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Design and Development for Electric Vehicle

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ABSTRACT

In today's life vehicles are important factor. But due to environmental impact there is limitation of utilization of conventional vehicle. Places like airport, hospital, college campus gasoline vehicles are ban because of pollution. We observe the difficulties of old people, physical handicap and patients in public places. To avoid such problem electrical vehicle play important role. Generally, we preferred electric cars which is driven by battery powered electric motor. Those vehicle are manufactured for above concern. The numbers of electric vehicles are increasing day by day because of environmental concern and high gasoline price. In this paper we focus on electrical tri wheeler. For this tri wheeler 48V li-on battery is used and it is driven by BLDC motor. The number of electrical vehicles (EVs) on the road has increased in recent years, including battery-electric vehicles (BEV), hybrid-electric vehicles (HEV), plug-in hybrid-electric vehicles (PHEVs).In this current EV technology.

Keywords: Chassis, BLDC motor, BLDC motor controller, Battery, Throttle, Brakes

I. INTRODUCTION

In our world the energy conservation and environmental protection are growing rapidly, this development is fulfilled by Electrical Vehicle technology. These vehicles are able to provide emission free environment in urban transportation. Even we can consider conservation in power plant emission which produce fuel for gasoline vehicle. The use of electrical vehicle automatically reduce global air pollution. Therefore, electrical vehicle creates good impact on transportation, environmental, economic aspects as well as give contribution in development of technology. Therefore, design and fabrication of electrical vehicle has become a major concern. Battery operated vehicle eliminate need of fuel and thus becomes economical. It gives silent operation which reduce noise pollution as well. As design of vehicle gives us idea about looks and geographical structure. does in not add to any of the haze that contributes to the city's highly filthy air.

Electrical Vehicle

Electric vehicles are classified as

- BLDC motors are similar to traditional DC motors but do not use brushes for commutation. Instead, they rely on electronic controllers to switch the current in the motor windings. They offer several advantages over brushed DC motors, including higher efficiency, longer lifespan, and reduced maintenance requirements due to the absence of brushes.

- BLDC motors are known for their smooth and quiet operation, making them well-suited for electric vehicle applications where noise reduction is desirable.They are often used in electric bicycles, scooters, and some smaller electric vehicles due to their compact size, high power density, and efficiency.Overall, BLD motors are a popular choice for electric vehicles, particularly in applications where compact size, high efficiency, and low maintenance are important considerations.
- BLDC motors are known for their high efficiency, typically ranging from 85% to over 90%. They also offer high power density, meaning they can deliver a lot of power relative to their size and weight. This makes them well-suited for electric vehicles where space and weight considerations are critical. In an electric vehicle various components like motor, battery, controllers are used. While designing an electric vehicle, the first and foremost component to be selected is an electric motor which replaces the Internal Combustion engines of conventional vehicles

II. LITERATURE SURVEY

Paper 1: Afroz (2015) and his colleagues published a study to investigate how individual values and attitudes influence consumers' purchasing intentions for electric vehicles. Customers from Malaysia
are the focus of the study. Individual consequences (ICNs), such as measures of convenience, product size range, and perceived utility, were found to be adversely connected to green purchasing intention in the study (PIN). While consumers consider fuel efficiency, consumption, and comfort of a car when making a purchasing decision, they may choose an electric vehicle if the manufacturer

Paper 2: Craig Morton (2016) and co-authors observed the impact of consumer innovation as well as perceptions of electric vehicle functional capabilities on customer demand for electric vehicles in their study on consumer preferences for electric vehicles.

Paper 3: Nazneen (2018) and co-authors aimed to identify customer perceptions of EV benefits in terms of the environment, car cost, comfort, trust, technology, infrastructure, and social acceptance in their study. Consumers are fully aware of the benefits to the environment. More infrastructure facilities are needed by the government. Governments and manufacturers must invest to shape consumer perceptions and deliver the expected characteristics.

Paper 4: Karwa (2016) in his study comes up with the idea of educating the electric vehicle dealers and providing training. The hurdle to accept electric vehicle is to transfer knowledge from dealer to customer. The dealer sales staff is the main direct contact with the customer. The dealership personnel were able to better comprehend the value proposition of electric vehicles as a result of their regular use, and they were able to engage with potential customers. The service area and the front of the dealership should both have electrical infrastructure installed. Dealership staff should be trained on EVSEs on a regular basis. Multimedia tools and streamlined one-page sales papers that show EV fuel savings, local incentives, and advantages should be included in training.

