



DESIGNING AND FABRICATION OF FOUR WHEELED ELECTRIC VEHICLE BY USING BLDC MOTOR

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ABSTRACT:

This paper presents the design and fabrication of a four-wheeled electric vehicle powered by a 350W Brushless DC (BLDC) motor, aimed at providing an efficient, eco-friendly, and cost-effective transportation solution. The system integrates electrical, mechanical, and control components including a battery, motor driver, control unit, and four-wheel chassis. The BLDC motor is selected due to its high efficiency, low maintenance, and superior torque characteristics. The vehicle is designed to achieve smooth motion, improved energy efficiency, and reduced environmental impact. Experimental results demonstrate reliable performance in terms of speed, load handling, and energy consumption. The proposed system contributes to sustainable transportation by reducing dependence on fossil fuels and minimizing emissions.

KEYWORDS:

ELECTRIC VEHICLE, BLDC MOTOR, ENERGY EFFICIENCY, SUSTAINABLE TRANSPORTATION, MOTOR CONTROL, BATTERY SYSTEM, FOUR-WHEEL DRIVE, ELECTRIC MOBILITY, GREEN ENERGY.

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INTRODUCTION

Transportation plays a vital role in modern society, supporting economic growth and daily activities. However, conventional vehicles powered by internal combustion engines (ICE) contribute significantly to environmental pollution and depletion of fossil fuels [1]. The increasing demand for clean and sustainable energy solutions has led to the development of electric vehicles (EVs) [2].

Electric vehicles operate using electrical energy stored in batteries, offering higher efficiency and zero emissions compared to traditional vehicles [3]. Recent advancements in battery technology and motor control systems have improved EV performance and reliability [4]. Among various motor types, BLDC motors have gained popularity due to their high efficiency, low maintenance, and long lifespan [5].

Four-wheel drive systems provide improved stability and traction, making them suitable for various terrains [6]. Battery technologies such as lithium-ion batteries offer high energy density and longer life cycles, enhancing vehicle performance [7]. Control systems play a crucial role in regulating speed, direction, and safety of EVs [8].

Despite these advancements, challenges such as high cost, limited battery capacity, and complex control systems still exist [9]. Therefore, there is a need to develop a simple, cost-effective, and efficient electric vehicle system [10].

This paper focuses on the design and fabrication of a four-wheeled electric vehicle using a BLDC motor to address these challenges.

MATERIALS AND METHODS:

The proposed system was developed by integrating mechanical, electrical, and control components into a unified electric vehicle platform. The system consists of a battery as the primary power source, a motor driving circuit, a 350W BLDC geared motor, a control unit, and a four-wheel chassis. The battery supplies electrical energy to the motor driver, which regulates the speed and direction of the BLDC motor based on control signals. The motor converts electrical energy into mechanical motion, which is transmitted to the wheels through a gear-based transmission system to achieve efficient torque and movement.

The mechanical design includes a sturdy chassis that supports all components and ensures stability, along with a four-wheel arrangement that improves balance and load handling. The electrical system comprises wiring, switches, and connectors to ensure proper power distribution and control. The control system manages vehicle operations such as start, stop, forward, reverse, and speed regulation using techniques like Pulse Width Modulation (PWM). The entire system was assembled, tested, and evaluated under

different operating conditions to ensure proper functionality and performance.

RESULTS:



FIG. 1: FABRICATED FOUR-WHEELED ELECTRIC VEHICLE USING BLDC MOTOR

The fabricated four-wheeled electric vehicle was tested to evaluate its performance under various operating conditions. The system demonstrated smooth movement, stable operation, and efficient energy utilization. The BLDC motor provided sufficient torque for vehicle movement and load handling. The vehicle achieved reliable speed control and directional movement using the motor driving circuit.

The performance analysis showed good battery efficiency and stable power delivery during operation. The system also exhibited low noise and vibration levels, making it suitable for practical applications. The overall prototype of the developed electric vehicle is shown in **Fig. 1**, illustrating the integration of motor, battery, chassis, and control components. The results confirm that the system operates efficiently with improved performance compared to conventional small-scale vehicles.

DISCUSSION:

The developed system successfully demonstrates the feasibility of using a BLDC motor for electric vehicle applications. Compared to conventional motors, the BLDC motor offers higher efficiency, reduced maintenance, and better performance. The four-wheel design enhances stability and load-carrying capability.

The system is cost-effective and suitable for small-scale applications such as campus transport and short-distance mobility. However, limitations such as battery capacity, speed constraints, and charging time affect overall performance. Future improvements can include advanced battery technologies, regenerative braking, and smart control systems.

CONCLUSIONS:

This paper presents the design and fabrication of a four-wheeled electric vehicle using a BLDC motor. The system achieves efficient performance, reduced environmental impact, and improved energy utilization. The integration of mechanical and electrical systems ensures reliable operation and stability. The developed prototype demonstrates the potential of electric vehicles as a sustainable alternative to conventional transportation. Future enhancements can further improve performance, efficiency, and scalability for real-world applications.

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