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MODELLING AND DEVELOPMENT OF POWERED VEHICLE FOR DISABLED PERSONS

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Abstract : Wheelchairs are used by people to whom walking is difficult or impossible due to illness, injury, or disability. Disabled people who use a normal wheelchair for mobility and navigation require another person for support and to move around. The mobility of disabled people is a concerned social issue nowadays, most the pe use hand-powered wheelchairs and do not have the physical strength or coordination to propel themselves on the tricycle experience shoulder pain due to steering wheelchairs with only the upper limb muscles for a long time. Driving a manual wheelchair or crutches is a difficult task and there is then the availability of past invented powered vehicles in the present market that can be bought and used for physically disabled people. The main objective of this project is to design and simulate cheap intuitive, and practical powered vehicles. The proposed system presents a user-friendly tricycle that can be easily assembled into a wheelchair at any time. It has a front wheel-propelled mechanism with a hub motor installed inside the wheel. Based on the resultant output of motion analysis achieved by modelling and simulation of the powered vehicle it can be further fabricated. At the same time, this system uses batteries to move the wheelchair and in turn, no fuel is needed, making it a green vehicle. This powered wheelchair extension is designed to power normal wheelchairs and so, it achieves an effective and easier propagation method for patients and handicapped people as well. This extension uses metallic hollow pipes and rods together as a system that is designed to attach to a wheelchair's front pipe and thus clamp on it. We also use pipes and bearings connected to handles designed to achieve motion in multiple directions. Our team is currently pursuing a chain-drive system that transmits the motor's power to the driving wheel to provide the motion of our extension. The extension utilizes multiple rechargeable batteries to transmit power to the motor and, to change the movement. Therefore, using this extension, wheelchairs will be utilized by the patients and disabled directly to move over shorter routes without being dependent on other human beings. Some research is also being conducted to enhance the current design for making the extension more comfortable and more safety features can also be added in the future.

***Key Words*: Wheel Chair, Hub Motor, Battery, simulation.**

1. INTRODUCTION

A chair with wheels designed as a replacement for mobility is known as a wheelchair. This is used for the movement of physically disabled, elder people, and children who have difficulty and are unable to walk due to illness, injury, problems related to old age, etc. This device comes in many variations self-propelled, propelled by the motor, or with the help of an attendee to push. Wheelchairs come in a wide variety of formats to meet the specific needs of their users. They may include specialized seating adaptions, and individualized controls, and may be specific to particular activities. The seat size (width and depth), seat-to-floor height, footrests/leg rests, front caster outriggers, adjustable backrests, controls, and many other features can be customized on, or added to, many basic models, while some users, often those with specialized needs, may have wheelchairs custom built. Many types of wheelchairs are used for various reasons. It is important to understand the limitations and safe operation of whatever wheelchair you choose. This paper focuses on the emerging trend of powered vehicles. People with walking disabilities often need to use a wheel bench. Wheelchairs are often variations on A wheelchair is a wheeled mobility device in which the user sits. The device is this basic design, but there are many types of wheelchairs, and they are often highly customized for the individual user's needs.

2. LITERATURE REVIEW

Kink Phillip II of Spain. et.al. invented the 'invalid's chair' in 1595, designed for disability and mobility specifically for King Phillip II of Spain. The chair had small wheels attached to the end of the chair's legs and it included a platform for Phillip's legs and an adjustable backrest. It could not be self-propelled but most likely the King always had servants transporting him around.
In 1655, built the world's first 'self-propelling chair' was by Stephan Farffler. et.al, a 22-year-old paraplegic watchmaker. However, the device had an appearance of a hand bike more than a wheelchair since the design included hand cranks mounted at the front wheel.

In 1783, 'The town of Bath' was invented by John Dawson of Bath. et.al, England. Dawson designed a chair with two large wheels and one small one. The Bath wheelchair outsold all other wheelchairs in the early 19th century.However, the Bath wheelchair was not that comfortable and during the last half of the 19th century, many improvements were made to wheelchairs. An 1869 patent for a wheelchair showed the first model with rear push wheels and small front casters. Between, 1867 to 1875, inventors added new hollow rubber wheels similar to those used on bicycles on metal rims. In 1881, the push rims for added self-propulsion were invented

In 1932, built the 'first folding tubular steel wheelchair' by an engineer, Harry Jennings. et.al. That was the earliest wheelchair similar to what is in modern use today. That wheelchair was built for a paraplegic friend of Jennings called Herbert Everest. Together they founded Everest & Jennings, a company that monopolized the wheelchair market for many years. An antitrust suit was brought against Everest & Jennings by the Department of Justice, which charged the company.

