

Organized by

Eranad Knowledge City Technical Campus, Manjeri, Malappuram Dist, Kerala, India

# Design and Fabrication of Wheelchair Trike

Fazludheen C <sup>1</sup>, Mohammed Rinshad AP <sup>2</sup>, Mohammed Sabith MK <sup>3</sup>, Mohammed Junaid EK <sup>4</sup>,  
Muhsin Ali <sup>5</sup>

Associate Professor, Department of Mechanical Engineering, EKC Engineering College,  
Manjeri, Kerala, India<sup>1</sup> Orcid Id: 0009-0002-5484-480X

U.G. Student, Department of Mechanical Engineering, EKC Engineering College, Manjeri, Kerala, India <sup>2</sup> Orcid Id:  
0009-0001-6183-9307

U.G. Student, Department of Mechanical Engineering, EKC Engineering College,  
Manjeri, Kerala, India <sup>3</sup> Orcid Id: 0009-0007-9661-1779

U.G. Student, Department of Mechanical Engineering, EKC Engineering College,  
Manjeri, Kerala, India <sup>4</sup> Orcid Id: 0009-0001-3683-7721

U.G. Student, Department of Mechanical Engineering, EKC Engineering College,  
Manjeri, Kerala, India <sup>5</sup> Orcid Id: 0009-0008-8495-2143

**ABSTRACT:** A healthy person may carry out their responsibilities well without the assistance of another person, while a physically disabled person, whether from birth, as a result of life circumstances, or at some point in their lives, is regrettably reliant on others to do any type of job. They require assistance from another individual to do their daily responsibilities, such as travelling to the doctor or shopping centers for marketing. Keeping these in mind, the current work is concentrated on the requirements of physically challenged persons, market surveys, and the history of wheelchairs. Based on the data acquired, a wheelchair trike that is affordable and available to people of all economic backgrounds was designed. It is appropriate for those without a leg or legs. The wheelchair trike's design combines a bicycle head with a conventional wheelchair that is simple to connect and detach. The battery-powered hub motor on the bicycle head allows it to go at a speed of roughly 25 km/hr across curbs, hills, and flat terrain.

**KEYWORDS:** Wheelchair trike

## I. INTRODUCTION

The main worry in this rapidly expanding world would be "slow in pace" or "immobility". Having at least legs as a means of propulsion is a blessing, but not everyone has this luxury. We have no concept how difficult it is for elderly or physically challenged folks to relocate from one location to another. They constantly require help getting from point A to point B, and there is no guarantee that someone would be around at all times. In an emergency, this is much more concerning! In order to go from one area to another, several engineers and businesses have developed various motorized wheel chairs or motorized quad cycles. These solutions have undergone numerous designs and iterations along the road, but they are not without drawbacks. The project discusses the design and creation of a smart chair that will provide individuals mobility to improve their quality of life. In comparison to traditional models, a chair model has been produced with clever technical changes and developments to better the manoeuvring chores. To ensure that patients with all types of lower body limitations have a wheelchair they can use without suffering any damage, research is being done to develop electric wheelchairs. When they fail to control the steering wheel or head, they run the risk of hitting a wall or an obstruction. Patients with cerebral palsy, severe spinal cord injuries, quadriplegia, or cognitive impairment cannot regulate how hard they push the wheelchair's steering head or handle; if they push too hard, the wheelchair will speed quickly.

Organized by

Eranad Knowledge City Technical Campus, Manjeri, Malappuram Dist, Kerala, India

## II. RELATED WORK

The solutions for traversing rough terrain with wheelchair were point out by Nirit Yuviler-Gavish et al. [1]. The method was inspired by smart electric wheelchairs. The Euler-Lagrange equations helps in deriving model equations, then a descriptor model is derived [2] . This technique gives the basic structure of the wheelchair. In [3], the author's presents the modelling of electric powered wheelchairs has resulted in the development of wireless data collecting the control platform. In [4] an author describes the development of a support system avoiding obstacles for electric wheelchairs using adaptive and learning schemes. In [5], authors describes about how to overcome the problem related to movement and user command for elderly and paralysed people. The authors in [6] have adjusted the method to calculate an electric wheelchair power cycle; fuel cell implementation.

The work in this paper is divided in three stages.

- 1) Design of wheelchair trike
- 2) Analysis of wheelchair trike
- 3) Manufacturing of wheelchair trike.

