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Manufacturing of a multi facilities Powered vehicle for physically challenged people

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***Abstract*— In today's world, transportation has become one of the prime requirements of people for moving self or goods from one place to another. We have even come across people travelling for more than 200 km every day for reaching their work place. Mobility has thus become an essential part of our lives with many development and improvements happening in this field. Because of the changing lifestyle of today's world, there is a huge reduction in the level of interactions within the people group. In these conditions it becomes more difficult for physically challenged people to commute and to perform their day to day activities like working, education, shopping etc. as they have to constantly depend on others for getting assistance to alight and board the vehicle. In this project. a feasible design solution in form of a user friendly three wheeler vehicle, which allows physically challenged people to commute on their own and perform their activities without anyone's assistance, has been proposed.**

This vehicle is suitable for physically challenged or disabled people. I proposed complete customized solutions for physically challenged drivers and patents also. This proposed vehicle successfully dealing with electric and Hybrid vehicle Conversions. In this upgrade vehicle we introduced a solar dependent working engine and some other feature like Seat(to reduced spondylitis,spine problems of PHP's),emergency toilets and lighting conductors. My proposed system is a luxurious vehicle. This vehicle is re design from my previous design i.e Modeling and manufacturing of a powered vehicle for physical challenged vehicle With a disability, it can be very difficult to drive so hand controls can make this much easier with more control and faster response times. Persons with Both Limbs Disability can use an Automatic Transmission Vehicle fitted with a Hand operated Brake & Accelerator.

***Index Terms*— Motor electrical, Battery, Tubeless Tires, Controllers, welding, Operations**

I. INTRODUCTION

The term Disability covers impairments, activity limitations, and participation restrictions. Impairment is a problem in body function or structure. An activity limitation is a difficulty encountered by an individual in executing a task or action. However participation restriction is a problem experienced by individual involvement in life situations. Disability is caused by impairments to various subsystems of the body – these can be broadly classified under the following categories.

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Any impairment which limits physical function of limbs or damage of limbs or organs is a physical disability.

Mobility impairment is a category of disability that includes people with varying types of physical disabilities. This type of disability includes upper limb disability, lower limb disability, manual dexterity and disability in co-ordination with different organs of the body. Disability in mobility can either be a congenital or acquired with age problem. This problem could also be the consequence of some disease.

Physical disability is also termed as handicap, when physically challenged people come across social cultural or physical barriers which prevent their access to different system in the day to day life which are available for other common people. Thus handicap is the loss of opportunities to take part at equal level with others. One of the areas where physically challenged people lose out is transportation. Transport disability keep out current physically challenged people from all form of transport like public, private and personal transportation. These in turn limit their ability to interact with others in the society and take up jobs or business away from their home. Access to transport will give them freedom to live independent life.

Fig. 1 Difficulty faced by the physically challenged person [1]

Census 2001 has revealed that over 21million people, about 2.1% of the population, in India are suffering from one or the other kind of disability [1]. Among the total disabled in the country, 12.6 million are males and 9.3 million are females. Although the number of disabled is more in rural than urban areas, such proportions of the disabled males and females are 57-58% and 42-43% respectively. The disability rate (number of disabled per 100,000 populations) for the country as whole works out to 2130. This is 2,369 in the case of males and 1,874 in the case of females.

Table 1. Number of disabled population and the type of disability [1]

	Population	Percentage (%)
Total population	1,028,610,328 100.0	**100**
Total disabled	21,906,769	2.1
Disability rate (per lakh population)	2,130	
Type of Disability		
(a) Vision	10,634,881	1.0
(b) Speech	1,640,868	0.2
(c) Hearing	1,261,722	0.1
(d) Movement	6,105,477	0.6
(e) Mental	2,263,821	0.2

From the statistics it is evident that majority, 52% in Rural and 55% in urban area, of the physically challenged lack facility for transport. Among these are, 1217 males and 785 females per million people [2] these numbers are taken from NSS 58th rounds of survey. For people with lower limb disability accessibility and movement from one place to another place is primary issues. Access to public areas such as city streets and public buildings and restrooms are some of the more places where physically challenged people face problem.

In recent years a noticeable changes have taken place in the society which can be seen in the form of installation of elevators, automatic doors, wide doors and corridors, transit lifts, wheelchair ramps, curb cuts, and the elimination of unnecessary steps where ramps and elevators are not available, allowing people in wheelchairs and with other mobility impairments to use public sidewalks and public transit more easily and more safely. From the above statistic lower limb disability is second higher and for them ease of transit is the demand and giving workable solution is the mail requirement.

