



Compact Electric vehicle

Mini compact EV with compact features and compact size

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Abstract : India's EV sector is experiencing significant growth, accompanied by certain challenges. Our innovative approach aims to mitigate these drawbacks. Our focus is on compact mini electric vehicles, particularly a 3-wheeler, 2-seater design, which is well-suited for both urban and rural settings. Leveraging a cost-effective business model, our solution addresses parking constraints in congested cities by requiring minimal parking space. This design is also ideal for delivery personnel like Flipkart, Zomato small businesses and short-distance commuting for families, including older individuals aged 60 and above.

Urban areas grapple with limited parking space, and this is where our approach shines. Our compact EV design requires minimal parking space, effectively addressing one of the most pressing issues in crowded cities. This innovation not only optimizes parking solutions but also opens avenues for sustainable urban planning and infrastructural development. Designed for urban and rural settings, they tackle parking issues, benefit short commutes, deliveries, and cater to elderly and small business needs. This inventive approach promises to reshape India's transportation landscape.

IndexTerms - Electric Vehicles (EVs), Compact Mini Vehicles, 3-Wheeler Design, 2-Seater Design, Urban Mobility, Rural Mobility, Cost-Effective Business Model, Parking Constraints, Minimal Parking Space Requirement, Delivery Services, Short-Distance Commuting, Elderly Mobility, Sustainable Urban Planning, Infrastructural Development, Transportation Landscape Reshaping.

I. INTRODUCTION

India's electric vehicle (EV) market is expanding at an astonishing rate thanks to government incentives, rising environmental consciousness, and technology improvements. Nevertheless, despite its rapid expansion, the industry confronts a number of difficulties, such as a shortage of parking spaces in crowded cities and the requirement for reasonably priced, effective transportation options that can serve a wide range of demographics.

This research study presents "Electri 1.0," a small electric car that is intended to meet the unique requirements of urban and rural inhabitants in India, as a solution to these problems. The 3-wheeled, 2-seater Electri 1.0 is a versatile solution that may be used for a variety of purposes, such as delivery services and short-distance commuting. Electri 1.0 uses an economical business strategy to minimize the amount of parking space needed, which helps to alleviate parking issues in densely populated cities. This function is especially important in metropolitan locations where parking availability is a major obstacle to both urban planning and mobility.

Additionally, the architecture of Electri 1.0 accommodates the changing requirements of various user groups, such as families and senior citizens (60 years of age and above) as well as delivery workers from businesses like Flipkart and Zomato. It provides convenience and accessibility to people of all ages and is a great option for navigating crowded metropolitan streets due to its small size and simplicity of maneuvering.

By encouraging sustainable urban design and infrastructure development, Electri 1.0 has the potential to change India's transportation landscape in addition to meeting the country's immediate requirements. This creative strategy opens the door for a more sustainable and effective transportation system in India by maximizing parking options and lowering traffic jams.

II. LITERATURE REVIEW

India's electric vehicle (EV) market is growing at a rapid pace, which is indicative of a global trend toward environmentally conscious and technologically advanced sustainable transportation options. The purpose of this review of the literature is to place the introduction of small, compact electric cars, like the Electri 1.0, in the larger context of EV development and urban mobility issues in India.

The dynamics of the electric vehicle (EV) market in India have been the subject of numerous research. These studies have highlighted the elements that impact consumer acceptance, government legislation, and industry trends. According to current research, the EV Market size is of 3.21+ Billion USD with the expected growth of 7.09+ Billion USD till 2025 and 113.99+ Billion USD till 2029. Consumer awareness campaigns, infrastructural development, and government incentives all have a significant impact in the nation's EV adoption. Currently about 1.46+ Million EV had been sold in India with the Average pricing of 1.5 L to 3L Rupees. These observations offer insightful background information for comprehending how changing market and regulatory factors are influencing the demand for small electric.

EV 3-Wheeler Cargo Market has also been expanding quickly. Sales for 2023–24 are estimated to be 1,01,499+ units, with an additional 10,67,985 units anticipated through 2030. In India, the average cost of a three-wheeler cargo vehicle ranges from approximately 3 to 5 lakhs for reputable brands, and from approximately 2 lakhs for local brands and regional workshops. This kind of electric vehicle has a usual range of 80–150 km, an average charging time of 4 hours, and a load carrying capability of 200–300 kg.

A. Mini Compact Electric Vehicles' Advantages

- 1) metropolitan Mobility & Parking Solutions: Smaller size facilitates simpler navigation and mobility in crowded metropolitan settings.
- 2) Addresses a significant issue in Indian cities by requiring the least amount of parking space.
- 3) Advances infrastructure development and better urban planning for environmentally friendly transportation.

B. Applications and Target Audience:

- 1) Perfect for drivers making short-distance city deliveries (e.g., Flipkart, Zomato).
- 2) Ideal for families' and individuals' short-distance commuting needs, especially those of senior citizens (60 years of age and older), who may find it difficult to operate larger vehicles.
- 3) Meets the demands of SMEs and small enterprises for affordable and effective transportation.

