

Solar Powered Electric Smart Skate Scooter with IoT

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ABSTRACT

Pollution due to fuel-based vehicles can be controlled by renewable energy-based vehicles. In this project solar based electrical skate scooter was proposed. Solar based electrical skate scooter was designed with a motor coupled with wheel Motor runs with a help of a battery. Battery was charged with the solar power from solar panel fitted in the scooter. Use of a smart energy management system with solar power charging the battery reduces the pollution. The whole setup was interconnected with ARDUNIO for monitoring. The parameters such as speed, battery level and battery status (Charging/Discharging/low power/full power) was sensed and monitored by ARDUNIO. Data was processed and was transferred to the cloud with using the NodeMCU module. The data is stored in the cloud which can be received by the receiver section, which is mobile phone or laptop.

Keywords: IOT, Solar, Scooter, solar panel

1. INTRODUCTION

Environment pollution is the foremost issue Indian face today. Pollution is caused by different industries and vehicles. Industries pollutions are restricted by government by laws but pollution due to fuel-based vehicles was growing issue now a days. In our country majority of the vehicles runs on petrol only limited number of vehicles runs on batteries. In this new era, conventional petrol source have to be replaced by different renewable energy sources. Extraction of Solar energy for production of power is now a wide research area. Vehicles also face different issues like Traffic problems, increased fuel costs, investment problems, size, parking problems etc. Considering all the above problems solar Powered Electric Smart Skate Scooter is the best solution for a short distance travel.

Usage of solar renewable energy sources in scooters reduces the pollution. Small size of the scooter reduces the traffics and it also helps elderly people to travel short distance. This project makes use of a smart energy management system with solar charging. Where solar powered vehicles extract energy from direct sunlight, Hybrid vehicles are restricted to use battery to a specific speed limit and then automatically convert on fuel. Voltage fluctuation due to movement of the sun, earth or cloud etc. was managed by the electronic circuits. Voltage comparator compares the voltage of solar panel and the battery and then it provides the higher voltage to the transistor to activate the relay which provides the required and stable voltage. The operation of the system is more efficient than other normal automobiles. Usage of solar renewable

energy sources in scooters reduces the pollution. Small size of the scooter reduces the traffics and it also helps elderly people to travel short distance.

Chien-Ching Su and Kaohsiung Hsien have registered a US patent for Solar Skateboard. In which solar panel fixed in skate converts solar energy into electric power to drive the skateboard and to function as a mobile photoelectric charger by Supplying power to an electric appliance [1].

Joerg D. Weigl and et.al has design a alternate solution with the bicycle hydrogen system. It is equipped with a proton exchange membrane fuel cell stack. Refilling station was also deigned [2].

METHODOLOGY

The proposed Solar Powered Electric Smart Skate Scooter with IoT was implemented with solar panel, battery, BLDC motor Skate scooter and Arduino.

A. Working

The Fig.1 represents the block diagram for motor control and charge indicator. The solar panel receives the sunlight and produces the DC power. DC power from solar panel was altered by the solar PWM charge controller. Solar PWM charge controller steps up the voltage into the required battery rating and the energies the battery. The battery can also be charged directed with AC supply with charger.

The motor speed controller controls the speed of the BLDC motor with the help of moving the accelerator, when the accelerator moves on increasing the motor speed is increased and the accelerator is reduced the motor speed will be reduced.

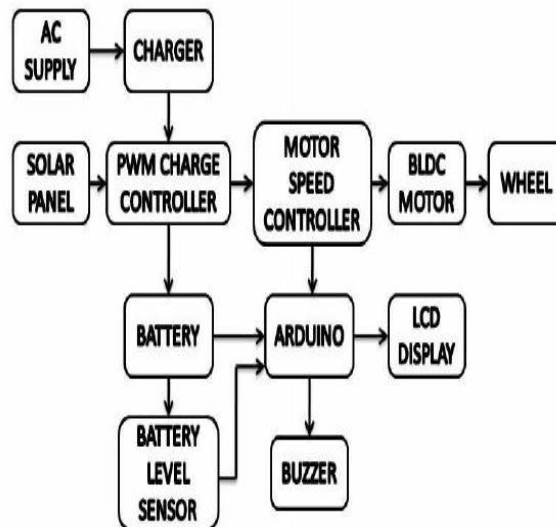


Fig.1 Motor Controller and Voltage Level Indicator

The motor speed and the level of the battery have been sensed by ARDUINO. ARDUINO send the motor speed and the battery level to LCD display, buzzer and mobile phone with IOT.

