Electrical Inter Corridor Mobility Vehicle

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***Abstract*—The project addresses the dual challenge of urban mobility and physical inactivity by developing a foldable, dual chargeable electric bike-engineered for compactness, efficiency, and sustainability. With increasing vehicular congestion, pollution, and health issues in urban populations, the solution integrates portability, regenerative braking, and self-charging features, enabling use both for commuting and light exercise. This innovation supports eco-friendly travel while optimizing storage and usability in crowded city scapes. In today's world, the infrastructure of College and Industries are becoming large so if one has to travel or visit from one place to another, he has to walk a long distance and sometimes it becomes very hasty and inconvenient. Sometimes after too many travelling on campus, it causes strain and pain in the body. So, to travel these distances two-wheeled electric Bike, Airway were introduced. But these bikes are very costly such as they start from ₹ 50,000. Another problem with that vehicle is that they are difficult to handle when we drive the first time. So, in alternate to this product, we developed whole newly designed product and this is Reliable, Eco-friendly, a Compact vehicle for the campus. Its utilities are college campus, Industries, Recreational Parks, Sanctuaries, Museums, Palaces, Villas, malls etc. So, our project is on Electric Inter Corridor Mobility Vehicle and also its multipurpose utility among the society. The concept of the model taken from children's scooter bicycle. The complete body looks like a bicycle in which platform is provided for standing and driving the powered bike. This product is a battery powered and motor-driven vehicle. The E bike is intended to use in indoors areas as well as in outdoor areas, due to the absence of any type of pollution causing drive mechanism such as petrol engines.**

***Index Terms*—Electric bike, mobility, sustainability, foldable.**

I. INTRODUCTION

In today's fast-paced urban lifestyle, individuals often struggle to allocate time for physical wellbeing. The increasing prevalence of sedentary routines and high-stress work environments has led to a rise in lifestyle-related health issues, particularly obesity. While aerobic exercises such as walking, jogging, and cycling are highly recommended for maintaining fitness and preventing illness, time constraints often make them difficult to pursue consistently. Simultaneously, urban transportation systems in cities like Bangalore face significant challenges namely, traffic congestion, high commuting costs, limited last-mile connectivity, and an overdependence on private vehicles. Rising fuel prices only exacerbate the problem, prompting a need for cost-effective, eco-friendly alternatives. Conventional electric bicycles (e-bikes) present a partial solution but are typically bulky, difficult to store, and prone to theft when parked outdoors. These issues, combined with the lack of secure parking infrastructure and frequent maintenance needs, limit their practicality in daily life. To address these problems, foldable electric bikes offer a promising alternative. Their compact, portable design allows them to be easily folded and carried into offices, homes, or public transport, eliminating the need for dedicated parking. Additionally, their integration into multi-modal transport systems can reduce overall commuting costs and environmental impact. However, most foldable e-bikes available in the market are expensive due to import costs, and very few are manufactured locally in India. This provided the inspiration for our project—to design and fabricate an affordable, dual chargeable foldable electric bike, specifically optimized for Indian urban conditions. An electric bike is a battery-operate done-person capacity vehicle which is specially designed for people with low mobility. It is generally used by those who have difficulty in walking for long periods of time. E- Bike are available in three common designs, those intended for indoor use, those for outdoor use, and those that are used for both.

II. LITERATURE REVIEW

A. Shishir S et al.:
This study addresses a prevalent societal challenge - urban commuting limitations and the need for compact personal transport. The authors proposed the design

and fabrication of a foldable electric bike that is lightweight, sleek, and yet structurally robust and safe. Unlike conventional electric bikes, which are bulky and often inconvenient to store or transport, this model emphasizes portability and ease of handling. The foldable design allows users to carry the bike easily into buildings or public transportation, minimizing the need for dedicated parking and reducing the risk of theft. The primary goal of the project was to develop a foldable electric bike that not only ensures riding comfort and reliability but is also cost-effective and suitable for widespread urban use. The research contributes significantly to the development of affordable and efficient last-mile connectivity solutions.

B. Shlok Desai et al.:
This project focuses on sustainable and efficient urban mobility by developing a foldable electric bike using aluminum 7075-grade material. The team emphasizes ergonomic design, material optimization through simulation software, and environmental benefits. The use of a Permanent Magnet DC (PMDC) motor instead of an internal combustion engine allows for lower emissions and improved energy efficiency. The study provides insights into practical, low-maintenance transportation that balances human comfort with cost-effectiveness and environmental responsibility.

C. Morteza Hanife Zade and Arian Ashrafi:
In response to increasing urban air pollution, this research presents the concept of a self-propelling foldable electric bike. The authors propose that such bikes can serve as a green alternative for short distance travel and last-mile transport. The design focuses on minimizing environmental impact while maximizing usability, especially in densely populated cities. The foldable mechanism makes the bike a viable and practical mobility solution for everyday commuters.

