iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** VII **Month of publication:** July 2023

DOI: https://doi.org/10.22214/ijraset.2023.54614

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue VII Jul 2023- Available at www.ijraset.com

Design and Development of Three-Wheeler Foldable E- Bike

Dr. Ramesh S Naik[1], Abhishek[2], Chandsab BT[3], Chetan PJ[4], Nagaraj U[5]
[1]*Assitant Professor, Departm,ent of Mechanical Engineering, Basaveshwar Engineering College, Bagalkote,*
[2, 3, 4, 5]*Final Year Students Department of Mechanical Engineering, Basaveshwar Engineering College, Bagalkote*

***Abstract:** Today there is a need for an alternative source of energy for transportation sector. The use of e-bike as a mode of transportation is the most promising step towards developing green transportation. The basic aim behind the project is to make an environmental friendly portable automobile that would be easy to handle by everyone. Specially for physically challenged people. This project is designed for carrying single person. This project is designed taking into consideration of non-polluting, cost effectiveness. Two 12V batteries used to drive the motor, chassis is made by using the steel, controller for electric motor, wheels are used.*

I. INTRODUCTION

As the population is increasing there is increase in demand of automobiles. Due to increase in automobiles, people will require space for driving and also for parking. As we know there is limited space available and due to increase in the number of cars on roads they are causing traffic congestion and with that they require a place for parking. In addition to these, pollution is also a priority nowadays. The pollution is reaching new limits day by day. So the idea of a foldable and portable vehicle comes into concept. The Foldable e-bike is a bike which can be folded easily, hence it does not require the parking place. Transportation has become one of the most significant concerns to address in the current circumstances, since commuting from one location to another within the city has become a time-consuming and costly task. Due to its compactness it can be used in various shopping malls, industries, college campuses etc. foldable e-bike can be used to cover short distance at many instances. Electric bikes have simultaneously gained popularity in many regions of the world. Design of this project will be completely focused on comfort to the rider.

II. LITERATURE REVIEW

1) Design of Electric Bike with Higher Efficiency Rahul Sindhwani et.al.[1]:From this paper it can be found that they are focused on the improvement of efficiency of E-bike. Generally the speed of E-bike is in the range of 40-45 km/hr at maximum. So there they increase the speed of E-bike and design the aerodynamic shape in such a way that the efficiency of E-bike is improved
2) Design and Fabrication of Power Scooter Nirmal Bhargava et.al.[2]:It is specially designed for those who having difficulty in moving or walking frequently from one place to another. An electric scooter is different from a wheelchair which is motorized, and is generally used for indoor use.
3) Design and Development of Compact Three Wheeled Foldable Electric Moped AdityaGanjapure et.al.[3]:This paper discuss in detail about design, fabrication methodology and characteristics of compact three-wheeled foldable electric moped. It also discuss in detail about the main components of this electric moped and its working operation.
4) Design, fabrication and performance analysis of solar power bicycle Rajendra Beedu.et al.[4]: Analyzed about the design, assembly and performance of solar powered bicycle.
5) Design and Analysis of Tricycle Powered by Solar Energy Jean Pierre Twajamahoro.et al.[5] : Analyzed and designed a tricycle which requires less physical effort for driving. Specifically designed for covering long distance.
6) Design and development of solar powered hybrid tricycle Mr. Prashant Kadi.[6]: Designed solar powered hybrid tricycle with efficient conversion of trapped solar energy into electrical energy and storing it in the battery for using in the absence of sunlight.
7) Feasibility Study of a Partially Solar Powered Electrical Tricycle Mohammad Rejwan.et al.[7]: Feasibility Study of a Partially Solar Powered Electrical Tricycle. It is observed that the solar charging energy that is obtained to charge the battery bank rises gradually as the solar radiation increases throughout the day. The maximum energy is obtained from 12.30 PM to 1.30 PM.

©IJRASET: All Rights are Reserved

8) Electric Bicycle Using Batteries and supercapacitor D. M. Sousa et.al[8] : They investigate electric converters. In this paper an electronic converter using two electric sources connected through two DC-DC converters is described having potential application in electric bicycles or in other vehicles for individual use without internal combustion engines.

9) Design and Fabrication of Hybrid Electric Bike Jerin Sam et.al[9] :This paper is about designing a electric bicycle. Now-a-days there are so many vehicles on road, which consumes more fuel and also hazards environment. Taking this into consideration they have taken step towards reducing the use of more fuel consuming vehicles and attract the eye of people towards its alternatives i.e. Electric bicycle.

10) Customer perception towards electric two-wheeler innovation Hemanth Kumar.G et.al[10]:The research paper is about study on customer's perception towards electric two-wheeler. The objective of the study is to identify the factors that influence electric bikes purchase. It was found that factors related to customer perception are charging time, a smaller number of models, distance travelled for one full charge and environmental concern.

