

# REVIEW ON MODIFIED VEHICLES FOR DIFFERENTLY ABLED PEOPLE

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**ABSTRACT:-** In our daily life, we have seen various types of tri-cycles and tri-wheeled vehicles used by the disabled peoples for their locomotion from one place to another. There are several newly developed tri-wheeled vehicles for physically challenged people, which will be operated by manual, electrical and motorized modes. The most commonly used handicapped tri-cycle are driven by the manual mode of operation by the use of paddle, but this vehicle provides discomfort to the handicapped persons through weakness in their body and due to their lack of physical fitness in all period of time. Hence, in order to reduce those difficulties various types of moped and modified scooter like vehicles are introduced, which are in the form of semi or fully automated mode of construction and working for their better increase in the comfort for their transportation. This paper overviews the implementation of new conceptual ideas and technologies on handicapped vehicles for the betterment in the pre-existing vehicle models for differently abled people and we hope this will be helpful for the further manipulation in developments and provide the guide line for the new innovations in automotive for the physically challenged people.

**KEYWORDS:** Tri-wheeled vehicles, physically challenged people.

## 1. INTRODUCTION

In the present era transportation of disabled people plays a vital challenge to achieve their destination. Since the 1980s, engineers and industries have helped to develop solar-powered cars, two wheelers and aero vehicles. In sprit of using cars or two wheelers that are costly, people will prefer to use tricycle as their vehicle. Several types of tri-cycle usually categorised as pedal powered tricycle, electric powered tricycle and Engine used tricycle. The most commonly used pedal powered tricycle utilises more energy from disabled people so that it results in tiredness and illness. IC engine powered tricycles are generally motorised form of vehicles which leave pollution to the environment. When the fuel becomes empty, the manual pedalling operation is difficult for the disabled people to move from one place to another, since he wants to drive the weight of IC engine and self-weight. In order to reduce the effort of the disabled people, we hope this will be helpful for the further manipulation in developments and provides the guide line for the new innovations in automotive for the disabled people.

## 2. PRE-EXISTING MODIFIED VEHICLES

There are various types of modified vehicles which are commercially used by the handicapped people in their day to day life. Let us see an over view of those vehicle as follows;

### 2.1 MANUALLY OPERATED VEHICLE

The manually operated tri-wheeled vehicles are the most commonly used disabled vehicles by the handicapped people. It is generally operated by the use of pedal and chain drive system linked to the sprocket of wheel rims. The wheels are fixed as rigidly by the use of clamps, couplings and linked with the help of frames. The entire design of the tri-cycle will be compact and in simple mode of construction. It provides the easy way to have good maintenance in conditions. The cost of the construction and development will be less when compared to that of other vehicles. The photographic image of existing manually operated tri-wheeled vehicle is shown in fig 1.



**Figure 1.** Photographic image of manually operated tri-wheeled vehicle.



**Figure 2.** Photographic image of motorized modified vehicle

### 2.2 MOTORISED MODIFIED VEHICLE

In order to reduce the efforts of manually operated disabled vehicles, the motorised handicapped vehicles are introduced. It comprises the Electric powered DC motor which is the driving source to pull the disabled and provides the freeness from the pedal operation

while driving. The charging system of this vehicle is governed by the lead acid batteries which are rechargeable. Thus, they are charged by pug-in charging method for a required time. The rate of discharging of battery powers depends upon the distance travelled for a particular period of time. By the use of starter switches, the motor operates the vehicle to run for the desired destination. The photographic image of existing motorized modified vehicle is shown in fig 2.

### 2.3 SOLAR POWERED MODIFIED VEHICLE

The solar power plays an important role, as it is widely used renewable resources in the automotive in future generations. The solar powered tri-wheeled vehicles consist of an additional feature which is nothing but the implementation of the solar panel which converts the solar energy into electrical energy and the vehicle is automated by providing the electric hub motor. The hub motors are generally Brushless DC motor (BLDC) which is fixed rigidly on the wheel rims and when the electric power from the solar panel provides supply to the BLDC motor, it will starts rotating in the constant speed over a period of time during the running conditions. The photographic image of solar powered modified vehicle is shown in fig 3.