C. Taking Up the Indian EV Sector's Challenges:

- 1) Cost-Effectiveness: To address the greater initial cost barrier for EVs compared to standard vehicles, the research study suggests a cost-effective business plan for the Electri 1.0. The following areas can be looked into in more detail: Production and material cost reduction techniques.
- 2) Mini-compact EVs are eligible for government incentives and subsidies.
- 3) To cut initial battery expenditures, consider leasing batteries or switching to different models.

III. METHODOLOGY

To design our Mini Compact Electric vehicle Electri 1.0. The methodology consists the list of Components, Chassis Design, and Block Diagram, Final Prototype.

A. List of Components:-

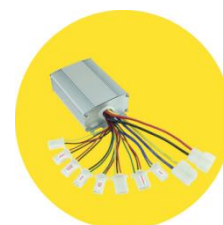
- 1) BLDC Motor –



This 48-volt BLDC motor, drawing 13.5 amperes, boasts a rated torque of 15.36 Nm, making it ideal for applications requiring robust power output. With a load capacity of up to 350 kg, it excels in powering electric vehicles, industrial machinery, and robotics with efficiency and reliability.

- 2) Battery Management System (BMS) –

The Battery Management System (BMS) specified operates within a temperature range of 0 to 50 degrees Celsius, ensuring optimal performance in various environmental conditions. Designed for 48-volt systems and drawing 13.5 amperes, this BMS provides efficient and reliable management of battery packs in electric vehicles and other applications.



3) Lead-Acid Battery –

The Lead Acid Battery specified operates at 12 volts and has a capacity of 30 Ah, making it suitable for various applications. With a power output of 1.5 kW, this battery provides reliable energy storage for electric vehicles, backup power systems, and renewable energy installations.



4) Charger –

The EV charger specified operates at 48 volts and delivers a charging current of 12 amps, facilitating efficient charging for electric vehicles. With its compatible voltage and current rating, this charger ensures quick and reliable charging, supporting the seamless integration of electric vehicles into various charging infrastructure networks.



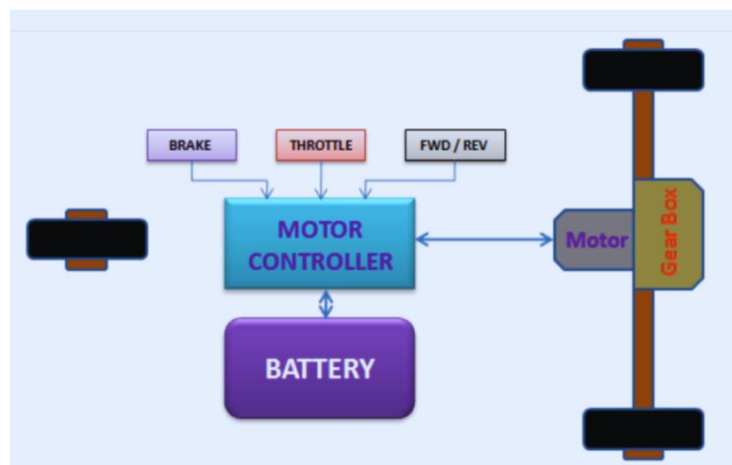
B. Chassis design



The selected rear-wheel-drive system powers the vehicle's back wheels directly, ensuring maximum traction and performance. This layout improves handling and stability of the vehicle, which makes it perfect for electric vehicles, particularly on rough terrain or off-road situations. Furthermore, the rear-wheel-drive configuration distributes weight evenly, which enhances driving dynamics and efficiency.

C. Block Diagram

B L O C K D I A G R A M



D. Final Prototype

**IV. RESULTS**

Based on the real life testing of the Electri 1.0 the specification sheet is given below,

A. Performance

- 1) Expected theoretical Range: - 35 to 40 km
- 2) Total power: - 105 kW (141 hp, 143 Ps)
- 3) Total torque: - 15.36 Nm
- 4) Drive: - Rear Wheel Drive

B. Motor specifications

1. Motor used: - BLDC Motor
2. Voltage: - 48 V
3. Current: - 13.5 A
4. Torque: - 15.36 Nm

C. Battery

1. Battery used: - lead ACID battery
2. Voltage of single battery: - 12 V
3. Am-hour: - 30 Ah
4. Battery Capacity: - 1.5 kWh

D. Charging system

- 1) Normal Charging port: - (230V / 16A)

Charging time: - 4.5 hours

E. Dimensions and weight

- 1) Length: - 6 FEET
- 2) Width : - 3 FEET
- 3) Height: -6 FEET
- 5) Payload: - 400 kg
- 6) Gross weight: - 118 kg

V. CONCLUSION

In conclusion, Electri 1.0 offers a ground-breaking answer to India's transportation problems. Its compact design solves important problems such as parking restrictions and short-distance commuting, meeting the needs of both urban and rural areas. It revolutionizes mobility and supports India's environmental aims by fostering inclusivity and sustainability. The possibility for Electri 1.0 to lessen traffic and dependency on fossil fuels represents a big step in the direction of a cleaner future. To optimize its societal impact and usher in a more sustainable transportation era, stakeholders must collaborate for successful implementation.

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