The Arduino consists of a physical programmable circuit board used to write and upload computer code to the physical board, it is easy user interface. The vehicle speed, and battery level can be calculated by using the Arduino with the help of the Arduino IDE with using the formulas.

B. Implementation

The solar panel receives the solar light and stores energy in the battery with the help of the solar PWM converter or battery can be charged by using the ac mains supply. The solar panel which is used to receive the energy from the solar and the produced energy will be stored in the

battery; the battery will store the 12V DC. But the BLDC motor speed controller requires 48V DC, so the PWM solar charge controller is used to convert 12V DC to 48V DC.

The energy can be converted to 48v because the motor speed controller requires 48v to operate the motor. The motor was interconnected with wheel which is the BLDC hub motor. The voltage level sensor is used to measure the voltage level in the battery and displays the battery level in the display and estimates the remaining kilometres to be operated with the battery level also displays. When the battery level is low the buzzer will alarm the low indication of the battery.

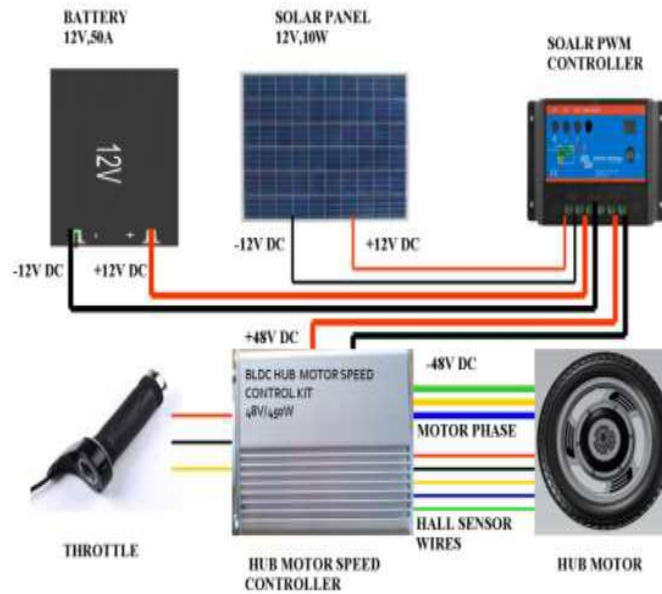


Fig. 2 Vehicle Setup

The throttle is used to control the speed of the BLDC hub motor with the control in motor speed controller which was shown in the Figure 2.

The voltage in the battery can be measured by using the voltage level sensor where the sensor is connected to the Arduino with the calculations the voltage can be measured and the estimated kilometres displayed in the display was shown in the Figure 3.

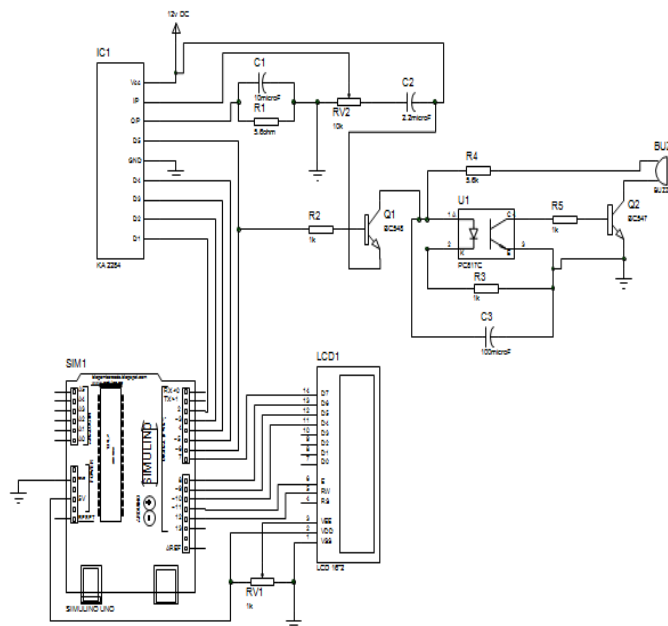


Fig. 3 Battery Level Indicator

The battery is below 20% the buzzer will indicate the sound for each 5 sec to ensure the battery is low level we want to charge the battery.