Canadian inventor, George Klein. et.al. invented the 'first electric-powered wheelchair' at the beginning of 1956. Canadian inventor, George Klein and his team of engineers while working for the National Research Council of Canada in a program to assist the injured veterans returning after World War II. he also invented the 15 microsurgical staple guns. Everest & Jennings, the same company whose founders created the folding wheelchair were the first to manufacture the electric wheelchair on a mass scale beginning in 1956. The project 'Hand powered wheelchair' is conducted in cooperation with the NGO "amendment was accepted – disabled person company more than 12 years.

Hand-powered tricycles are presently being used to provide mobility for disabled persons in rural communities across the world. Hand-powered wheelchair with special accessories –however, operated involved 20 people with disabilities, distance covered by a few hundred kilometres of roads of different regions of Lithuania. Marathon – a challenge for people with physical disabilities who overcomes daily, about 40 – 60 kilometres educating the hot sun or rain heavy rain. overhauling the various compensatory equipment, including wheelchairs, and producing special accessories – propulsion- greatly enhances the possibilities to move a wheelchair.

The design of the 'Electric Tricycle wheelchair' is adaptable to the current hand-powered tricycles with little modification. The design consists of an electric motor, a drive system, a motor, and steering controls, and power. An electric motor was chosen because high fuel costs prohibited the use of a combustion engine and because of the availability of electricity in Mahadaga. A solar array that provides electricity for the Handicap Center provides the ideal source of electricity for battery recharging. The first aspect of our design that was addressed was the drive system or means of power transmission. Power must be transmitted from the electric motor to the rear wheel of the tricycle. Second, a method of motor control was decided on. The controls for motor speed and braking were incorporated into a simple mechanical joystick to facilitate operation by users with limited dexterity.

The hand-power system was replaced with a steering system that disables the hand-power capability of the tricycle. All the above components (motor, transmission, controls, and batteries) were designed to be able to be installed on the existing hand-powered tricycles.

Everything necessary to convert a hand-powered tricycle to an Electric Tricycle is simple to install, and the conversion is reversible.

- Be able to climb a 10% grade
- Limit top speed to 7 mph
- Have a power supply that will provide a range of 8 miles at maximum speed
- Total cost of the power train and controls and power supply will not exceed 25,000.

Fig -1: Single arm drive wheel chair

3. METHODOLOGIES

Wheelchairs are used by people for whom walking is difficult or impossible due to illness, injury, or disability. People with walking disabilities often need to use a wheel bench. Wheelchairs are often variations on this basic design, but there are many types of wheelchairs, and they are often highly customized for the individual user's needs. The seat size (width and depth), seat-to-floor height, footrests/leg rests, front caster outriggers, adjustable backrests, controls, and many other features can be customized on, or added to, many basic models, while some users, often those with specialized needs, 19 may have wheelchairs custom built. This paper focuses on the emerging trend of powered vehicles. The powered vehicle is wheelchair driven with the help of a tricycle. The front wheel of the tricycle is driven in which a hub motor is installed for its mobility. Disabled people who use manual wheelchairs often experience shoulder pain due to steering wheelchairs with only the upper limb muscles for a long time. Some disabled peoples need medical treatment and also have surgical treatment in serious cases, to these potential muscle disorders there must be a need for an automated and efficient mobility vehicle that can fulfil their basic needs and service them without the help of any other person. Several types of electrical hand bikes have been recently introduced in which mobility is either manual-powered or electric-powered. An automated wheelchair is a powered wheelchair with a battery as an energy source. The battery would kick out a steady electric current, driving the dynamo in reverse so that it spun around in the hub motor. As the dynamo/motor turned, it would rotate the tire and make the tricycle go along without any help. The tricycle is the simplest and most user-friendly mobility device.

