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Hybrid Peddle and Solar Electric Vehicle for Physically Challenged People

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Abstract

Physically challenged people are difficult to drive the tricycle in long distance, because the people are less stamina to drive the vehicle compare to normal human being. Most of the handicapped people don't have enough stamina to drive the bicycle as well tricycle even a small distance. So, generally handicapped people are habituate to travel by bus with more crowd, another side to climb staircase bus as well the siting seat arrangement is not comfortable. In market four wheel petrol engine vehicle are available but more costly, weight as well as required continuous maintenance. Regularly spent some saving amount to fuel. The another difficult of the vehicle are more weight to balance, less flexibility and it produce harmful gases (CO2, SO4) to environment. The alternative solution of electric vehicle too available in the market with more cost around 50,000 rupees and above. So in this article design and analysis the low cost hybrid tricycle with peddle as well solar photo-voltaic electric charging system was discussed. The proposed electric tricycle contains multiple features such as automatic charge system through solar photo-voltaic panel, battery level indication, wireless speedometer, drive up-to 60KM without expectation of charging station, comfortable to drive two members, etc. In addition with, the proposed vehicle operate on both conventional peddle as well electric battery system with as-usual weight.

Keywords – *Electric vehicle, Differently able people, Cost Analysis, Solar Panel.*

I. INTRODUCTION

In the world fifteen percent of the people are physically challenged [1]-[10]. They are doing their work as usual other but their physically body doesn't support to compete what normal person are doing because they are physically defect. These type of physically challenged people face more problem on day to day live [2]-[6]. Especially travel, they cannot to travel like normal people because the staircase of bus, train, and other vehicle not designed based on their requirements. The physically challenged people need little bit more time to get into the bus, similarly seating arrangement also not comfortable for challenged people. So they will travel by own

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vehicle, in outside market petrol engine four wheel vehicle are available with more cost as well need to spend cost for fuel continuously[3]-[8]. The another side the fuel cost also increases day by day as well the resource of the fuel are reduce on one side. The fuel engine vehicle are balanced one but contains more weight can't to move when repair such as wheel puncher, low fuel, vehicle repair, etc. So these fuel engine vehicle uses to travel long distance is difficult as well unhealthy for environment because it emit as usual carbon dioxide emission [4]-[9].

The alternative method of electric vehicle is suitable for these defect, physiologically handicapped operate electric vehicle availability in the market is very less as well more cost [5]-[7]. One side the carbon dioxide emission is reduce as well weight of the vehicle but other side the cost of the vehicle is increased to high. It is come around 50,000 to 80,000 rupees. It's can't bared for below poverty people [11]-[19]. Another defect is required charging station, every-time, need to be ensure the charge level of battery. When battery level is low, it's can't help to travel even a short distance[12][14]. Once stop the vehicle on road due to low fuel i.e. less energy it is very difficult to move further as well return to the home [15][16]. So to implement into the solar photo-voltaic system uses to overcome these problem but the proposed idea availability especially challenged people vehicle is very less as well cost is more[12]-[17].

In the paper describe cost fewer hybrids peddle as well solar electric vehicle will be discussed in details[4][8]. The main feature of this paper is the total cost of the vehicle will come around less than 20,000. It will operate normal peddle method whenever sun irradiance are unavailable and night time; similarly charge the vehicle while running on direct sun.

II. PROPOSED SYSTEM

In this proposed articles contains two combination of system were designed one is electric vehicle charge system through solar photo-voltaic and conventional paddle system[5][6]. It contains few more features like it having wireless speedometer work through magnetic sensor arrangement[7][9]. The speedometer display system uses to ensure number kilometer cover one time full charge system[10][12]. In addition with buzzer type horn and front light system. It contains two horn which are indicating as usual left and right side turn[13][14]. The light is installed both front as well back side to clear visual to other vehicle[15][16].