## III.METHODOLOGY

With the use of a removable head included in the wheelchair, the project's primary goal is to help paralyzed persons regain and enhance their strength and mobility. We are producing this item with excellent quality while also keeping in mind the general public's capacity to purchase it. We are launching the wheelchair with a straightforward removable head. Our proposal consists of a wheel chair with a removable head, which is attached to the frame of the chair using two appropriate joints that may be moved and fixed according to our needs. The wheel chair's front portion features a detachable configuration that incorporates a battery-operated dc hub motor a 500W, 48V DC hub motor is being introduced, and its 25 km/hr speed range may be changed. The user is designed to sit in the wheelchair and can move about without assistance from a bystander. We are building our wheelchair in a way that allows for efficient and quick transportation from one location to another. The user's legs are also designed to rest on the foot rest. In order to prevent the patient from slipping out of the wheelchair, a tie-down belt is utilized to support them. The wheelchair's 500 watt hub motor is connected to the bicycle head. It features a control system that adjusts the torque based on the speed input. Battery (36V 20AH) power the hub motor. With a power charger, it is readily detachable and rechargeable.

## IV. EXPERIMENTAL RESULTS

### DESIGN OF WHEELCHAIR HEAD:

This is a design of wheelchair head it consist of an hub motor which drives the wheelchair trike. It has a battery pack powers the hub motor which can be easily removable are located on the handle. The head has two supporting wheels which support the head when it is not connected to the wheelchair. The suspension at the front provides comfort for the riders. It has a locking system which helps to connect with the wheelchair easily. All the parts and joints are designed with the help of NX CAD software.



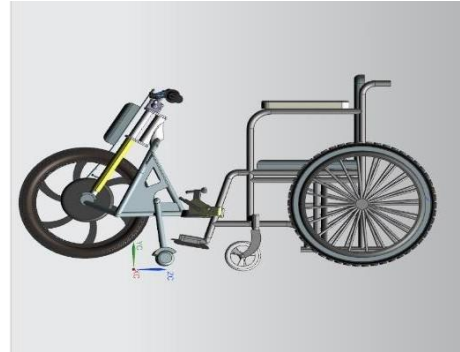
(a)



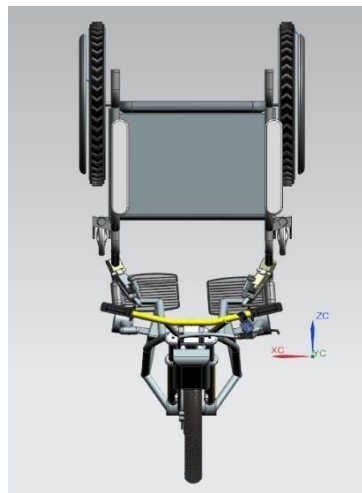
(b)



(c)



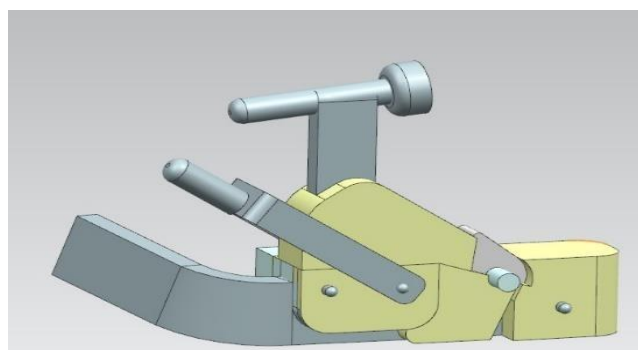
(d)



(e)

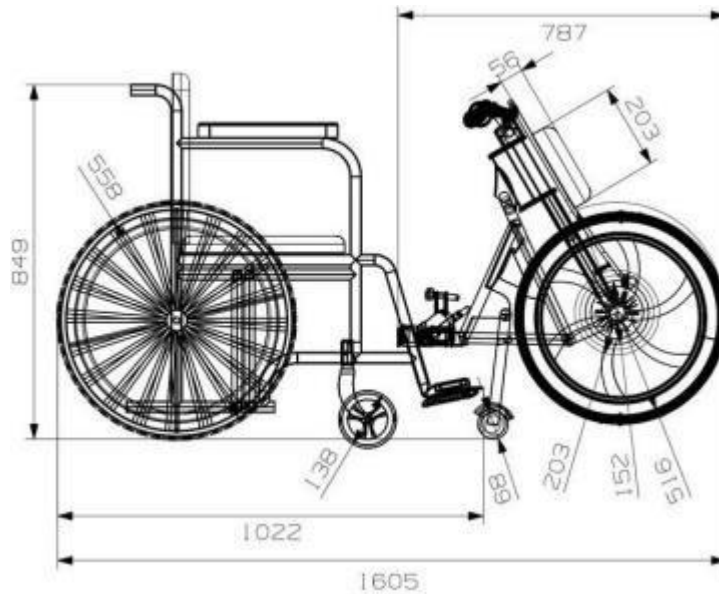
### DESIGN OF LOCKING MECHANISM:

The locking mechanism enables the wheelchair trike a stable connection between the handle and the wheelchair. It is a double locking system which ensures the safety of the person who drives the wheelchair trike. The first lock which is enabled by attaching the handle towards the wheelchair then with a little upward push and the second lock which directed above the major lock, it is a safety lock. Locking mechanism is also done with the help of NX CAD software.

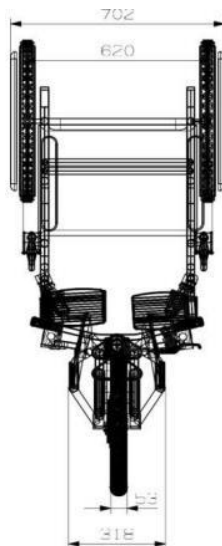


**DESIGN DIMENSION:**

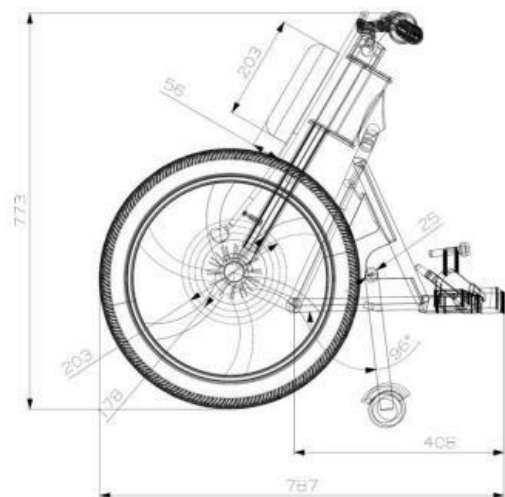
The basic dimensions are shown in the figures:  
(All dimensions are in mm)



(a)



(b)