Study Objectives:

*. To comprehend the diverse travels needs of the physically challenge people.

*. To build up a appropriate and feasible design for the vehicle which can satisfy their travel needs and safe for them to travel?

*. To test the vehicle in real time situations under the surveillance of authorities.

Study Methodology:

The Methodology used for the study is based and experiment and testing method which is the most suitable for exercising engineering projects. In order to conduct the study a, model of the vehicle was developed with the help of previous studies available and a suitable model was designed.

Then all the components were built and assembled in the work shop and fixed together. The vehicle was sent to the testing laboratory where the vehicle had its simulator runs and was found to be fairly safe even at the initial stages.

A sample of 10 respondents with physically challenging disabilities such as osteoporosis and slip disk problems were chosen and under the surveillance of the Road Transport and safety authorities. The sample respondents were trained for using the vehicle for three days and they were allowed to test the vehicle and drive it in real traffic for about 5 Kilo Meters. Their observations were recorded and the vehicle was tested to be successful.

Literature Review:

In order to get an idea about the task in hand I have tried to gather as much information as one can from the similar studies carried over previous across the globe. The details of which are as follows:

a) The development of the "Wellesley Chair MIT, 2006:

Wellesley is the name given to the chair used for experimental development by Holly Yanco, first at Wellesley College and now at MIT. This chair has a Subsumption Architecture-like layered approach to its performance. By means of a graphical interface the user of the chair points to the direction in which the chair should head. The chair then goes in that direction while performing other tasks such as obstacle avoidance.

The interface also allows the user to tell the chair when specific tasks. such as going up a ramp are required and to have a record of a particular environment and important features of that environment. The chair is designed in such a way that it can turn in place. It has 12 proximity sensors, 6 ultrasonic range sensors, 2 shaft encoders and a front bumper with sensors. A 68332 computer is onboard and the interface runs on a Macintosh Power book. Work is underway to incorporate information from the angle of the eyes of the user to control the computer as a replacement for the mouse.

The luxurious facilities are provided in the vehicle is as follows:

cooking
drinking water
sleeping
laptop
charging fan
Emergency toilet
Specially designed Seat

<u>Powered vehicle Design Requirement:</u>

Required blocks to manufacture Proposed Vehicle:

1. Motor(Electro-Craft tape drive motor)
2. Controller
3. Batteries
4. Driven system
5. Dynamic braking
6. Bearings
7. Bolts and nuts
8. Belt
9. Body construction (Blue print)
10. Chassis formation
11. Solar circuit design for this required model
12. Seat design special for PHP's

Above all are the requirements for the construction of powered vehicle for physically challenged peoples. And the following operations are performed to construct the vehicle

Design Operations:

- Marking operation
- Bending operation
- Drilling operation
- Threads cutting
- Step turning
- Groove cutting
- Cutting operation
- Welding operation
- Grinding operation

Motor: The motor is an electro craft tape drive motor from a reel to reel computer tape drive. The model number of motor was rubbed off. This motor firstly used to design cyclic motor vehicle.

The specification of this motor is 5/8 inches diameter shaft and 14 gauge wire for power. Dimensions are 4 inches in diameter and 6.75 inches long. The motor has a fairly high winding resistance measured 0.5ohms which was one of the criteria that made me go with a 60 volt system.

Controller:

The bike uses a 60 volt electrical system to take advantage of the characteristics of the motor and to lower battery losses due to high amperage . 60 volts is fairly nonstandard and there is a bite more difficulty finding compatible equipment than with the more typical 36v or 48v. luckily there are cheep scooter controllers and chargers available that work with 60v system. A key switch is used in-line with the throttle and accessory power circuit for security.

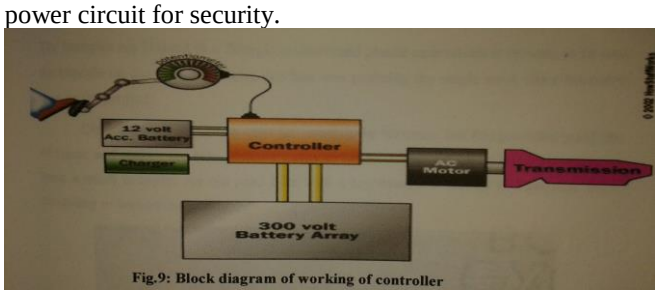


Fig.9: Block diagram of working of controller

Batteries:

Lead acid batteries were the default choice at least for the initial build/proof of concept. Five (5) 7 amp-hour, 12 volt "bricks" in a series string were used to get a nominal 60 volts. The battery pack weight is 13.6kg.