Figure 3. photographic image of solar powered modified vehicle



Figure 4. photographic image of Engine powered modified scooter.

### 2.4 ENGINE POWERED MODIFIED SCOOTERS

The contemporary modified tri-wheeled vehicles used by the physically disabled person for transportation are not ergonomic and do not provide protection from adverse weather conditions. It is also difficult for physically disabled person to ride over longer duration. In order to overcome those difficulties, a feasible design solution in the form of a user-friendly tri-wheeled, scooter is introduced, which allows disabled person to commute themselves and performs its activities without any

assistance. The photographic image of engine powered modified scooters is shown in fig 4.

### 3. COMPONENTS DISCRPTION IN PRE- EXISTING MODIFIED VEHICLES

The most commonly used components in the available modified vehicles are listed below as follows:

#### 3.1 PEDALS

It is the common type of additional attachment in all the tri-cycles used by the handicapped people. It is generally made up of rubber which provides the grip to handle it to drive the cycle during their travel. The photographic image of pedal is shown in fig 5.



Figure 5. photographic image of pedal



Figure 6. photographic image of BLDC motor

#### 3.2 MOTOR

The brushless DC motor (BLDC) is generally used in electric vehicles in order to run at a constant speed over the period of time. It has a high starting torque and noiseless in their operation in order to attain higher efficiency of the vehicle. The BLDC motor is also termed as Hub motor. Hence it is generally fixed along the wheel hub and attached with the support of rims. The photographic image of BLDC motor is sown in fig 6.

#### 3.3 SOLAR PANEL

The solar panels are nothing but the Photo voltaic cells which act as a power converter. Hence it directly converts the sunlight into electrical energy by the use of the semiconducting materials in it. This panel is connected with the power regulator or booster circuit in order to produce the constant current to the interlinked devices. The photographic image of solar panel is shown in fig 7.



Figure 7. photographic image of solar panel



Figure 8. photographic image of solar charge controller

### 3.4 SOLAR CHARGE CONTROLLER

In general, the solar charge controller is used to control or to regulate the output voltage from the solar panel. It consists of booster circuit which helps to handle the low voltage and helps to convert into a constant power production for the connected appliances. It acts as a switch to control the current from the solar panel. The photographic image of solar charge controller is shown in fig 8.

### 3.5 LEAD ACID BATTERY

The lead acid battery is the most commonly used battery in all electronic devices. It has more advantages over other conventional batteries. These batteries are generally used in the solar vehicles in order to produce the constant rate of voltage for their better functioning. The photographic image of lead acid battery is shown in fig 9.



Figure 9. photographic image of lead acid battery



Figure 10. photographic image of Throttle

### 3.6 THROTTLE

The electric throttles are generally used in bicycle or in some places of tricycles. It helps to convert the DC voltage from the battery to an AC voltage with variable amplitude and the frequency that drives the hub motor at different speeds. It drives the motor from zero speed to full speed. The photographic image of Throttle is shown in Fig .10

## 4. PROBLEMS FACED BY DIFFERENTLY ABLED PEOPLE

In our life, we have faced several problems which make us uncomfortable to survive without happiness and with lots of mental stress. Likewise, the people suffered through disability by natural foul play or by unexpected accidents, will have to face lots of problems in their life by commercial as well as social too. Here we will see some of the problems faced by the disabled people;

### 4.1 SOCIAL PROBLEMS OF DISABLED PEOPLE

The individuals having disability have been treated differently in society throughout their life. They are given less opportunity to be contributing members of society, are likely to face discrimination, poverty and inequality in the society as a whole. To overcome those problems, we need to redefine what disability means in our society and reconstruct a positive meaning to the world. If we had a positive outlook on individual who had a disability dreams how different our world would be. According to Labelling theory;