D. Anop Mundel et al.:
This study introduces a compact foldable e-bike with a power limit to ensure rider safety. Designed for smart cities, the bike can be folded into compact dimensions (25in x 20in x 15in) for backpack storage. It aims to support intermodal transport, allowing users to ride the bike to a station, fold it, and carry it onto public transport. The focus is on user convenience, safety, and environmental sustainability, making it ideal for smart urban ecosystems.

E. Arunabh Choudhury et al.:
This paper explores a self-recharging electric bike that reduces dependency on external charging infrastructure. The authors integrate a regenerative system using a dynamo and battery, capturing energy from braking and pedaling. Their innovation lies in enabling continuous operation and extending the range of electric bikes without relying solely on plug-in charging, addressing a common limitation of electric vehicles.

F. Prof. S.B. Thakre et al.:
The authors propose an eco-friendly, fuel-free self-charging electric bike powered by a hub motor and dynamo system. It provides the rider the flexibility to switch between motor drive and manual pedaling. The project focuses on sustainability, low-cost implementation, and the reduction of environmental pollution. This solution aims to support short-distance commuting with minimal energy consumption and user effort.

III. OBJECTIVES

1. To reduce time and fasten the movement
2. To reduce the use of non-renewable energy sources
3. To control the pollution
4. To be used for transportation on airports, colleges and at places of tourists' interests.

IV. METHODOLOGY

FORMULATION OF METHODOLOGY
The core design objective of this project is to develop a foldable electric bike with dual charging capabilities and enhanced structural integrity. The bike is designed to be portable, space-efficient, and suitable for urban commuting.

Folding Mechanism and Frame Design - The bike features a foldable joint integrated at the center of the frame, secured with a robust locking system made of soft-cast steel to ensure strength and durability. This mechanism enables compact storage and easy transportation, addressing the common issues of parking and theft associated with conventional electric bikes.

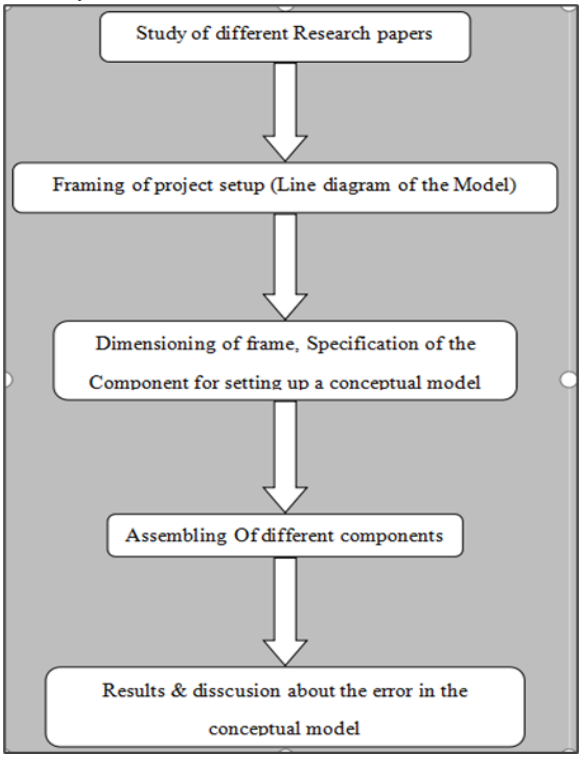
Load Capacity and Structural Analysis - The design was tested to determine its load-bearing capacity, ensuring the frame and components can reliably support up to 80 kg—whether for a rider or cargo. This

makes the bike suitable for everyday commuting as well as light-duty personal transport.

Regenerative Braking System - The regenerative system is activated by a relay switch installed at the braking mechanism. When the brakes are applied, the relay triggers the connection to a boost converter, which channels kinetic energy back to the battery, allowing partial recharging during operation—especially effective on downhill routes.

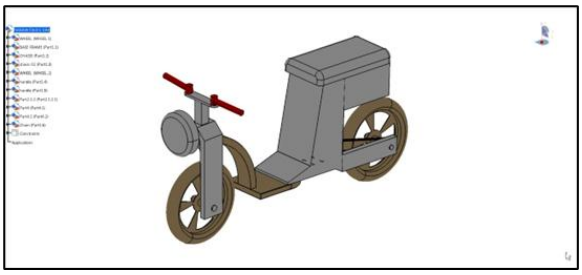
Motor and Power Specifications - The propulsion system is driven by a 250W, 12V 30A DC motor, which delivers sufficient torque for city commuting. The electric bike can be charged in three different ways: 1) Through a standard charging port 2) By manual pedaling 3) Via a regenerative braking system.