The typical rules of lead acid and avoiding discharges of over 50% this battery pack has capacity of 210 watt hours:60v*7ah*0.5.

The batteries are house hold in a fiberglass reinforced plastic case which is molded to fit into the triangle on the frame making this box was probably the single most labor-intensive item in the project.

Solar Charge Controller:

The solar charge controller regulates the battery charge and prevents overcharging of the batteries thus increasing battery performance and lifespan

Solar panel:

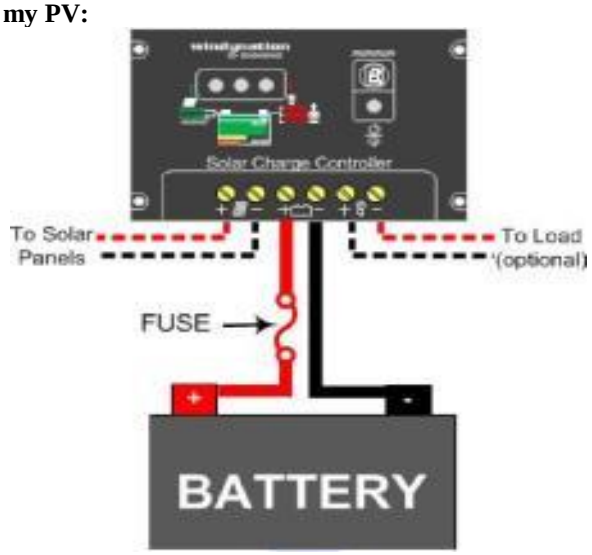
The solar panel is a set of solar photovoltaic modules that generate electricity and are available in powers of 30W, 60W, and 100W; with either Monocrystalline or polycrystalline solar cells. For kits sized 200W and larger, the use of multiple 100W panels is utilized.

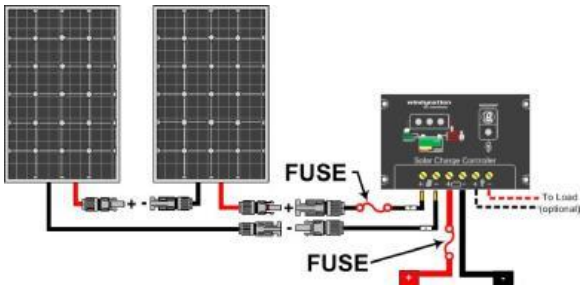
Inverter:

An electronic device that converts the battery DC voltage (Direct Current) provided from the solar panel/battery to an AC voltage (Alternating Current).

The inverter, if included, will connect directly to the 12V battery and will provide three 120VAC outlets used to power typical household items/ Electrical motor based systems.

Structure and Basic blocks to installation of solar charger to my PV:





Drive system:

The drive system of this powered vehicle is open belt drive. The open belt drive is used with shafts arranged parallel in the same direction. In this the driver pulley pulls the belt from one side and delivers it to the other side. Thus the tension in the lower side belt will be more than that in the upper side belt. The lower side belt is known as tight side where as the upper side belt is known as slack side the open belt drive is as shown in the figure

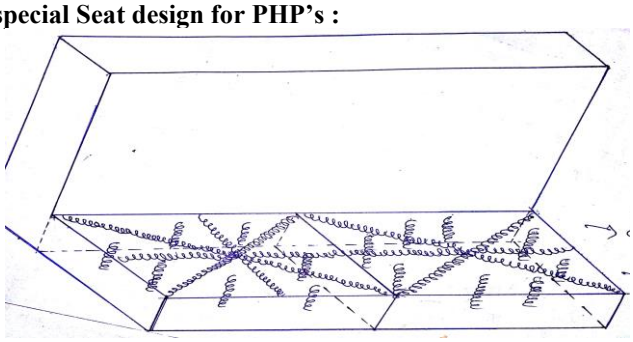
Dynamic breaking:

Given the heavy weight of the vehicle braking became more of a problem. The typical bicycle rim brakes worked but it was certain that wear of breaks pads and rims would be horribly quick if they were the only mode of braking.