In switching circuit board consists of one MCB, three on-off switch, battery level indicator(led display). one switch for charging purpose, one switch for starting purpose, and remaining one for lighting purpose. Brake system given to front wheel they are control by manually. In this vehicle brushed DC motor battery system are used. Motor drive the vehicle with the help of chain- sprocket.

2.1 Solar charging system:

The solar panel system uses to charge the battery continuously with help of renewable solar energy system uses on the electrical vehicle, long distance without depend on neither charging system nor fuel station. The 50 watts panel is sufficient to charge the 60Ah battery system. The solar panel fix on top of the vehicle to get two benefits. First one is to get sun light to charge the battery fast. Second one is to protect the temperature fall on the person. The simplified charging method uses to charge the battery. The solar panel is fitted by nuts bolt on the roof of the vehicle. The fixing of the panel on towards south direction at the angle of 19 degree. Fig.1 shows the 50watts solar panel. Fig.2 shows the connection of brush DC drive system. Fig.3 shows the Peddle connection of wheel system.

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Fig.1 50W Solar Panel

Fig.2 Back wheel connection of brush DC drive system

Fig.3 Conventional pedal system

2.2 Driving system:

In the proposed system implemented on two types of the driving system. One is conventional peddle system, the second one is electric drive system. The brushed DC motor is used to implement on the e-vehicle system. The rating of brushed DC motor is 350watts. It is uses to easily track(or move) the vehicle with maximum withstand weight is 100kg so appropriately two members travel on the vehicle comfortable on some short of distance. Whenever the electrical system troubles or low battery conditions the paddle system uses to drive the vehicle continuously. In the proposed system back side one wheel chain attached on DC motor to drive the vehicle, another one wheel is attached on conventional pedal system, it uses to drive as usual method. Further secure the vehicle as usual lock system is implemented. In future GPS type of system implement to identify "Where is my vehicle" and shows the battery level of the system on mobile phone.

The brushed DC motor is fitted near to the left back wheel by nuts-bolts and it drive the wheel by using chin and sprocket.The hand driven paddle is used for driving vehicle when battery condition is low and un-sunny period. It is connected to right side back wheel and it through chin and sprocket.

(a) Steering

(b)

(b) Braking

Fig.4 Steering and Braking System

2.3 Flexible Steering and Braking system:

In the proposed system flexible steering and braking system are implemented for user friendly disabled people. Some people don't have the two hands as well difficult to hold the hand by handicapped people for that, designed single hand steering system uses to flexible to drive the

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vehicle as well apply brake to the vehicle by just downward press method. The brake is connected through spring tension. Whenever we release the hand, it will come back to original position due to spring tension. The above features are shows on Fig.4

2.4 Battery holder :

The battery system uses to operate the bicycle continuously on long distance. The battery charge through solar panel system. In this project miniature circuit breaker (MCB) uses to isolate the PV panel and battery system. Further in the output of the solar panel diode device uses to permit the flow of the current on one direction from PV source to battery load not vice verse. The 65Ah battery uses to travel on 60Km as shown on Fig.5. Further the battery locking system uses to secure the battery. In feature GPS method uses to update the charging and level of battery.

In generally lithian iron or lead acid rechargeable battery is used for electric vehicle. Battery charged by solar panel which is fitted on the roof of the vehicle. The battery is placed on below the driver seat with protection of iron angles and nut-bolts. The battery supply the power to the motor through control switch.