Electronic Control System - The accelerator is operated through a trigger mechanism, which is connected to an electronic controller. The controller incorporates a 555 Timer IC circuit, functioning via Pulse Width Modulation (PWM) to regulate the power supplied to the motor based on throttle input. This setup ensures smooth acceleration and efficient power delivery.

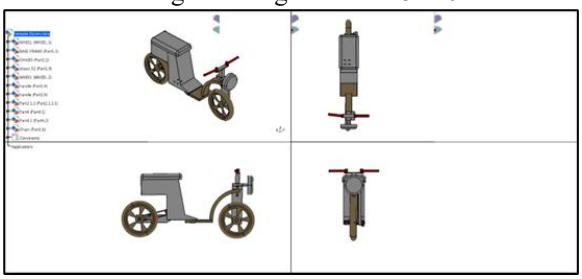


Flowchart

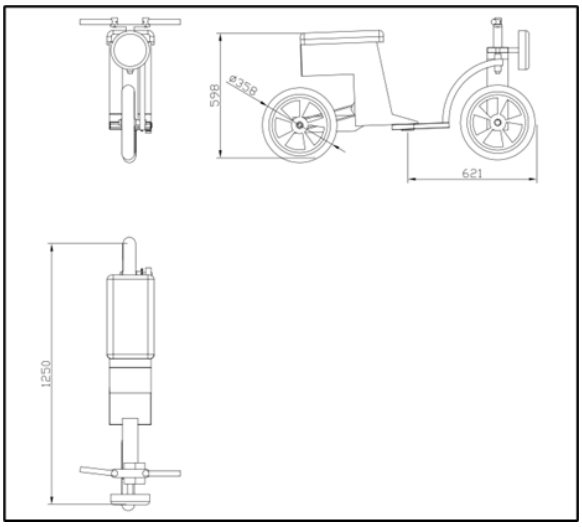
V. CAD MODELING



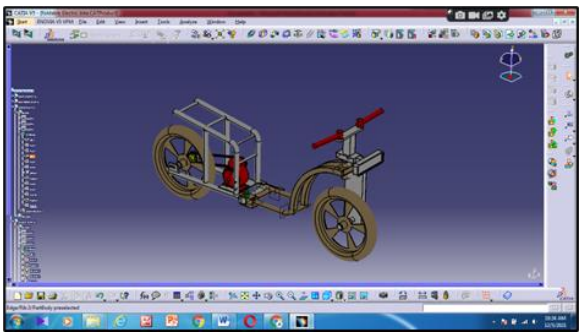
Designed using CATIA V5R20

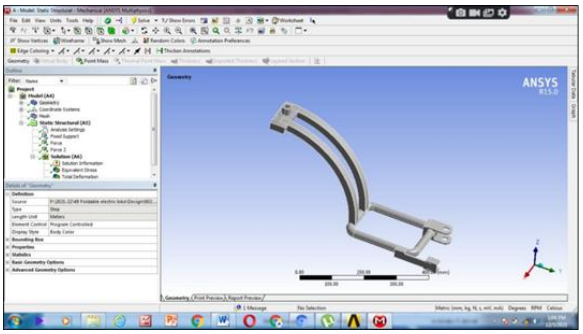


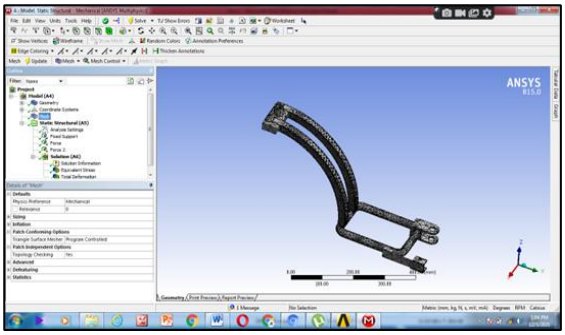
All views of CAD Design F.V, S.V, T.P, Isometric view

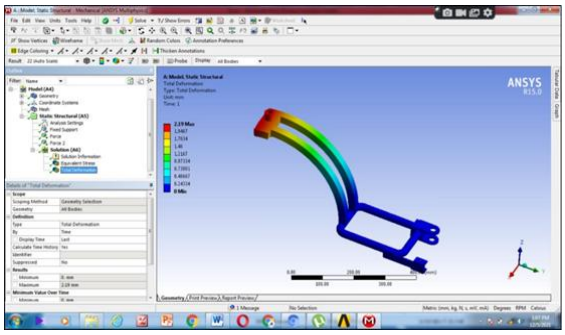


Drafting view of Foldable Electric bike



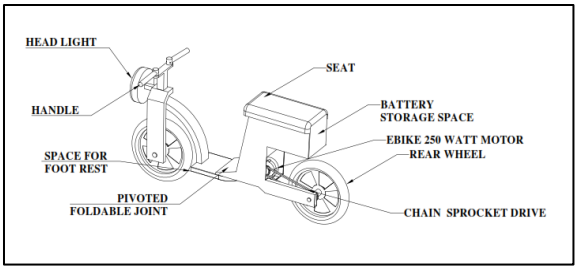






VI. WORKING PRINCIPLE

An electric car is powered by an electric motor rather than a petrol engine. The motor receives energy from a controller, which adjusts the power.