Since the motor generates electricity when coasting down long steep hills for more power than the batteries could ever absorb inn regenerative braking a braking resistor was added. Its nothing more than a coil of stainless steel wire that gives a resistance of about 4ohms . using the d brake active a relay which switches the motor off of the controller and across this resistor.

Above all are the main requirements of my powered vehicle. And my pv structure is as following it will shown in engineering drawing . it is look like a auto structure because the handle of the auto controls all the momentum of vehicle so I also proposed auto structure and I placed an application i.e it will be drive suitable single limb peoples that's y I had selected this structure. Above requirements are to design inner means the engine structure and the body .

special Seat design for PHP's :



cross springs supports the total body weight pillar springs supports the vertical loads of muscles, bones and gives the uniform blood circulation of body pillar springs balances the vertical loads on the spines it reduces the sodalities pains.

Body Structure:

Body Frame represented in the form of Engineering drawing :

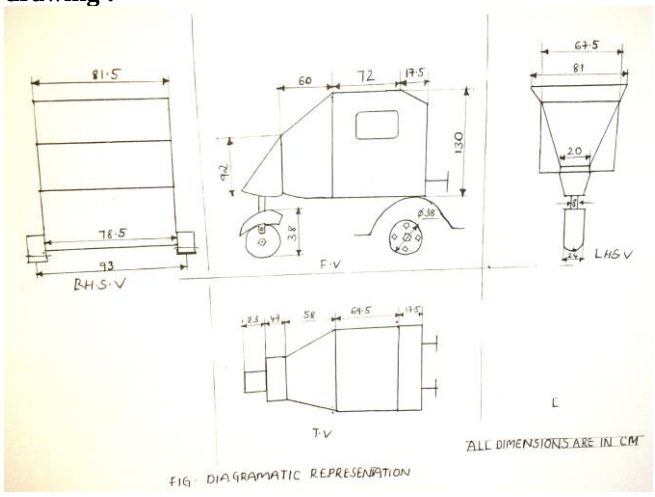
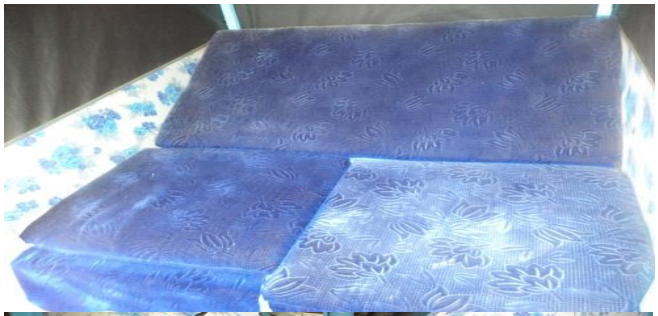


FIG: DIAGRAMATIC REPRESENTATION

Facilities and Advantages:

- Cooking.
- Dust bin.
- Sleeping.
- Laptop.
- Emergency toilet.
- Specially designed Seat.
- Solar based power system.



ADVANTAGES:

1.More Facilities
2.Pollution Free
3.Noise free
4.Emergency Toilet
5.Less Cost
6.Less Vibrations
7.No fuel requirement
8.Easy maintenance.
9. Solar based power resourcing

TECHNICALSPECIFICATIONS

	VEHICLE TYPE	THREE WHELER
	VEHICLE CAPACITY	SINGLE PERSON
DIMENSIONS		
	POWERED VEHICLE LENGTH	218 CM
	POWERED VEHICLE WIDTH	82 CM
	POWERED VEHICLE HEIGHT	152 CM
MOTOR		
	MOTOR WEIGHT	10 KG
	MOTOR TYPE	BLDC MOTOR
	RATED POWER	250 W
	TOTAL VEHICLE WEIGHT	75 KG
BATTERY		
	TYPE	CEALED LEAD ACID
	VOLTAGE	48V
	CAPACITY	12Ah
	NO OF BATTERIES USED	4
CHARGER		
	RATING	48V2A
	CHARGING TIME	8-12 HOURS
	RANGE PER CHARGING	50 KMPC
	POWER REQUIRED	1 UNIT

NO OF CONTROLLERS USED	1
ESTIMATED SPEED	25 KM PER HOUR
NO OF WHEELS	3
WHEEL DIA	38 CM
NOOFBEARINGS USED	2
NO OF SHAFTS USED	1
NO OF PULLEYS USED	1
SHAFT LENGTH	100 CM
PULLEY TYPE	FLAT
NO OF BELTS USED	1
BELT TYPE	FLAT

MATERIAL SPECIFICATIN:

MATERIAL TYPE	M.S SQUARE,CIRCULAR,FLAT
SQUARE PIP THICKNESS	2.5 MM
CIRCULAR PIPE THICKNESS	3MM
PLAYWOOD THICKNESS	3 MM
BELTMATERIAL	COTTON
PULLEY MATERIAL	CAST IRON
SHAFT MATERIAL	CAST IRON

Testing process:

The vehicle is tested under the supervision of qualified automobile experts for injury and biomechanics testing and the results obtained were found to be good.

