

Design and Fabrication of Standup Assistant Wheelchair for Physically Challenged Person

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Abstract

Wheelchair users are more likely to experience a range of physical and mental health problems due to their extended sat posture and inactivity, including weariness, hip joint pain, pressure sores, etc. Other related issues include increased carer dependency, lower back pain among carers, and injury occurrences during transfer help. Many elderly individuals who are able to walk are compelled to use wheelchairs because they cannot stand up independently. There is a critical need for improved wheelchair designs to boost the independence of wheelchair users because there are fewer carers and more elderly and lower limb impaired people in society. To increase independence and quality of life, the present project aimed to create a breakthrough reconfigurable wheelchair with stand-and-sit features. Subjects in their senior years who are disabled in their lower limbs. Further work presents the detailed product design and development processes of a reconfigurable wheelchair.

Keywords: Pain, wheelchair, limb, sores, limbs, wheelchairs, posture, carers, users, injury.

1. Introduction

In general, wheelchairs are made to only support sitting transportation of disabled people. A standing wheelchair is a type of assistive equipment that allows its user to raise their chair from a seated to a standing position, similar to a standing frame. A variation of the typical wheel chair that allows users to stand and move around is the mechanically operated standing wheel chair, which was created to enhance the quality of life for people with impairments. It is convivial, easy to use, reliable, and reasonably priced because it is entirely mechanically operated. Ratchet, belt, chain, and gear systems are the foundation for the design of a standing wheelchair. It is inexpensive and simple to maintain this wheelchair. Participants made an average of 60 (622) moves per day. This research can help with the design of a system that encourages standing and sitting movements in the workplace.

2. Construction

Square tubes and channel are used to construct the wheelchair frame through metal cutting and metal joining, or welding. Four wheels are mounted to the frame, two at the front and the other two at the back utilizing axle shafts. Through the use of a chair drive system, the rear axle shaft is connected to the DC drive. The seating arrangement features two pivoting links, one of which is hinged to the base frame and the other to the vertical frame. On the other end, the free ends of both links are attached to one another. A lead screw that meshes with a separate drive mounted to the base frame is welded into the centre of the top link. The battery serves as the power supply for the drive, and a DPDT switch is utilized to control the drive's rotational direction.

3. Design Setup

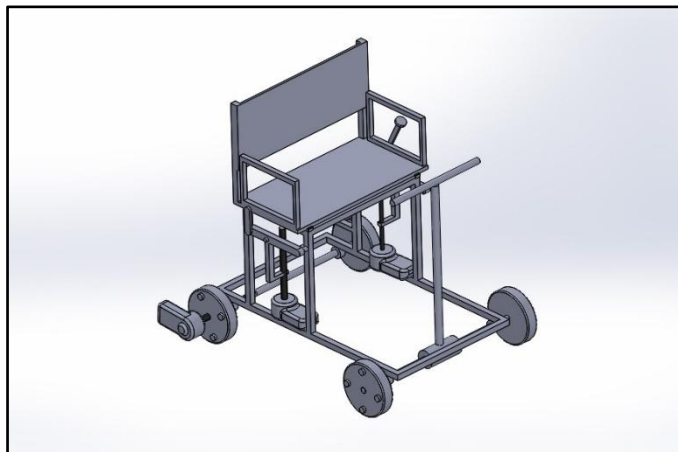


Figure 1. Design Setup

4. Experimental Setup



Figure 2 Experimental Setup

Table 1 Experimental Data

Time taken upward	180 sec
Time taken downward	158 sec
DC motor speed	1000 rpm

Table 2. Parts Used

Parts	Material
Frame	Mild Steel
Shaft	Mild Steel
Metal Strip	Mild Steel
Battery	Electrical
Bearing	Stainless Steel
DC Motor	Electrical
Two way switch	Electrical
Sheet Metal	Mild Steel
Wheel	Plastic
Lead Screw	Mild Steel

4.1 Battery

In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photo-voltaic system and batteries are high in capital costs. It is necessary that the overall system be optimized with respect to available energy and local demand pattern.

4.2 DC Motor

The electrical motor is an instrument, which converts electrical energy into mechanical energy. According to faraday’s law of Electromagnetic induction, when a current carrying conductor is placed in a magnetic field, it experiences a mechanical force whose direction is given by Fleming’s left hand rule.Constructional a dc generator and a dc motor are identical. The same dc machine can be used as a generator or as a motor. When a generator is in operation, it is driven mechanically and develops a voltage. The voltage is capable of sending current through the load resistance. While motor action a torque is developed.

4.3 Two Way Switch

A Two Way light switch is a simple single pole "changeover" switch with three terminals. These are typically labelled COM, L1, and L2 (Some may label the L1 and L2 positions as "1 Way" and "2 Way"). In one switch position the COM terminal is connected to L1. In the other switch position it changes over so that COM is connected to L2. The design is a "break before make" type, such that the connection to the first terminal is disconnected before the connection to the new one is made.

4.4 Wheel

The materials of modern pneumatic tires are synthetic rubber,natural rubber, fabric and wire, along with carbon blackand other chemical compounds. They consist of a tread and a body. The tread provides tractionwhile the body provides containment for a quantity of compressed air. Before rubber was developed, the first versions of tires were simply bands of metal that fitted around wooden wheels to prevent wear and tear. Early rubber tires were solid (not pneumatic).

Today, the majority of tires are pneumatic inflatable structures, comprising a doughnut-shaped body of cords and wires encased in rubber and generally filled with compressed air to form an inflatable cushion.

4.5 Working Principle

The drive attached to the rear axle begins to turn when the operator gets into the wheelchair and moves the DPDT switch that controls moving ahead. This causes the wheelchair to move forward. Similarly, the wheelchair goes backward when the position is reversed. When the operator wants to stand, the lead screw's drive is turned clockwise, which causes the screw to rotate around its axis and tends to pull the nut towards the top where it meshes with it. When the driving position is reversed, the wheelchair is placed in the home position after the nut's movement stretches the link, causing the operator to stand with the assistance of the extended link.

5. Conclusions

The lifting and standing motions of a wheelchair have historically been performed by a system with two degrees of freedom and two power sources. The "Wheelchair with One Degree of Freedom to Perform Lifting and Standing Functions" invention has the following two features: In order to achieve lifting and standing motion functions, the wheelchair is powered by a single source of energy. Additionally, the wheelchair's centre of gravity after standing up (or lifting up) remains between the front and rear wheels, negating the need for auxiliary wheels. Engineering professionals might utilise the findings of this research as a guide for creating a practical wheelchair.

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