*“Resolving social problems sometimes involves changing the meanings and definitions attributed to people and situations”.*

### 4.2 COMMERCIAL PROBLEMS OF DISABLED PEOPLE

In general, the disabled people are facing several problems in their daily life. Here, some of their commercially faced problems are discussed as follows;

- ❖ The most disabled peoples are facing the lack of financial independence.
- ❖ They do not have value added education.
- ❖ Lack of job vacancies for their working ability.
- ❖ They are facing several problems due to their poverty.
- ❖ They wish to have a personal assistant to guide them in a proper way.
- ❖ The disabled people are fond of travelling for long distances travel to feel their freedom.
- ❖ Nowadays, the families of disabled people are isolated because of their lack of affection to care them which makes person to hurt much in their feelings.
- ❖ The disabled people are to be well trained for the better communication skill in all languages.

- ❖ They want the same respect and to treat them in equal manner to have a satisfied life.

## 5. OBJECTIVE

The main aim of this paper is to solve the difficulties in the automotive of the disabled people by performing some researches and literary survey on various journal articles. This will be helpful to establish a best desired technology in the pre-existing modified vehicles to implement in the society for their comfort and to achieve their desired goals. Here some of the special features expected by the disabled on their modified vehicles are listed below;

- ❖ To have an eco-friendly mode of vehicles for their transportation.
- ❖ To have Comfort while travelling.
- ❖ To achieve a constant speed of the vehicles to travel over distance.
- ❖ To have mileage on the modified vehicles to travel longer distance.
- ❖ To have good safety during their travelling.

## 6. LITERATURE SURVEY

**Latikesh khedkar et al., (2016)** "Design And Fabrication Of Reverse Gear Mechanism For Handicapped People Vehicle", This research paper aims at the designing and fabrication on a reverse gear mechanism, which will be fitted to the vehicle with little modifications in the existing model. The reverse gear mechanism is achieved by adding only about 2% of original weight balance.

**Ripal Kumar Patel et al., (2015)** "Design and development of solar tricycle for handicapped people", In this paper solar tricycle is designed and well developed specially for the handicapped person which will help to reduce the effort of handicapped person. It can run up to 15km / hour once batteries are fully charged which carry 120kg of load.

**Jayprabakar J et al., (2016)** "Design of Affordable Electric Vehicle for Handicapped", the objective of this study was to design and develop a vehicle of highly compact to enter building and structure like industries, hospitals, indoor and outdoor place. The vehicle had less weight in order to increase its range and also to carry a better weight. The vehicle was built with a height as low as possible but the other factor, ground clearance is also considered for the suitability of Indian road conditions. A platform was made in the vehicle so that disabled person survive with wheel chairs can also keep their wheel chairs comfortably. A prototype of this vehicle was fabricated and tested on the road.

**Samip Mehta et al., (2016)** "Foot Steered Tricycle", In this research paper to improve ambulation, the foot steered user combination can be optimized at three levels. The user can optimize physical capacity and

technique by training. The second level focuses on steered tricycle user interface. Finally, the tricycle focus lies on minimizing power loss of the tricycle user by reducing frictional forces and optimizing the vehicle mechanics.

**Algarni S et al., (2017)** "Performance analysis of a solar powered wheel chair", the main aim of this paper is to discuss on a new design of solar powered wheel chair (SPW) considering various design aspect and functionalities. This includes the modification of a motorized wheel chair to use solar energy with the help of solar panels, and an optimal compact design was also carried out to understand the effective mobility of wheel chair. Energy characteristics study of the photovoltaic cell added to this design for the weather conditions up to an average power of 490 Wh/day. Hence it can provide an additional uninterrupted journey of 9km at a maximum speed of 6 km/hr.