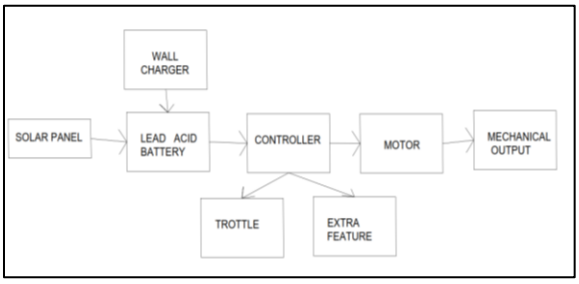
Thus, an electric vehicle will have three basic components -
Energy Storage Unit
Controller
Propulsion system

The energy storage unit will have a way to store power. A chemical battery is the most common energy storage technology currently, although it can be different - for example - A fuel cell (which gets its electricity from hydrogen rather than a battery pack), can be used instead of a chemical battery as the energy storage unit.

The controller acts as a pipeline or gateway to the electric motor. The controller will do other things too - it moderates the power, will also act as a converter - converts power from DC to AC, or it might also increase or decrease the amperage etc. The controller is the brains of the system.

The electric motor, which is the propulsion system, converts the electric power and converts this into physical energy for movement. The whole system is a much simpler, more efficient device than the combustion engine found in most cars, enabling you to get the most mileage for your charge.

VII. BLOCK DIAGRAM



Block Diagram of E-bike Design requirement

VIII. MERITS AND DEMERITS OF ELECTRIC BIKE

Merits of Foldable Electric bike:
1. Easy to transport
2. Easy storage
3. Security
4. Environmental benefits
5. Eco friendly

Demerits of Foldable Electric bike:
1. High initial cost compared to normal bike
2. Maintenance cost is high
3. More weight compared to normal bike

IX. CONCLUSION

The project deals with the design and fabrication of Electric bike that promotes economical and eco-friendly means of transport for everyone. As the initial step, a literature survey on related systems and projects were conducted. A suitable design was proposed but due to infeasibility incurred in making the model, we decided to make a scaled-down prototype changing the design accordingly. The design dimensions and aspects were successfully calculated and analysed. Materials and components for the fabrication of the project were compared and selected. The vehicle is used to reduce the manual effort i.e. in place of conventional cycle; and gives more displacement with lesser effort. This bike has only two wheels, looks robust and lets you take it for a ride according to its design. Many systems can be improved in the future to optimize the manufacturing of the vehicle. Solar panels and Dynamo generators can be incorporated with the vehicle for charging while driving. Lightweight carbon fibre can be used to reduce the overall weight of the vehicle and improves strength. This system can be efficiently used anywhere whether it is out door or in door. This utilizes highly fuel-saving technology which
is a major requirement of this era.

X. FUTURE SCOPE

1. It can be used as an indoor locomotive device infrastructure with large roof span i.e. malls, warehouse, open markets, large office spaces, etc.
2. By using such product pedestrian cops can save themselves from getting exhausted.
3. Pedestrians in large campuses can benefits from this product the same way.
4. Can replace cycle as an energy efficient vehicle for those who cannot drive a cycle.

XI. ACKNOWLEDGMENT

It gives us immense pleasure to present this report entitled “Electrical Inter Corridor Mobility Vehicle” We wish to acknowledge with deep sense of gratitude to Prof. Krushna Ghadale, Dhole Patil College of Engineering, Pune for his valuable guidance and co-operation throughout this dissertation work. In spite of his busy schedule, he spared time, took keen interest, reviewed our work, discussed at length and gave us constant encouragement to complete this dissertation. Our profound thanks to our respected Head of Automobile Engineering department, Dhole Patil College of Engineering, Pune for his valuable advice and constant encouragement to complete this dissertation in a successful manner.
We are also thankful to Dr. Abhijit Dandavte, Principal, Dhole Patil College of Engineering, Pune, for extending relevant facilities during this work. We are deeply grateful to our family members, all our friends and well-wishers for encouraging and helping us directly or indirectly, throughout our project work.

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