



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 6, June 2022

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.118

9940 572 462

6381 907 438

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# Fabrication and Development of Track Typed Stair Climbing Wheel Chair for disabled Person

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**ABSTRACT:** This project aims at developing a mechanism for easy transportation of heavy loads over stairs. The need for such a system arises from day-to-day requirements in our society. Devices such as hand trolleys are used to relieve the stress of lifting while on flat ground; however, these devices usually fail when it comes to carrying the load over short flight of stairs. In light of this, the project attempts to design a stair climbing hand cart which can carry heavy objects up the stairs with less effort compared to carrying them manually. It also endeavors to study the commercial viability and importance of such a product. Several designs were conceived that would allow a non-industrial hand trolley to travel over stairs, curbs, or uneven terrain while reducing the strain on the user. In our project, the trolley is equipped with Tri-Star wheels which enable us to carry load up and down the stairs. It also eases the movement of trolley in irregular surfaces like holes, bumps, etc.

**KEYWORDS:** trolley. Stair climbing mechanism, three star wheel, easy transportation

## I. INTRODUCTION

One-fifth of the estimated global population, i.e. between 110 million and 190 million people, experience significant disabilities. Disabilities of various parts such as eye, ear, hand, leg etc. Limb disability is one of the disabilities which are caused due to various reasons such as deformation by birth, war, disorders such as diabetes. Lower limb of sports person also suffers huge blows while playing and are always at the risk of suffering severe injuries. These injuries sometimes may be a permanent disability.

## II. LITERATURE REVIEW

Giuseppe et al. [1], depicts the mechanized wheelchairs goes back on schedule with a few researchers and scientists assessing the step climbing component. This paper assesses different step climbing instruments viz crawler type, leg type, half breed type and wheeled sort. Different powers and forces following up on the wheelchair while climbing the steps are assessed. Ideally the external help get together includes wheels on one or the other side of the seat. An inward help get together, nearer to the middle line of the seat, additionally upholds the seat gathering.

Murray and Takakazu [2], the back tires are independently determined and the front wheels are freewheeling castors. This proposed idea is mathematically displayed and power estimations for straight actuators are made. Step rising and step plunge tasks are portrayed alongside figures and conditions. The control framework and the step edge sensor framework are additionally explored. The venturing calculation is talked about exhaustively. The impact of outside factors like expense, weight, style, the scope of activity, wellbeing, functional effectiveness, solace is assessed.

Simpson et al. [3], presented that, the steps will probably forever be a reality in reality, on account of the great degree of spatial productivity they give while interfacing areas of varying vertical rises. Steps in all actuality do introduce an expanded level of risk contrasted with, for example, delicate inclines however this must somewhat by need be basically thought of. For instance, in the preparation of any new structures, the objective clients ought to be thought of. Obviously for public conveniences, for example, wheelchair clients should be thought of, yet for instance, on account of saying a private home in Japan where land space is at a higher cost than normal (all the more explicitly over the top expensive) staggered development is unavoidable and steps will undoubtedly keep on being utilized. A trade-off circumstance on account of families really focusing on maturing guardians is frequently

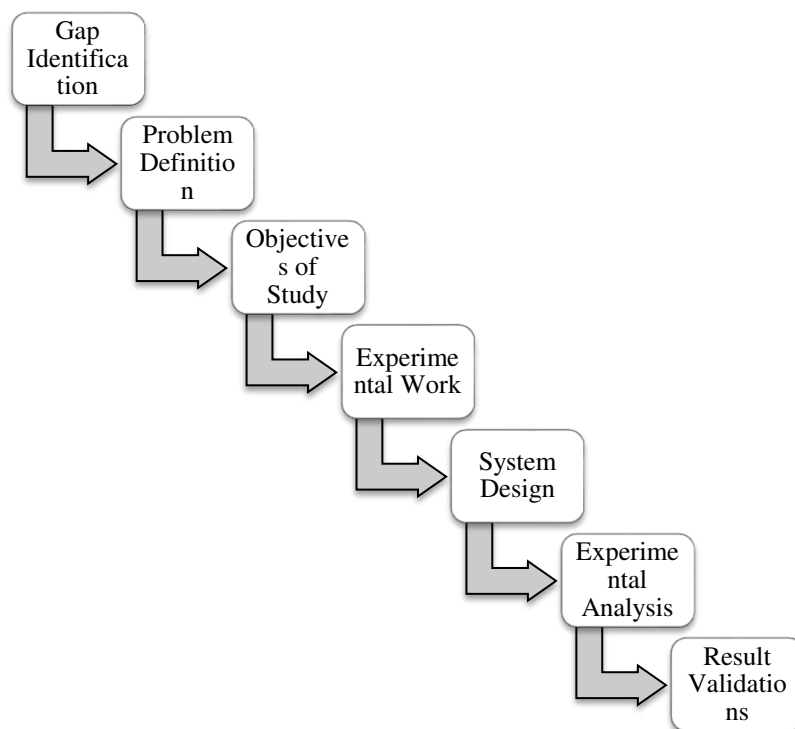


giving every one of the fundamental conveniences at ground level (boundary-free) and involving the upper levels for the more youthful families' individual rooms and so on.