Also, the vehicle is tested for road grip and stability to prove that it is safe for public transport and the results are positive.

II. CONCLUSION:

My main criterion of this powered vehicle is economy of manufacturing. Despite of economy can any one can adopt automatic technologies for automatic opening and closing and openings of provided facilities so far cost factor we adopt simple technique in manufacturing of this multifaciltated vehicle. My powered vehicle is automatic charging system by solar arrangement on the top of the vehicle, automatic seasonal dome opening, advanced suspension system for avoiding quick fatigue of driver.

The number of facilities provided in this power vehicle is helpful not only physically challenged people but also common .In personal interest any one can adopt this vehicle.

These vehicles for challenged persons meet the expectations as the advanced technologies the person adopt this vehicle will satisfy more than expect. This vehicle provides almost all facilities without considerable moving of the person.

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Guide :-

Dr. A.V. Ratna Prasad, Obtained his B.Tech (Mechanical Engineering) from velagapudi Ramakrishna Siddhartha Engg College, Vijayawada in 1989, and M.Tech from IIT, Kharagpur, in Jan 1991 and Ph.D from JNTU, Hyderabad in Mar 2007. He began his career at **M/S Ashok Leyland Ltd .,**, Chennai, as a Development engineer. Later, he joined VRSEC, Vijayawada as a Lecturer in the year 1992. Subsequently, he was an Assistant Professor, Professor and Head of Mechanical Engineering Department for 7 years and presently working as Principal, V.R. Siddhartha Engineering College, and Vijayawada. He is a recipient of National merit scholarship throughout the Educational career.

He supervised 12 Masters Thesis and at present he is supervising 4 students for **Ph.D** under various universities and one Ph.D awarded under his guidance from A.U. in 2012. He has been actively involved in research work and brought about 82 Lakhs through various sponsored research projects. At present he is handling a Major Research Project sanctioned by **UGC**, and FIST project sponsored by DST as a Principal Investigator for an amount of Rs 51.76 Lakhs and completed one research project sanctioned by **DRDO** for an amount of Rs 9.92 Lakhs and two MODROB projects sanctioned by AICTE for an amount of Rs 20.35 Lakhs. He also, organized several seminars, workshops, and International Conferences; most of them are sponsored by national funding agencies such as AICTE and DST.

He published **50** research papers, out of which, **25** in peer-reviewed International and National Journals which are **SCI** indexed having Impact factor and **20** in International Conferences. His papers were cited by more than 200 researchers across the world. He has received highest no of citations for one of his papers in 'Journal of Materials and Design' published by ELSEVIER, UK since 2010 and is placed in the cover page of the journal. He is also the reviewer for many papers published in International Journals such as International Journal of "Polymer Composites" (John Wiley, USA), Journal of Composite Interface (Taylor & Francis), International Journal of "Reinforced Plastics and Composites" (SAGE Publications, USA), International Journal of "Materials and Design" (ELSEVIER publishers, UK), Recent Patents on Materials Science (Bentham Science Publishers, USA), Book Chapter in the book titled " Natural Polymers" (Published by Royal Society of Chemistry, UK) and many more.

Dr. Prasad is a recognized master trainer and resource person for **National Board of accreditation,** New Delhi and he mentored many institutions in preparation of Self Assessment Report on outcome based education and accreditation.

Universities visited abroad– He has visited University of Toronto, University of Ontario Institute of Technology in Canada and delivered expert lecture there. He presented papers in various International Conferences including Canada and also chaired sessions in many conferences.

G.Vijaya Prakash, Pursuing Ph.d from Acharya Nagarjuna University. Completed M.Tech (MD) from JNTU Kakinada and B.Tech (Mechanical) in ASR College Of Engineering, Tanuku. And did his diploma from Gudlavalleru Polytechnic. He is having more than 10 years of teaching experience.