III. OBJECTIVES

1) To design and develop three wheeler foldable electric vehicle.
2) To develop a light weight e-bike which can be portable and eco-friendly.
3) To optimize the cost.

IV. METHODOLOGY

The steps involved in this are as follows

1) Literature Survey
2) Material Selection
3) Conceptual Design
4) Design
5) Fabrication
6) Testing
7) Documentation

Components used are Battery, Shaft, Sprocket, Wheels, Fasteners, Motor, Seat

A. Proposed Design

1) Parts

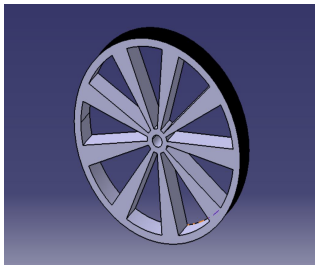


Fig 5.4 Front Wheel

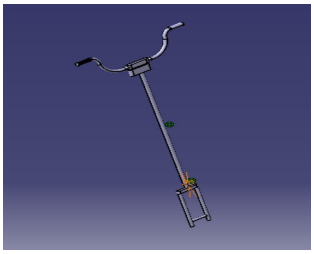


Fig 5.8 Handle

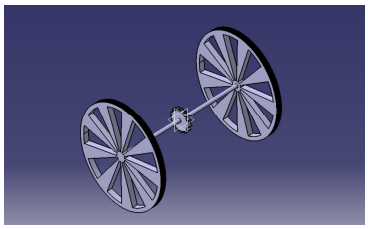


Fig 5.5 RearWheels

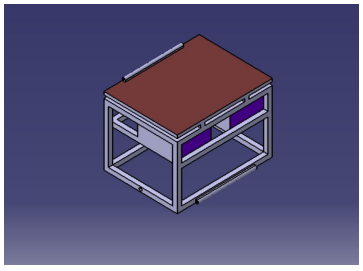


Fig5.6Base

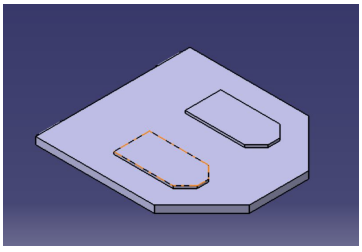


Fig5.7FootRest

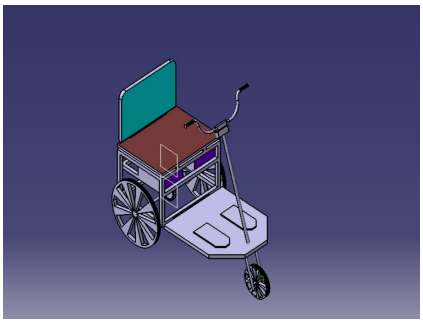


Fig 5.9 Unfolded e-bike

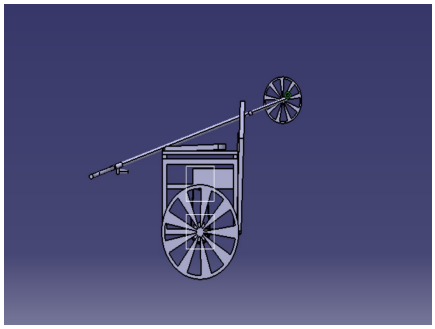
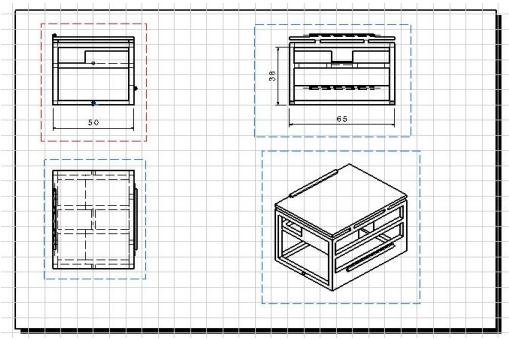
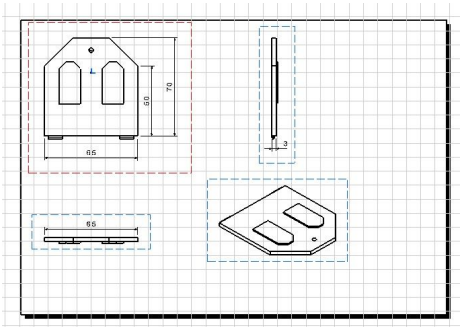
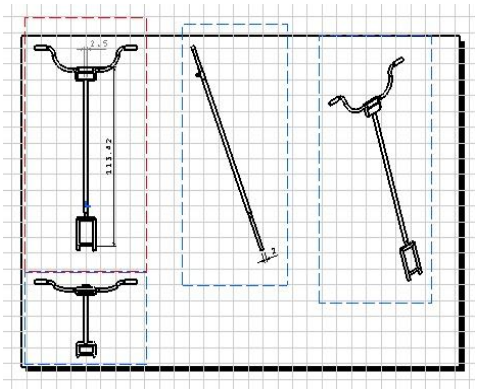
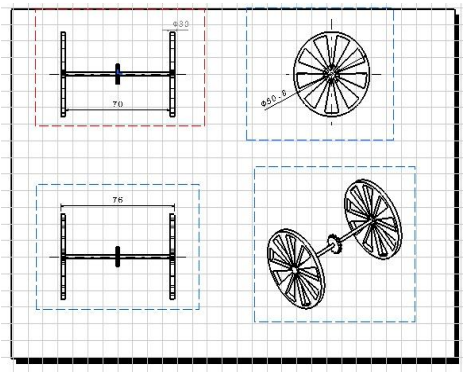