**Weijun TAO et al., (2016)** "A Novel wheel-track hybrid electric powered wheelchair for stairs climbing", this paper aiming at efficient locomotion on the ground and safe stair climbing for aged or physical disabled people. Here they present the wheel-track hybrid design of the EPW with a focus on the mechanical structure and of onboard control system. Then they discuss and analyse the wheel and the track mobile modes and their switching design of the EPW. The use of the track mobile mode is for commonly ground surfaces. The mechanical analysis during these two mode switching and in the process of climbing up and down the stair are also presented in the paper. The stimulation and experimental results show that the new wheel-track hybrid EPW can effectively conduct the two locomotion modes including climbing up and down the stairs.

**Abhishek K. Saw et al., (2015)** "Literature Review on solar powered Tricycle for Handicapped person", this paper gives the details about the research papers related to the solar power tricycle project and includes the method and considerations regarding the proper working of the tricycle. The content of this paper is solar PV panel, Brushless PMDC motor, charge controller and battery. This paper will discuss about the main idea of the component and here they compared the different component.

**Subrahmanyam V et al., (2015)** "Fabrication of Tri-wheeled Electric Vehicle to Aid Disabled", in this paper to aid disabled people they modelled and fabricated a tri-car. This tri-car is a three wheeled electric powered vehicle with two seats one against other back to back and can accommodate two passengers and a driver. They finally designed the vehicle to be propelled by an electric hub motor mounted in the front wheel and powered by 48V Lithium-ion battery.

**Gavandi Munir Akram et al., (2016)** "Solar powered Electric Tricycle for physically Challenged Person", in this paper will discuss that how solar tricycle will help

to reduce the effort of handicapped person. All the designs specification considered after analysing the problems from the handicapped person. Comfort in the tricycle is important and we have given importance to it.

**Ravikumar Kandasamy et al., (2013)** “Design of Solar Tricycle for Handicapped Person”, this paper will discuss about the main idea of this project on handicapped vehicle and to get a larger picture on what is the problem in the current technologies, what that they want to achieve in this project and the area that will cover this project.

**Mahadi Hasan Masund et al., (2017)** “Design Construction and Performance study on a solar Assisted Tri-cycle”, in this study, a cheaper solar tricycle with more capability of utilizing the solar energy is designed for developing countries. The power transmission of solar tricycle is also simple. It is found that tricycle serves 24% of backup for running by the solar panel. Also, the construction cost of the tricycle is only 240\$ with near about zero impact on the environment. This highlights the advantages of the dual mode of charging, including the economic and environmental feasibility of the tricycle.

**Vishnuprakash P et al., (2015)** “Design and concept Evaluation of tricycle for aged and orthopaedic Differentially Able person”, this paper aims at proposing new alternative design which overcomes all the limitations in the current design. The design is provided with features of adjustable back rest, foot rest and adjustable crank and related accessories. Thus the improved design meets the ergonomic issue which were lagging in the current design.

**Prabhu P, Parthipan M et al., (2017)** “Design and Fabrication of Magnetic Tricycle for disabled people”, in this paper they have developed the magnetic tricycle for handicapped person. Magnetic tricycle will helps to


reduce the fatigue to the handicapped person. All the design specification considered after analysing the problems based on the handicapped person. The comfort of the person in the tricycle is an important factor they have given importance to it. The main content of the tricycle is a pair magnets and brake systems. This project will able to help the patients and physically handicapped people such way that user friendly type.







**Ajit A. Mohekar et al., (2015)** “Design of an Innovative Retrofitted Tricycle for a Disabled Person”, in this paper the existing mean of transportation for disabled people require a disabled person to dismount from the wheel chair. A retrofitted tricycle is designed to overcome this problem by allowing the disabled person to wheel up or down his wheel chair onto or down the tricycle. This is achieved using a special designed platform that allows the wheel chair to be wheeled up or down. This paper discusses an attempt to be design and fabricate a retrofitted tricycle for disabled people. This tricycle is specially designed to suit wheelchair occupants.






