
Independently Accessible Mobility Vehicle For Locomotor Disability

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Abstract

This paper describes accessible mobility vehicle which allows locomotor disabled to drive vehicle directly with the wheelchair, without any dependency. It has specially designed retractable ramp fitted on the rear of

the vehicle to ensure easy ingress and egress for wheelchair users, thus eliminating the requirement of mounting and dismounting of the user from wheelchair to access the vehicle. To address concerns about the safety of the wheelchair and its user, there is a separate docking mechanism for both. This vehicle will deliver the best of performance and range with its state of the art electric motor and battery management system. The vehicle is fully loaded with soft suspensions which makes the ride extremely comfortable.

Keywords

Accessible mobility; locomotor disability; wheelchair; Ramp; Independent mobility; assistive technology; wheelchair driving.

Introduction

In India, there are 5.5 million[1] people with locomotor disabilities and wheelchair is the commonly available mobility aid. However wheelchairs have limited range of mobility and users find it difficult to travel significant distances. The barriers are mainly due to bad road conditions, difficult terrains, the inability of the wheelchair to withstand road conditions and fatigue

caused by the absence of any suspension in a wheelchair. There have been some efforts made to deal with this problem but those solutions have undermined few aspects like safety, the stability of the vehicle, efficiency, performance, torque vectoring required during turns, and ease of access to the user. Thus we have come up with a permanent solution of an affordable and comfortable vehicle which gives independent mobility access beyond the boundaries for wheelchair users and for a person with a locomotor disability.

INDEPENDENTLY ACCESSIBLE VEHICLE

Wheelchair user measurements:

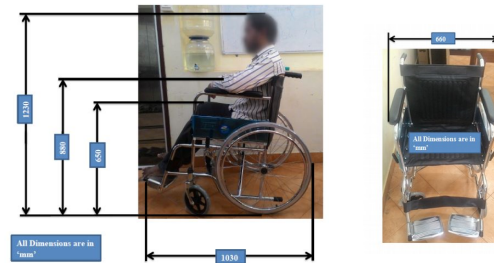


Figure 1: Wheelchair user measurements

Compared to other disabilities, wheelchair users always need quit a large space to accommodate themselves anywhere. **Figure 1** shows the measurement of a wheelchair with a typical user. The overall length of the wheelchair is taken considering foot space of user, i.e.,

1030 mm, The total height of the average wheelchair with the user is 1230 mm. The width of the wheelchair is 660 mm excluding the hands for propulsion whereas the total width comes to 780 mm.

Our Design Approach to the Vehicle:

To understand its basic design we needed inputs that could meet current norms i.e., ARAI, RTO etc,. After validation we arrived at basic outcomes. **Figure 2** is a brief schematic of the design approach that we adopted.

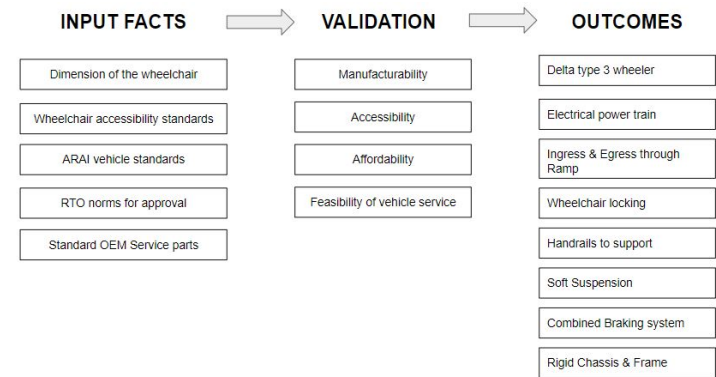


Figure 2: Design Approach

Concept Design:

Our aim is to design a single body three wheeled vehicle, with a convenient ramp mechanism for user to ingress and egress along with his assistive device like wheelchair, crutches. The body of the vehicle is supported and mounted with three wheels in a delta design. The front wheel acts as the main drive for the vehicle that is powered with an electric power train, with the ability to drive and control the motor. User controls are in the handle bar of the vehicle. All other mechanism like suspension, braking, indicators, wheelchair locking are their in respective places.

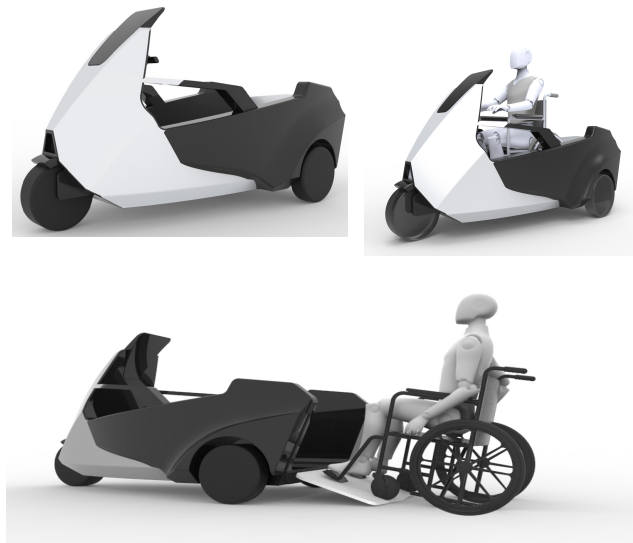


Figure 3: Concept Designs

User Trial:

We have build a basic skeleton to experiment with user accessibility and user space in terms of ingress & egress and standard ergonomics. It also included our experiments with automation of the ramp. We had user trails at APD Bangalore to validate the concept prototype. The reviews were good as they found the ingress and egress comfortable.



Figure 4: Prototype User Trial

Future Work:

To produce a full scale product which is optimized to agree with the size of the current vehicles. It will be user oriented, adhere to user needs in terms of assistance, user safety, space and presence, situational warnings and indications. The vehicle will have a simple UI to have a better understanding not just for the user also for service. The software will help the user learn more about their vehicle which will allow a personal growth with the vehicle. Its parts will be Standard to OEM which will make easy for service. The vehicle will be designed to be as hassle free as possible so that it requires minimum attention but still becomes a part and participle of our users day to day life.

Summary:

We foresee a future where mobility is designed to be accessible to every human being, regardless of their physical condition. To begin with the process of such designs we have taken a step to initiate the project to help us learn more about the possibilities that are conventional and not explored.

Acknowledgment:

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