Helmus (2016) explores result and performance metrics to aid policymakers in optimizing the rollout of charging infrastructure; enhancing the business case in his research is a key performance indicator of charging infrastructure. Performance measurement is essential for a successful charging infrastructure rollout and operation. This involves the development of key result indicators (KRIs) and key performance indicators (KPIs), which provide policymakers with data to use in their interactions with stakeholders and projects. To extract appropriate KPIs, a two-step technique was used: first, policymakers' stakeholders were analysed (resulting in a set of objectives and result indicators), and then these objectives were translated into KPIs.

Motor Controller

Motor control in electric vehicles, especially with BLDC (Brushless DC) motors, involves sophisticated systems to manage speed, torque, efficiency, and overall performance. Here's some detailed information about motor control in the context of BLDC motors BLDC motors are typically controlled by electronic speed controllers (ESCs). ESCs manage the timing and sequencing of current pulses to the motor windings to control speed and direction. They also incorporate feedback mechanisms to ensure precise motor control and stability. Many modern BLDC motor control systems operate in a sensor less manner, relying on the back electromotive force (EMF) generated by the motor to determine rotor position. This eliminates the need for position sensors, simplifying the motor design and reducing cost. FOC is a common control technique used to optimize the performance of BLDC motors. It involves controlling the stator currents in such a way that the magnetic field produced by the stator aligns with the rotor flux, maximizing torque production and efficiency. FOC allows for smooth and precise control of motor speed and torque across a wide range of operating conditions. Closed-loop control systems utilize feedback from sensors (such as encoders or Hall effect sensors) to continuously monitor and adjust motor performance in real-time. This ensures accurate speed and position control, as well as stability and reliability under varying load conditions. BLDC motors are often used in regenerative braking systems, where they function as generators to convert kinetic energy into electrical energy during braking. transition between motoring and generating modes seamlessly, optimizing

III.PROPOSED SYSTEM

Problem Statement: Motor selection

- Rating
- Torque.

Fabrication

- Size Selection.
- Weight.
- Speed Torque.
- Torque Ratio.

A. Motor selection

The first step in selecting a BLDC driver is to determine what type of architecture is suited for an application. Architectures range from integrated drivers for low- to mid-power applications up to gate drivers enabling multi-kW motor drive systems. In addition, BLDC portfolio offers integrated control drivers for both sensored and sensor less sinusoidal and trapezoidal control. illustrates the various motor driver architectures in BLDC portfolio such as gate drivers, integrated drivers and sensored vs sensor less integrated control. Weight, Front area, Maximum Speed requirement, Maximum Torque, Maximum Power, and Gradeability.

B. Block Diagram

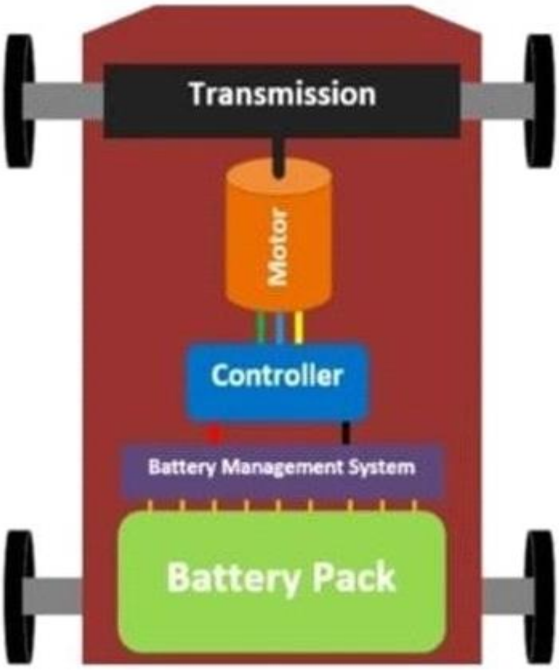

Figure 1: Block Diagram

C. Hardware Requirement

- Fabrication
- BLDC Rotor
- BLDC Stator

D. Fundamental Steps for System

1) System Requirements Analysis: Define the electrical specifications of the electric vehicle system, including voltage levels, power ratings, efficiency targets, etc. Identify the control and conversion requirements such as motor control, battery charging, power factor correction, etc.
2) Motor Selection: Choose an appropriate BLDC motor based on factors such as power output, torque characteristics, size, weight, and efficiency. Considerations also include the motor's voltage and current ratings, as well as its compatibility with the vehicle's power requirements.
3) Control System Development: Develop control algorithms for the BLDC motor system to ensure smooth acceleration, deceleration, and overall vehicle performance. This includes implementing closed-loop feedback control for speed and torque regulation, as well as algorithms for field-oriented control (FOC) or other advanced control techniques to maximize efficiency and torque output.
4) Integration and Testing: Integrate the BLDC motor, motor controller, battery pack, and control system into the vehicle's chassis. Perform thorough testing to validate system performance, efficiency, and safety under various operating conditions, including acceleration, braking, and thermal stress. By following these fundamental steps, you can design and implement a reliable and efficient electrical vehicle motor system based on a BLDC motor.