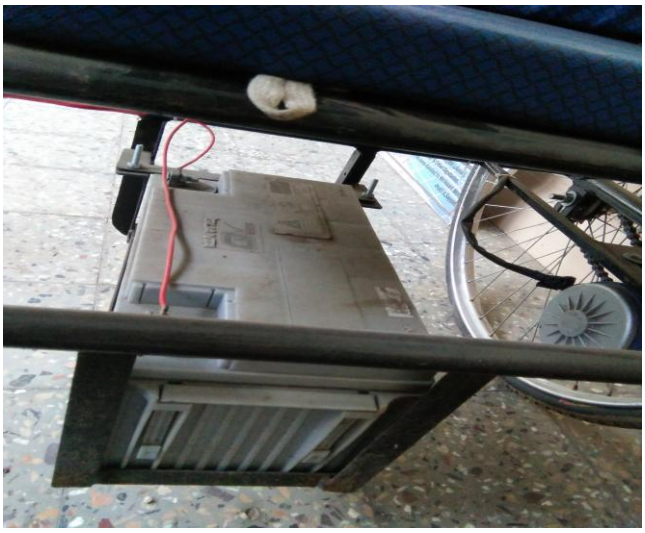

Fig.5 Battery holding system

2.5 Smart control of electric vehicle:

The control board contains various switches to control the entire electric vehicle. Some time possibility to flow the power form battery to solar panel, it will protected by MCB uses to disconnect the circuit whenever ideal mode. Further batter level indication system uses to know the battery level and locking system uses to on the connection between battery and motor system. In addition with front light control as well horn system is attached on the control board as shown on Fig.6.

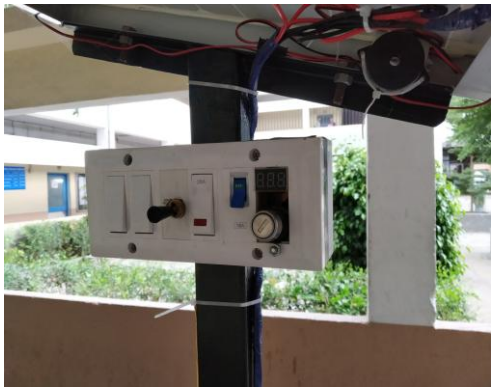

Fig.6 Smart vehicle control system

III. Cost Analysis of Handicapped Vehicle

In the proposed project multiple features are incorporated such as smart speedometer sensor uses to sense the speed of the motor as shown in Fig.7, flexible single hand drive system, comfortable to seat on two persons, both conventional and battery drive system, the solar panel (rating are mentioned on Table.II) uses to charge the battery as well protect from sun light and heat, Manual on and off motor drive system uses to drive flexible, simplified braking system i.e when candidate press the handle down to stop or slowdown the vehicle speed, locking system for tyre, as well smart control system, etc

In the following Table.I describe the total cost of the proposed system. Which includes 50watts solar panel, 60Ah battery, control panel board, DC brushed motor, etc.

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(a) smart speedometer display

(b) Wireless sensor

Fig.7 Smart speed display and sensing system

Table. I Cost of Proposed System

Sr. No.	Name of Component	Rating	Cost(Rs)
1	Solar Panel	50Wp	2750.00
2	DC brushed Motor	350W	3,894.00
3	Control Panel	_	600.00
4	Battery	65Ah	3,900.00
5	Speedometer And Sensor	_	400.00
6	Indication & Lighting system	5W	300.00
7	Paddle system	_	400.00
8	Break	_	150.00
		Total	12,394

Table. II Solar rating of handicapped electrical vehicle.

Sr.No.	Particulars	Rating
1	Peak watts	50Wp
2	Maximum voltage	19.95V
3	Maximum current	2.51A
4	Open circuit voltage	23.26V
5	Short circuit current	2.63A

IV. CONCLUSION

The physically challenged electric vehicle availability in market are less, even few are available with more cost and less features. The cost of exist vehicle is cannot bare by below middle and poverty class people. In this article design and analyses physically handicapped electric tri-cycle with low cost and additional features. The developed vehicle comes around less than 20,000 rupees only. It include both convectional peddle as well electric vehicle system arrangement's. It doesn't require any fuel as well fuel engine so the cost for spending fuel and weight of the system totally reduced. The battery charge through renewable energy solar photo-voltaic system so need not to expect any charging station while travel. It is one time investment need not required any frequent maintenance like petrol engine. The proposed vehicle uses to travel long distance without worry because of integration of 50watts solar panel. Furthermore, smart locking system uses to secure the entire system. The proposed vehicle comfortably travel by two members upto 60km with one time fully charged the battery.

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