Morales R et al. [4] describes the mechanical gadgets, the developments, and the direction age of a clever wheelchair model fit for climbing flights of stairs. The vital elements of the plan are the utilization of two decoupled components for every hub, one used to arrange steps, and the other positioned the hub concerning the seat to oblige the general slant. This decoupling makes various climbing procedures conceivable, the general system turning out to be remarkably flexible according to a control perspective. A control framework is important to synchronize the developments of the multitude of actuators of the wheelchair so that its focal point of mass can follow discretionary spatial directions.

Kilari, Snehita Praneetha, et al., [5] In this diary the streetcar is intended to climb flight of stairs with the assistance of tri wheel instrument and this kind of component is utilized to climb the flight of stairs effectively with weighty burden which can't be out of control essentially or simply by lifting it. This idea of tri wheel instrument is moved to wheel seat. The essential target of bearing weighty burden like 120-150 kg is accomplished during testing. The exhibition is marginally confounded when the straight edge was tried for differing step sizes. Yet, when tried with Quasi-static edge, the vehicle showed more noteworthy execution in any event, for steps with various aspects. Static primary examination shows that it is fit for moving weighty burdens with less disfigurement and with no break.

### III. METHODOLOGY



#### 3.1 Gap Identification

There are so many studies available on the motorization of wheelchair. There are so many techniques are also available to signify the fabrication of such system and its development. However, in case of stair climbing systems, there are limited researches available. In addition, the available researches fails to describe entire process of fabrication and implementation.

### 3.2 Objectives

- └ Fabrication of Motorized wheelchair for disabled people.
- └ The development of tracked system for continuous support and proper traction.
- └ Design and Fabrication of Wheelchair.
- └ To understand the principle of power transmissions system.

### 3.3 Methodology

Methodology deals with the process followed to perform the study. In context of this project, following steps are followed,

- Problem Identification
- Objectives
- Design of System
- Validation of System
- Implementation
- Performance analysis.

## IV. EXPERIMENTAL SETUP

### Design of Frame:

A frame is a structural system that supports other components of a physical construction or steel frame that limits the construction's extent. The frame was designed in Solidworks software. This frame was fabricated using MS pipe of outer diameter 25.4 mm and wall thickness of 1.67mm. The frame can be divided into two parts rectangular part and leg part. The rectangular part is used to hold the chair along with the tilting mechanism, drive shaft and gear motor. The leg part is mainly used to hold the planetary wheels and driven shaft. The dimensions of the rectangular part were chosen by considering the space required for a normal person to sit comfortably and taking other ergonomic considerations.

### 4.2 Design of Transmission System:

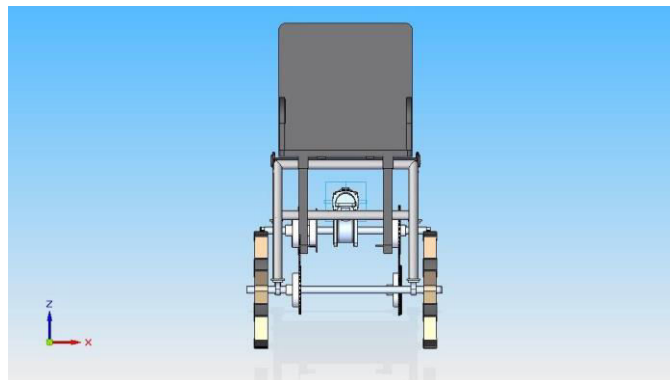


Figure 1: Transmission System

In this study, the power transferred from motor is provided to the wheelchair by means of track belt. Initially, the torque generated at motor shaft gets delivered to the wheel. The transmission component of the wheelchair design is responsible for allowing the operator to change gears between forward, neutral, and reverse movement.

The transmission system consists of the motor and chain-sprocket system. The motor with the reduction box is directly mounted on the center shaft with the help of mountings from the frame to hold the motor in place. Therefore the motor is mounted rigidly, so that all the torque produced is completely transferred to the wheels. Now the drive from the center shaft is transferred to the front and back shafts with the help of the chain sprocket arrangement. The front and back shafts drive the wheels which climbs the stairs.



V. RESULT

LoadingCondition	LoadOn Wheelchair	Result
Onflatsurface	Noload	Successful
	20kg	Successful
	40kg	Successful
	60kg	Successful
	80kg	Successful
	100kg	Successful
	110kg	Unsuccessful

Oninclination (35 <sup>0</sup> )	Noload	Successful
	20kg	Successful
	40kg	Successful
	60kg	Successful
	70kg	Successful
	80kg	Unsuccessful

Onstairs (35 <sup>0</sup> )	Noload	Successful
	20kg	Successful
	30kg	Successful
	40kg	Successful
	45kg	Successful
	50kg	Successful
	55kg	Successful
	60kg	Unsuccessful

VI. CONCLUSION

The design of the wheelchair is compact and hence is able to move about in almost all the stairs that we find at institutions, offices, industries and also at some homes. The design is made very safe and there is no chance of failure of the frame and wheels under normal conditions

According to the tests conducted, the stair climbing wheelchair has a capacity of carrying a load of 100kgs on flat surface. It has the ability to ascend a flight of stairs of 35-degree elevation carrying a weight of 55kgs.

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