Fig 5.10 Folded e-bike









2) Prototype Model







3) Cost Estimation

Materials Cost		
SL.NO.	Particulars	Cost in Rs.
1	Metal Bar	1500
2	Plate	800
3	Wheels	800
4	Shaft	600
5	Fasteners	200
6	Motor	5000
7	Chain/sprocket	850
8	Race	600
9	Controller	600
10	Battery	1800
11	Other attachments	500
12	Labour charges	2000
	TOTAL COST	15250

V. CALCULATIONS

Current flowing through the motor :
Power = 250W
Voltage = 24V
Current (in amperes) = Power (in watts) / Voltage (in volts)
= 250/24
= 10.42Amp.

A. Discharge Time Of The Batteries

Two 12V-9Ah batteries connected in series, resulting in a total capacity of 18Ah. And the current flowing through the motor is 10.42 amperes.
Discharge Time (in hours) = Total Battery Capacity (in Ah) / Load Current (in amperes)
Discharge Time = 18Ah / 10.42A
= 1.7 hours

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

B. Distance Covered In Single Charge

Usable Energy (in watt-hours) =Battery Capacity (in Ah) x Voltage (in volts) x Efficiency
= 18Ah x 24V x 0.75
= 324 watt-hours
Now, consider the energy consumption of the motor per unit distance. Let's assume a conservative estimate of 10 watt-hours per kilometer:

Distance (in kilometers) = Usable Energy (in watt-hours) / Energy Consumption per Kilometer (in watt-hours)
= 324 / 10
= 32.4 kilometers
Time taken to charge the battery:
Charging time (in hours) = Battery Capacity (in Ah) / Charging Current (in amperes)
= 9Ah / 2A
= 4.5 hours

VI. EXPECTED OUTCOMES

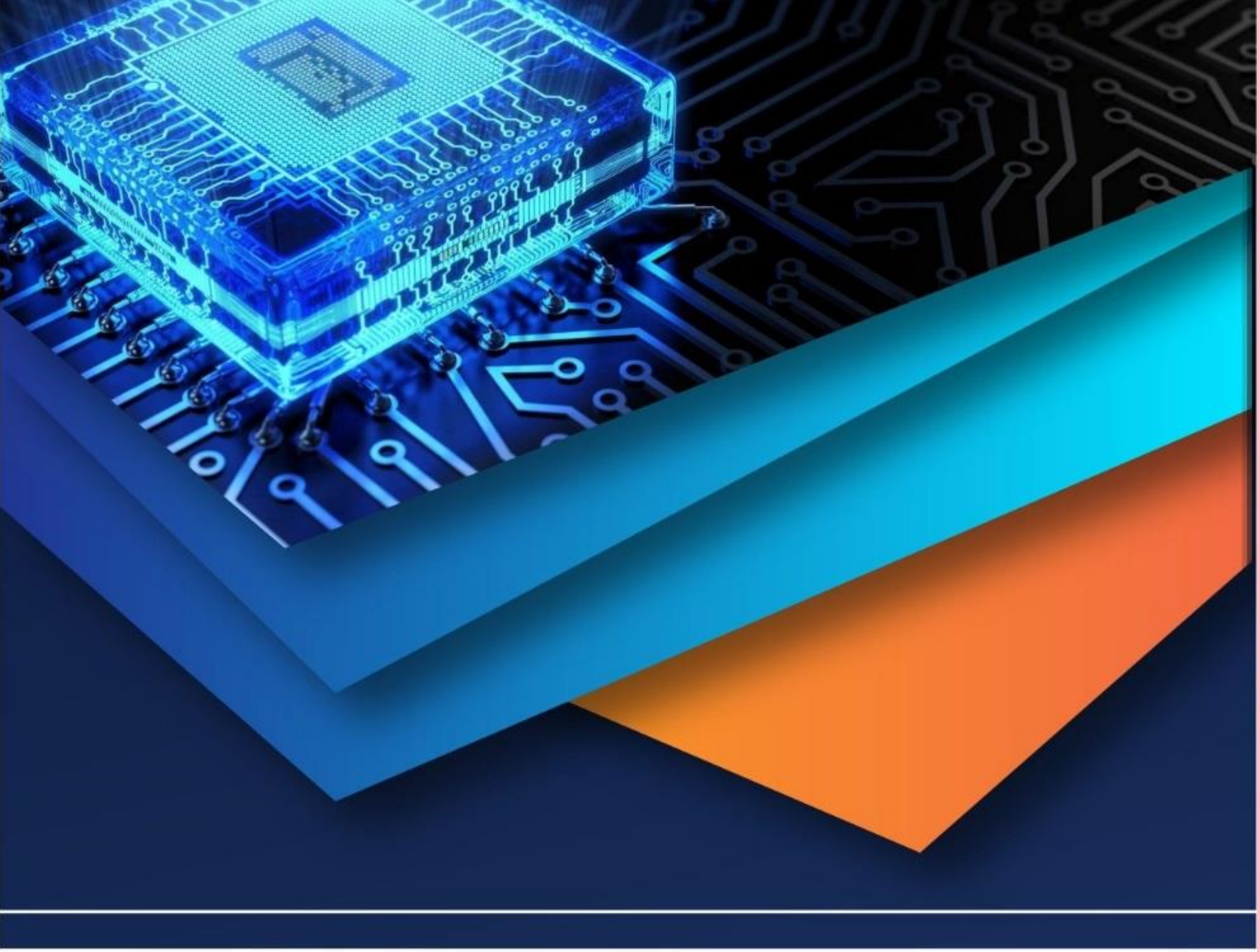
1) Economical e-bike is designed as compared to e-bikes available in the market.
2) Fabrication can be done in workshop.
3) Maintenance cost will be low.
4) Portability will be good.