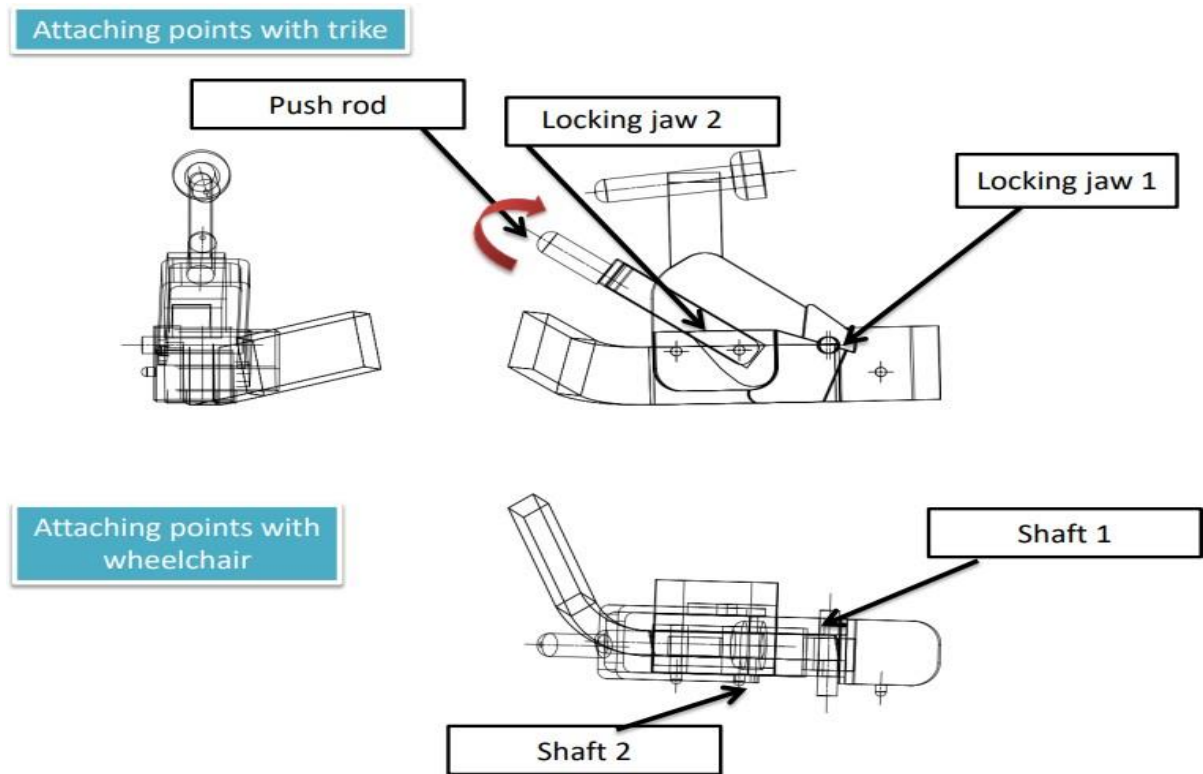


(c)

Organized by

Eranad Knowledge City Technical Campus, Manjeri, Malappuram Dist, Kerala, India

**JOINT MECHANISM EXPLAINED:**



**V. CONCLUSION**

We have designed an Electric wheelchair Trike, which makes day-to-day life of a lower body handicapped person more easier both indoor and outdoor. This wheelchair trike helps a disabled person to manoeuvre along the roads as well as terrain surfaces as it has sufficient suspension on the front handle. The indoor activities can be performed by detaching the front handle and use as a simple wheelchair. Designing of all the parts and joints are done in the NX CAD software.

**REFERENCES**

- [1] Nirit Yuviler-Gavish et al., “Wheelchair users’ perception of a system enabling them to traverse rough terrain controlling their own wheelchair”.Applied Ergonomics 106(2023) 103866.
- [2] M.Gray, T.M. Guerra, S.Delprat, S.Mohammed. “Control of an automated wheelchair”. IFAC PapersOnline 53- 2(2020) 7971-7976
- [3] Xiaoqi Chen, et al. “System Identification and Modelling of Front Wheel Drive Electric Wheelchairs”. Proceedings of the 17th World Congress The International Federation of Automatic Control Seoul, Korea, July 6- 11, 2008
- [4] Ryota Kurozumi , Toru Yamamoto , “ development of a support system avoiding obstacles for electric wheelchairs using adaptive and learning schemes”. IFAC Workshop on Periodic Control Systems,(2004) 739-8524
- [5] Sudipta Chatterjee, Sahadev Roy. “A low cost assistive wheelchair for handicapped and elderly people”. Ain Shams Engineering Journal 12(2021) 3835-3841.
- [6] Dafne Zuleimna, et al.. “Adjusted method to calculate an electric wheelchair power cycle; fuel cell implementation”. Journal of Energy Storage 23(2019) 371-380
- [7] Dimitar Stefanova, al.. “The development and testing of a system for wheelchair stability measurement”.



**Organized by**

**Eranad Knowledge City Technical Campus, Manjeri, Malappuram Dist, Kerala, India**

Medical Engineering and Physics 37(2015)1061-1069

- [8] Boiadzjiev G. et al. Powered wheelchair control based on the dynamical criteria of stability Int J Mechatron Elsev. (2002)
- [9] Boiadzjiev G. et al. Powered wheelchair control based on the dynamical criteria of stability Int J Mechatron Elsev. (2002)
- [10] Power wheelchair driving challenges in the community: a users' perspective. Torkia C, et al. Disabil Rehabil Assist Technol. 2015. PMID: 24640944 Free PMC article.
- [11] <https://www.indiamart.com/proddetail/10-inch-hub-motor-1000w-24-36-48v-350w-tyre-electric-motor-kit-for-motor-electric-bicycles-26566200573.html>
- [12] <https://lrsa.in/product/lrsa-36v-20ah-lithium-ion-battery-pack-for-e-bike-solar-etc-with-bms-protection/>
- [13] <https://robu.in/product/e-bike-motor-controller-6-inch-24v-for-hub-motor-350w>
- [14] <https://www.indiamart.com/proddetail/foldable-wheelchair-3763607655.html>  
<https://bikeadvice.in/disk-brake-brake-discrotor-part-1/>