

Design and Development of an Electric Mobility Vehicle for Physically Challenged Peoples

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Abstract: *Mobility is one of the major challenges faced by physically challenged individuals in their day-to-day life, especially when moving independently outside their homes. Many existing mobility solutions are either costly, complex to operate, or not suitable for short-distance outdoor travel. The Single Person Electric Vehicle for Handicap Users is designed to provide a safe, affordable, and user-friendly transportation solution that enables physically challenged users to move comfortably and independently. This project focuses on developing a compact electric vehicle that can be easily operated by a single person with minimal physical effort. The proposed system integrates both mechanical design and electrical systems to achieve smooth and reliable operation. The mechanical structure is designed using lightweight materials and includes components such as a strong frame, rotating wheels, steering mechanism, gears, and proper balancing support to ensure stability and safety. Special attention is given to ergonomic design so that users can operate the vehicle comfortably. On the electrical side, the vehicle is powered by a rechargeable battery connected to an electric motor that drives the wheels through a suitable transmission mechanism. Basic electrical components such as motor controllers, wiring, switches, and safety circuits are used to ensure efficient power delivery and easy control. This project aims to improve the quality of life for handicap users by offering an eco-friendly, low-maintenance, and easy-to-use electric mobility solution. The designed vehicle can be used for short-distance travel such as moving within residential areas, campuses, hospitals, or nearby markets. Overall, the project demonstrates how mechanical fabrication and electrical integration can be combined effectively to develop a practical assistive mobility device that promotes independence, accessibility, and social inclusion for physically challenged individuals.*

Keywords: Electric Vehicle, Rechargeable Battery, Handicap Users, Mechanical Design, Fabrication, Hardware Components, Gears, Steering, Rotating Wheels, Electrical Components Battery, Motor, Wires, etc

I. INTRODUCTION

Mobility plays a very important role in the daily life of every individual. For physically challenged or handicap users, moving from one place to another without assistance is often difficult due to physical limitations. Many people depend on wheelchairs or others for support, which reduces independence and confidence. Although motorized wheelchairs and electric scooters are available in the market, they are often expensive, bulky, and not easily affordable for common users. Hence, there is a strong need for a simple, low-cost, and easy-to-operate electric vehicle specially designed for handicap users.

The Single Person Electric Vehicle for Handicap Users is developed to address this need by providing a compact and efficient mobility solution. The main objective of this project is to design and fabricate an electric vehicle that allows a physically challenged person to move independently for short-distance travel. The vehicle is designed for smooth



operation, safety, and comfort using basic mechanical and electrical components. It helps users to travel outside their homes, such as to nearby shops, parks, hospitals, or residential areas, without depending on others.

This project combines mechanical design and electrical systems to create a functional and user-friendly vehicle. Mechanical concepts such as frame fabrication, wheel rotation, steering mechanism, gears, and balancing are used to provide stability and strength. Electrical components such as rechargeable batteries, DC motor, wiring, switches, and control systems are used to power the vehicle. The integration of these systems ensures reliable performance, energy efficiency, and ease of control, making it suitable for handicap users.

II. PROBLEM STATEMENT

Physically challenged individuals face difficulty in independent mobility due to limited physical strength and lack of affordable mobility solutions. Existing electric wheelchairs and scooters are often expensive, heavy, and complex to operate. There is a need for a cost-effective, lightweight, and easy-to-use single person electric vehicle that provides safe and independent mobility for handicap users in daily life.

III. OBJECTIVES OF THE PROJECT

- To design and develop a single person electric vehicle that supports independent mobility for physically challenged users.
- To integrate mechanical and electrical systems for smooth, safe, and reliable vehicle operation.
- To use rechargeable battery and electric motor for eco-friendly and energy-efficient movement.
- To design a simple steering and control mechanism that requires minimal physical effort.
- To ensure user safety and comfort through proper vehicle stability and ergonomic design.
- To reduce overall cost so that the vehicle is affordable for common users.

IV. PROPOSED SYSTEM

The proposed system is a compact single person electric vehicle specially designed for handicap users. The vehicle consists of a strong mechanical frame that supports the user's weight and provides stability during movement. The frame is fabricated using lightweight yet durable materials to reduce the overall weight of the vehicle. Rotating wheels, gears, and a steering mechanism are designed to allow smooth direction control and easy turning with minimal effort. The vehicle is designed to maintain balance even on uneven surfaces.

On the electrical side, the vehicle is powered by a rechargeable battery that supplies energy to a DC motor. The motor is connected to the wheels using a mechanical transmission system to provide controlled speed and torque. Electrical components such as switches, wires, motor controller, and safety circuits are included to ensure smooth power flow and safe operation. The user can control the movement of the vehicle using simple switches or controls, making it easy to operate even for users with limited hand strength.

The proposed system is designed to be user-friendly, eco-friendly, and cost-effective. It reduces dependency on others and improves the confidence and independence of handicap users. The vehicle is suitable for short-distance travel and daily use in residential areas, campuses, hospitals, and public places.