After the real time implementation the battery level indicator will be seen as in the Fig.4 the whole Skate scooter after implementation was shown in the Fig 5



Fig. 4 Hardware Implemented Battery Level Indicator

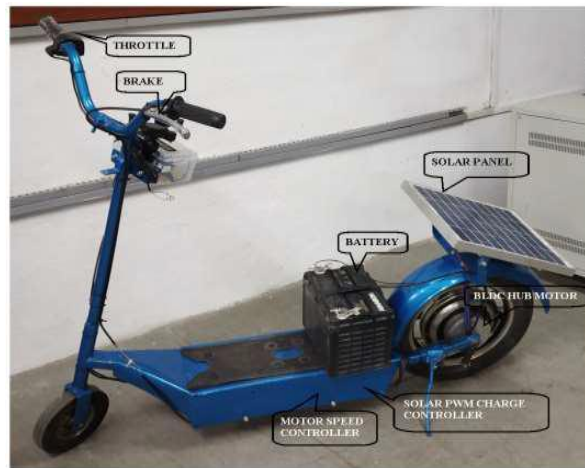


Fig.5 Solar Skate Scooter

C. Result Analysis

The analysis of the solar skate scooter with the battery percentage, voltage level, calculates the estimated kilometres driven from the current location and calculates the charging time with the solar energy it was shown in the Table 1. With the analysis of all categories graphical representation of the analysis will be shown in the Fig 6.

Table.1: Overall Analysis of Solar Skate Scooter

S.No	Battery percentage	Voltage level	Km driven	Charging time
1	100	12.92	60	7 h 45 min
2	80	10.4	48	6h 12 min
3	60	7.8	36	5h
4	40	5.3	24	3h 4 min
5	20	2.6	12	1h 20min

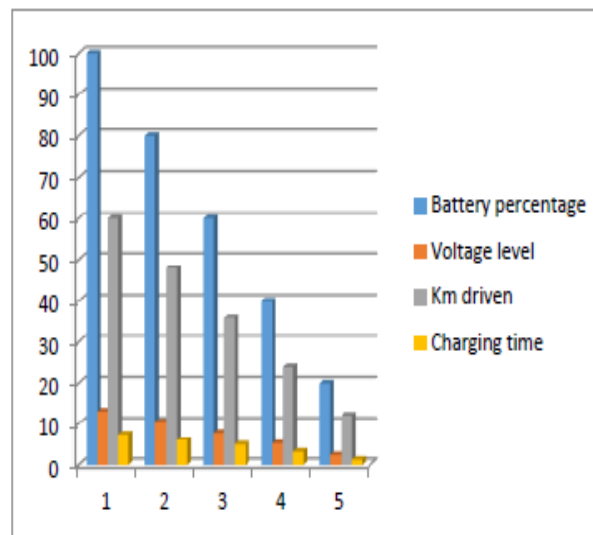


Fig.6 Chart of Analysis of Solar Skate Scooter

CONCLUSIONS

Energy efficiency is the wave of the future. The world is quickly moving towards energy sustainability. With an unhealthy hike in the prices of petrol and diesel, an automobile running on solar power can create a trend thus solar scooter is very essential. When compared to the normal electric vehicle the proposed solar skate scooter is efficient. The recharging time of the battery has been decreased. Solar charging of the proposed system makes it efficiency. This project is to reduce the environmental pollution by designing an electric skateboard using renewable energy source, which can be used to travel for short distances. Thus the skateboard is running successfully as per the desired objectives

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Conflict of Interest

None of the authors have any conflicts of interest to declare.

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