for daily outdoor use.



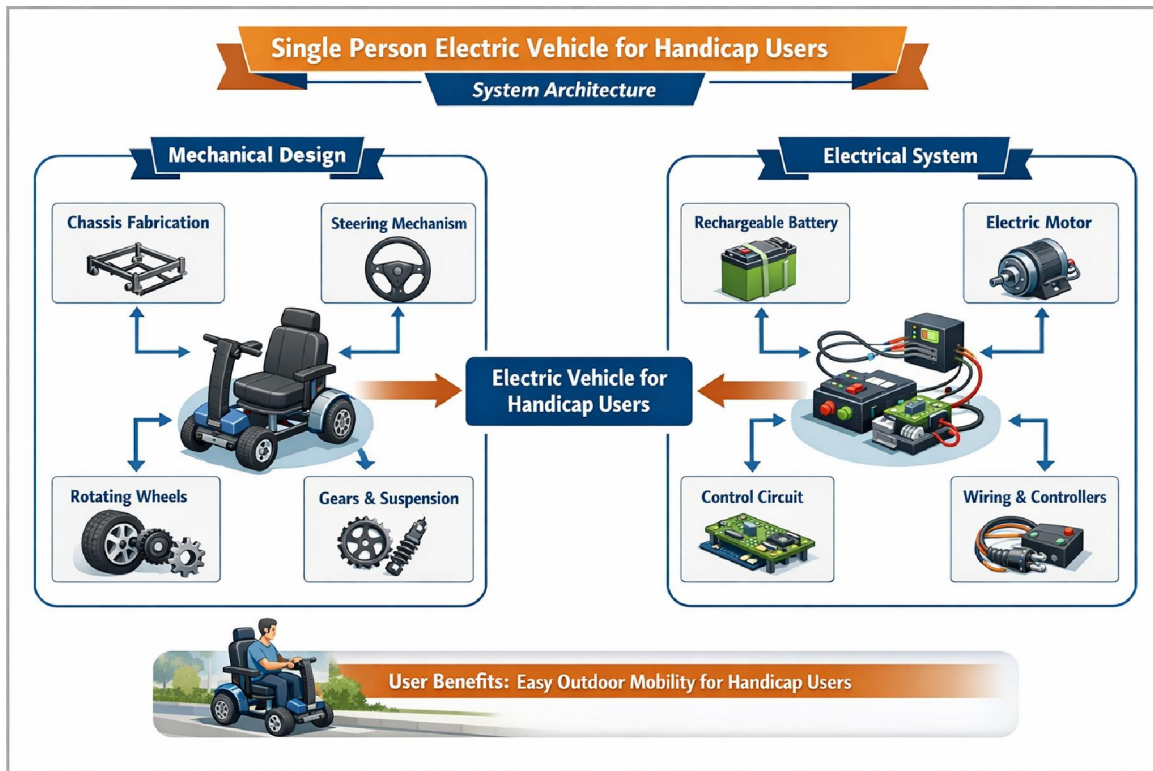


Fig.1: System Architecture Design

VII. CONCLUSION

The Design and Development of an Electric Mobility Vehicle for Physically Challenged Peoples successfully addresses the mobility challenges faced by disabled individuals by providing a simple, affordable, and reliable transportation solution. The project demonstrates the effective integration of mechanical and electrical components such as fabrication, steering mechanism, gears, battery, and electric motor to develop a functional single-person electric mobility vehicle. The developed system improves independence, confidence, and quality of life for physically challenged users by enabling easy outdoor movement without external assistance. The vehicle is eco-friendly, easy to operate, and cost-effective, making it suitable for daily use. In the future, this system can be further enhanced by incorporating advanced safety and smart features to increase usability and performance.

Future Work:

- Advanced control methods such as joystick, voice control, or mobile app control can be added to make the vehicle easier to operate for users with severe disabilities.
- The existing battery system can be upgraded to lithium-ion batteries to increase driving range, reduce charging time, and decrease overall vehicle weight.
- Safety features like obstacle detection sensors, automatic braking, GPS tracking, and emergency alert systems can be integrated for safer outdoor usage.
- Comfort can be improved by adding better suspension, ergonomic seating, and weather protection, making the vehicle suitable for long-term use.
- The design can be optimized for mass production at low cost, helping make the electric mobility vehicle affordable and accessible to a larger number of physically challenged people.



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