V. PROPOSED SYSTEM DIAGRAM

The block diagram of the system consists of major components such as the rechargeable battery, motor, motor controller, mechanical transmission, wheels, and steering mechanism. The battery acts as the main power source and supplies electrical energy to the motor controller. The controller regulates the speed and direction of the motor based on user input. The motor converts electrical energy into mechanical energy, which is transferred to the wheels through gears or a shaft mechanism. The steering system allows the user to control the direction of the vehicle, while the mechanical frame supports the entire structure and ensures stability.



The working principle of the single person electric vehicle is simple and efficient. When the rechargeable battery is charged and the power switch is turned ON, electrical energy flows from the battery to the motor through the controller. Based on the user's input, the motor starts rotating and drives the wheels. The rotation of the wheels moves the vehicle forward or backward. The steering mechanism allows the user to change direction easily by turning the front wheels or steering handle. The mechanical structure ensures balance and safety during movement. The vehicle continues to operate until the battery power is exhausted, after which the battery can be recharged for further use.

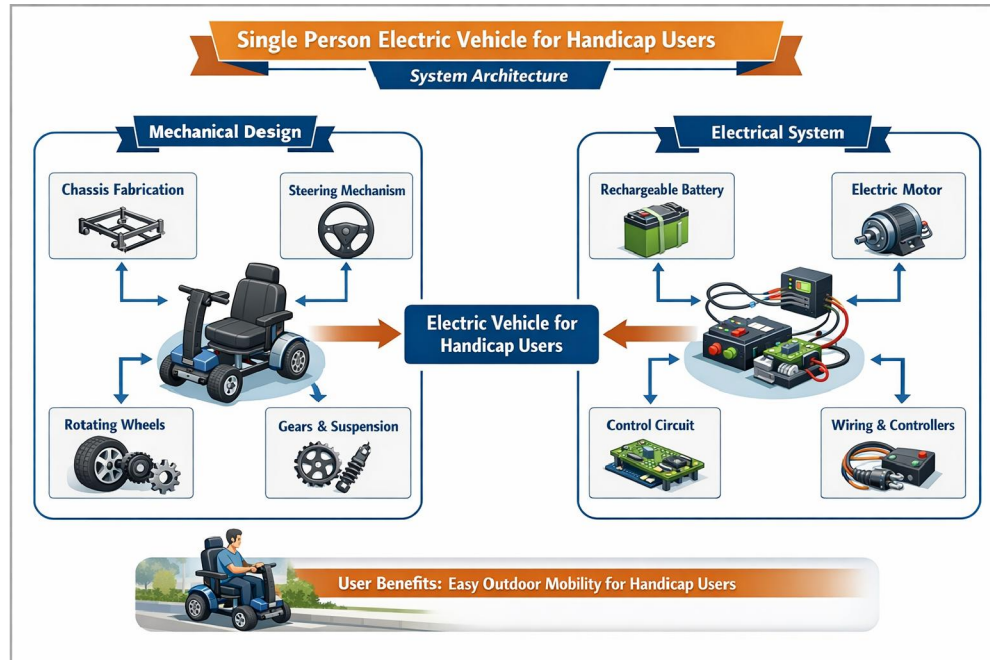


Fig.1: System Architecture Design

The system architecture of the Single Person Electric Vehicle for Handicap Users is designed by integrating electrical control units with mechanical components to provide safe, smooth, and independent mobility. The user input unit, such as a throttle or control switch, allows the user to control the speed and movement of the vehicle. This input is processed by a control unit (Arduino or controller), which acts as the brain of the system and decides how the vehicle should respond.

The controller sends signals to the motor driver or relay, which controls the power flow to the DC motor. The motor converts electrical energy into mechanical motion. This motion is transmitted through mechanical components such as gears, shafts, and axles, enabling efficient torque transfer. The steering mechanism and wheels ensure smooth turning and stable movement of the vehicle.

A rechargeable battery supplies power to all electrical components, making the system eco-friendly and cost-effective. Additional safety and indication units, such as buzzers and LEDs, provide alerts and system status to ensure safe operation. Overall, this architecture combines mechanical strength with electrical intelligence to deliver a reliable mobility solution for handicapped users.

VI. CONCLUSION

The Single Person Electric Vehicle for Handicap Users is a practical and affordable solution to improve mobility and independence for physically challenged individuals. By combining mechanical fabrication and electrical components, the project successfully demonstrates a functional electric vehicle that is easy to operate, safe, and energy efficient. The system reduces dependency on others and enhances the quality of life of users by allowing them to move freely and



confidently. This project highlights the importance of assistive technology and shows how engineering solutions can positively impact society.

Future Work:

- Integration of speed control and braking systems
- Addition of solar charging support
- Use of lightweight composite materials to reduce weight
- Incorporation of smart controls or joystick operation
- GPS tracking and safety alert systems
- Improved battery capacity for longer travel distance.

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