VII. CONCLUSION

The aim of this project is design and build a coaxial, light weight vehicle which will consume less space for parking and can be carried along. This aim has achieved and a foldable three wheeler e-bike has manufactured. The structural design has considered concurrently with component selection, aesthetics, and ergonomics to minimize mechanical, electrical and rider integration problems. It can be used in college campuses and industrial areas to minimize the walking distance. As it is electric motor powered, it is easy to operate. The vehicle is compact, light weight, has simple design and hence easily portable. Cost of manufacturing is moderate.

REFERENCES

[1] Rahul Sindhwani, Punj L. Singh , Anjum Badar , Ankur Rathi “Design of Electric Bike with Higher Efficiency” International Journal of Advance Research and Innovation, Volume 2, Issue 1 (2014) 247-251
[2] Sasank Sekhar Panda , Nirmal Bhargava , Kamal Lochan Pradhan , Prashanta Mishra “Design and Fabrication of Power Scooter” International Journal of Research in Advent Technology, Vol.4, No.4, April 2016
[3] Aditya Ganjapure, Palash Kawale, Mangesh Deshpande Roshan Patil “Design and Development of Compact ThreeWheeled Foldable Electric Moped” International Journal of Engineering Research & Technology (IJERT), Vol. 5 Issue 05, May-2016
[4] Rajendra Beedu “Design, fabrication and performance analysis of solar power bicycle” International Journal of Renewable Energy and Environmental Engineering Vol. 02, No. 03 (July 2014).
[5] Jean Pierre Twajamahoro, Emmanuel Mudaheranwa “Design and Analysis of Tricycle Powered by Solar Energy” International Journal of Science and Research,IJSR , 2018
[6] Mr. Prashant kadi “ design and development of solar powered hybrid tricycle” IJRAR, July 2018, volume 5, issue 3
[7] Md.Fahim Bhuiyan, Mohammad Rejwan , “Feasibility Study of a Partially Solar Powered Electrical Tricycle” (4th International conference ICEEICT),2018
[8] D. M. Sousa P. J. Costa Branco J. A. Dente DEEC ACEnergia /CAUTL, Instituto Superior Técnico, TU Lisbon DEEC AC-Energia, “Electric Bicycle Using Batteries and supercapacitor” Institute Superior Técnico, TU Lisbon Av. Rovisco Pais, 1 – 1049-001 Lisboa Lisboa, Portugal
[9] Jerin Sam.C.Rb “Design and Fabrication of Hybrid Electric Bike” International Journal of Research Publication and Reviews Vol (2) Issue (7) (2021) Page 1061-1066
[10] Hemanth Kumar.G “Customer perception towards electric two-wheeler innovation” Journal of Contemporary Issues in Business and Government Vol. 26, No. 2, 2020



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)