**Snehal G. Bali et al., (2015)** “Fabrication of solar powered Tricycle for handicapped person”, in this paper they have developed the solar tricycle especially for the handicapped person. In this paper it is discussed that how solar power is utilised for providing the power to the tricycle, which will reduce the efforts of handicapped person. The solar tricycle mainly consists of solar panel, brushless DC motor, battery, charge controller and throttle.

**Vishal Upadhyay et al., (2015)** “Design of scooter for physically handicapped people with foldable hoods”, this paper focused at providing a feasible design solution in form of a user friendly three wheeled scooter, which allows disabled people to perform activities without anyone’s assistance.

**6.2 COMPARISION TABLE OF LITERATURE SURVEY:**

S.NO	YEAR	AUTHOR	JOURNAL PAPERS	DESIGN	MATERIAL USED
1.	2017	Algarni S, Mellouli S, Abhilash E	Performance analysis of a solar powered wheel chair		28Ah batteries, 168w motor, solar panel 24V, solar charge controller PWM-10A-24V

2.	2017	Prabhu P, Parthipan M	Design and Fabrication of Magnetic Tricycle for disabled people		Wheels, frames, foot rest, Neodymium magnets, wheel rims
3.	2016	Jayaprabakar J, Saikiran K	Design of Affordable Electric Vehicle for Handicapped	 <small>Fig. 1. Side view of the vehicle</small>	48V battery, wheels & tires, controller, hub motor, throttle.
4.	2016	Weijun TAO, Yongxiang JIA, Tao LIU	A Novel wheel-track hybrid electric powered wheelchair for stairs climbing		Tilting sensor, IR-sensor, pressure sensor, wheelchair, wheels
5.	2016	Samip Mehta, Devan Godhani etal.,	Foot Steered Tricycle		Wiper motor, BLDC hub motor, VRLA battery, motor controller, voltage converter, SPDT switch, electric converter, wires
6.	2016	Latikesh khedkar, ketan khedkar etal.,	Design And Fabrication Of Reverse Gear Mechanism For Handicapped People Vehicle		Power transmission shaft, spur gears, casting of gear box
7.	2015	Vishal Upadhyay etal.,	Design of scooter for physically handicapped people with foldable hoods		Wheel, handle, suspension system, body of scooter, chassis design.

8.	2015	Subrahmanyam V, Anjani Kumar B, Naresh K etal.,	Fabrication of Tri-wheeled Electric Vehicle to Aid Disabled		Electric hub motor, 48V lithium-ion battery, wheels, mild steel rod, perforated plate.
9.	2015	Ripal Kumar Patel, Vikesh Patel etal.,	Design and development of solar tricycle for handicapped people		Tricycle, frame (MS plate), solar panel, sprocket, bearings, battery, D.C motor, Accelerator lever
10.	2015	Ajit A. Mohekar, Savita V. Kendre etal.,	Design of an Innovative Retrofitted Tricycle for a Disabled Person		High tension rope, 12V DC motor, IC engine, brakes, suspension, gear box
11.	2013	Ravikumar Kandasamy, Sachin Raut, Deep Varma etal.,	Design of Solar Tricycle for Handicapped Person		12V solar panel, 250 w BLDC motor, 12v battery, wheels, throttle, tyres
12.	2017	Madhav P, Pranav S Meghal etal.,	Design and development of wheelchair Accessible Ramp for scooters		Frame, ramp, wheel chair, drive train, steering, suspension, shaft designs.

## 7. CONCLUSION

These modified disabled vehicles work on multi-power supply system, such as in solar powered vehicles, with the help of solar panel supplies electric power to the batteries when it got energised and thus the charging system charged and governs the electric DC motor to run the vehicle. In case of hybrid tricycles, they utilise the alternative mode of power for transportation which will be helpful for the differently abled people to reach their destination. Hence, provide the guide line for the new innovations in automotive for the physically challenged people.

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