IV. RESULTS

- Length Of vehicle = 2133mm

Bigger exterior dimensions give a car a stronger road presence. A wider car also usually provides better shoulder room for near passengers.

- Width Of Vehicle = 1524 mm
- Height Of Vehicle = 1219mm
- Ground Clearance Of Vehicle= 180mm

A higher ground clearance makes it easier to go tall speed breakers or drive borne roads without scrapping and damaging the cars under by

- Mass Of Vehicle = 600 kg
- Speed Of Motor = 2616.33 rpm
- Motor Test Parameters

TABLE I PARAMETER

Sr. No	Voltage (V)	Current (A)	Speed (RPM)	Torque (Nm)	Power (W)
1	50.5	3.5	3000	0.06	35
2	50	5.8	2977	0.74	217.2
3	49.5	12.32	2964	1.26	450
4	49	15.78	2953	2.14	632.6
5	48.5	22.9	2949	2.53	792
6	48	25.8	2944	3.28	857
7	47.5	30.5	2939	3.53	925
8	47	34.7	2937	3.97	1049
9	46.5	39.18	2931	4.43	1463
10	46	42.8	2927	4.9	1783
11	45.5	48.6	2922	5.18	1910

A. Input Location :

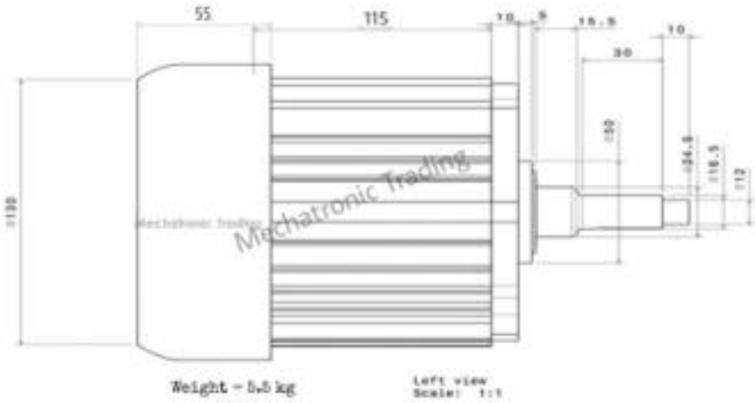

Figure 2: Input Page

B. Output Page

Figure 3: DC Motar

V. RESULT DISCUSSION

- Performance Evaluation: Assess the performance of the fabrication and motor in terms of motor drive efficiency, power use by motor efficiency, and overall system responsiveness. Discuss how well the control algorithms achieve desired objectives such as torque control, speed regulation, and motor management. Present experimental data or simulation results to illustrate the system's dynamic response under different operating conditions (e.g., acceleration, deceleration, steady-state driving).
- Maximum speed: The maximum speed of an electric vehicle (EV) depends on various factors including the vehicle's design, motor power, battery capacity, and regulatory limits. Many electric cars currently available on the market can achieve speeds comparable to traditional gasoline-powered vehicles, with some high-performance EVs reaching speeds of over 200 miles per hour (320 kilometers per hour). However, most consumer EVs have maximum speeds that typically range between 80 mph (130 km/h) to 155 mph (250 km/h), depending on the model and manufacturer.
- Speed Torque and RPM: In a brushless DC (BLDC) motor used in electric vehicles, speed, torque, and RPM (revolutions per minute) are interrelated parameters that determine the motor's performance.The relationship between speed, torque, and RPM in a BLDC motor can be described by the motor's torque-speed characteristics, which typically show that torque decreases as speed increases and vice versa. However, this relationship can vary depending on factors such as the motor design, operating conditions, and control algorithms implemented in the vehicle's powertrain system.
- Design With Agriculture Requirements: Fabrication of such an electric agricultural vehicle involves integrating these design considerations into the chassis, powertrain, and overall vehicle architecture Collaboration with agricultural experts, engineers, and farmers during the design and fabrication process can ensure that the final product meets the practical needs and expectations of users in the agricultural sector. Designing an electric vehicle (EV) for agricultural use involves several considerations to meet the specific requirements of farming and agriculture. Here are some aspects to consider:

VI. CONCLUSION

In conclusion, electric vehicles offer a promising solution to reduce emissions, improve air quality, and decrease dependence on fossil fuels. While challenges such as range anxiety and infrastructure development exist, ongoing advancements in technology and supportive policies are driving the growth of the EV market. With continued innovation and widespread adoption, electric vehicles have the potential to play a significant role in creating a cleaner and more sustainable transportation future. the fabrication of electric vehicle motors represents a crucial step towards sustainable transportation. By harnessing advanced technology

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