4. DESIGN PROCESS

All the design sketches, parts, and assembly were done using solid works. Wheelchair design aims to produce wheelchairs that perform well and can provide appropriate seating and postural support without compromising strength, durability, and safety. This can be achieved when government authorities, manufacturers, engineers, designers, service providers, and users fulfil their respective roles concerning design. Wheelchairs are used by people to whom walking is difficult or impossible due to illness, injury, or disability. Disabled people who use a normal wheelchair for mobility and navigation require another person for support and to move around. The mobility of disabled people is a concerned social issue nowadays, most people use hand-powered

Fig -2: Final model of Powered wheel chair

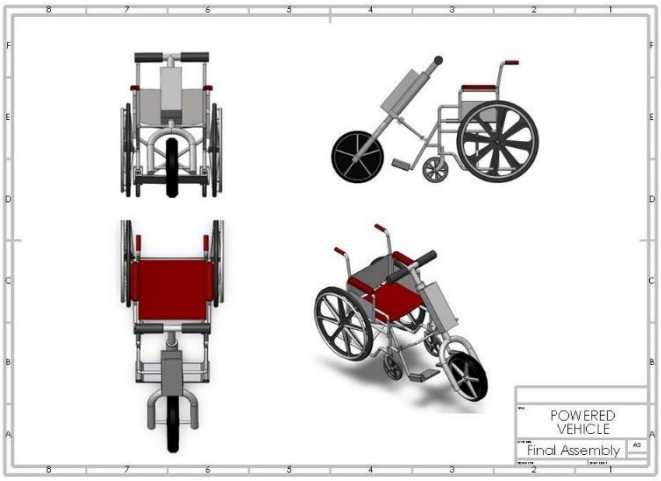
wheelchairs and do not have the physical strength or coordination to propel themselves on the tricycle and experience shoulder pain due to steering wheelchairs with only the upper limb muscles for a long time. The main objective of this project is to design and simulate cheap intuitive, and practical powered vehicles. The proposed system presents a user-friendly tricycle that can be easily assembled into a wheelchair at any time. It has a front wheel-propelled mechanism with a hub motor installed inside the wheel. Based on the resultant output of motion analysis achieved by the design and simulation of the powered vehicle it can be further fabricated.

4.1. DESIGN PROCEDURE

The design process usually involves the following steps:

- Identify the model requirements.
- Conceptualize the model based on the identified needs.
- Develop the model based on the concepts.
- Analyse the model.
- Prototype the model.
- Construct the model.
- Edit the model, if needed.

Before you design the model, it is helpful to plan out a method of how to create the model. After you identify needs and isolate the appropriate concepts, you can develop the model using:



Sketches: Create the sketches and decide how to dimension and where to apply relations.

Features: Select the appropriate features, such as extrudes and fillets, determine the best features to apply, and decide in what order to apply those features.

Assemblies: Select the components to mate and the types of mates to apply.

5. RESULTS & DISCUSSIONS

A wheelchair attachment is being developed to address a dependability and safety issue for a disabled person's movement (paralysis patient). The electric Automator attachment is designed to eliminate the strains that the paraplegia patient's upper body has been subjected to. Furthermore, having a mode of transportation provides individuals with a sense of freedom. The existing system is substantially more expensive and has some shortcomings, which our project has addressed. The project's price, as well as its modular nature, makes it a viable option for disabled people who cannot afford conventional alternatives. Front-wheel drive and a low centre of gravity Driving and braking make it easier to navigate uneven terrain while maintaining stability.

6. CONCLUSIONS

The main theme of this project has been to make people aware of this technology and make it popular among the general mass so that it helps improve this world by reducing disability problems. There has always been this willingness in the human race to improve the ongoing technology that is prevailing at a particular time, by bringing a more sophisticated and advanced product than that is what is presently available today. This act is what leads to bringing new developments, and progress in every aspect of life for better livelihood all around. That is why with the improvements and growth in science and technology in recent decades, we can see similar progress in the field of transportation also.

As we know development is a continuous process and until it reaches a state of complete perfection, there is always room for its improvement, and our study is just to support this idea. We would say that our project has been successful considering the changes we had to make when compared to the available powered vehicle. We believe that our project will be effective in providing mobility for disabled people at an affordable price. As mobility is the basic need of every disabled person, we have made our project by considering its reliability, efficiency, and effectiveness. Its utilization will be very helpful for the NGOs as the availability of powered vehicles at an affordable price range will be financially and socially helpful. We have tried to analyze the properties of the powered vehicle, especially the role of the controller, motor, along with batteries, so that it may help to improvise this technology where it may be necessary. The main objective is just to highlight its importance among the common public and establish it as a more secure and reliable alternative for inside city transportation, homely use, and NGOs.

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