

TECHNICAL ANALYSIS AND ASSESMENT OF AUTOMATED SOLAR ELECTRIC HYBRID VEHICLE UTILITIES FOR IMPROVED OBSTACLE DETECTION AND PERFORMANCE

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Abstract: The concept of this paper "Technical Analysis and Assessment of Automated Hybrid Electric Vehicle" is based on the combination of both automation and manual operation on this vehicle which is a major advantage of this paper. For the automatic operation arduino and two sensors are being installed in the vehicle. A battery is used to store the energy and charge the system. The main objective behind this application is to achieve the low energy consumption, low fuel costs, obstacle detection, reduction in emissions with photovoltaic modules as the main electric source.

Keywords: electric motor, arduino, sensors, automation, solar panel.

1. Introduction

This paper discusses about the usage of solar energy to power up the vehicle and the automation operation applied on it. In order to achieve the required voltage for power up, the Photo Voltaic (PV) Module can be connected either in parallel or series, but it is costly. Thus to make it cost efficient, charged batteries have been used. The electrical charged batteries are connected to the PV panel and are directed to the output terminals to produce low voltage i.e (Direct Current). According to the state of use of the battery, the charging is done to avoid overcharging. The voltage produced by the solar PV panel makes the DC motors run which is used to drive the vehicle efficiently. In this paperwork, the features of these components: solar panel, charge controller, battery, arduino, sensors and DC motors are required for the vehicle automated application were studied.

2. History of Solar electric vehicles

Going through the history of PV electric vehicle, it is started in 1970. For more publicity in solar vehicle transportation, Hans Tholstrup organized a 1865 mile 3000 km race in 1987 which is called World Solar Challenge (WSC) where many competitors were invited from research group and universities. In 2005, the race has set a record for the longest

solar vehicle race, which covers all about 3960 km from Austin, USA to Calgary, Canada.

With the flow of the time, the design and construction of General motors have come to picture and made its place in society. And these technologies have remained as untapped resource. The study of electric vehicle has been developed which can be applied in many fields to provide a pollution free environment.

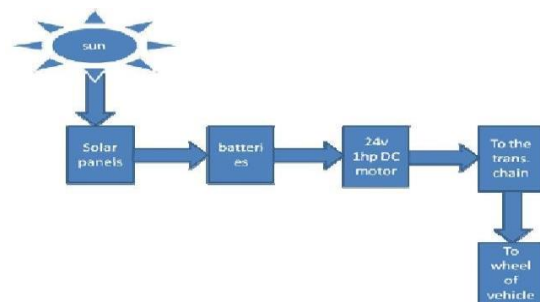


Fig-1: Basic block Diagram vehicle

3. Working

The working principle of solar electric vehicle is given below. It is a two wheeler device in which the solar energy is extracted from the sun through the PV panel to charge the batteries. The output power of this solar PV panel is 10W and batteries of 12V. Here the motors used are of DC geared. When motors run at constant speed, a direct motion is transferred. In this system, one arduino along with two sensors and a motor driver are used for automatic operation. Arduino is powered by the batteries. The sensors started sensing the obstacles after taking the respective commands from arduino. Sensing operation is in the sense of detecting unwanted obstacles coming to it. The overall working can be done with low energy consumption.



Fig-2:DC geared motor

4. Review work

All the recent activities in this paper is studied carefully with taking one thing in the mind that it will be both automated and manually operated.

In this paper ,the analysis of all recent activities that belong to Solar hybrid vehicle along with automatic operation have been presented. The main overall idea is made on the design improvement. The energy is absorbed by the solar panel which is converted to electrical energy. The electrical energy obtained is being fed to the batteries which get charged and is used to run 12V DC series motor with the help of motor driver. The wheel is being connected to the shaft of the motor of the vehicle. The batteries get fully charged getting the energy from the panel. Motor driver and arduino with the two sensors are installed in the vehicle for the proper reliable automatic operation.



Fig-3:Automated controlled solar hybrid vehicle

5. Application

Solar electric vehicle in our practical use as it has many usable techniques that is implemented in the vehicle which makes it a well performance vehicle. The greater performance and the speed range, designers must maximize the efficiency of the electrical components. It minimizes the

power requirements. If any obstacle will come across its path then it will automatically sensed by the sensors and it will take the necessary action. Here we are also using the motor driver which will amplify the voltage of the arduino.

6. Advantages

- **Zero Emissions:** Solar-powered cars have electric motors, they does not uses any fuel and produce no harmful emissions. It does not lead to be contributing to air pollution and greenhouse gases in the environment.
- **Preservation of Natural Resources:** The panels and other components of a solar-powered car initially consume energy and resources to manufacture, the solar vehicle would require no extra energy input as solar-powered vehicle consume no fuel and do not require the oil changes.
- **No Fuel Cost:** Because of its independence on external fuel sources, they are free from the fuel costs associated with gas, petrol, diesel etc. The Sunlight converted into electricity, which we use it for our daily application. Electric motors designed to operate without the noise and vibrations associated with conventional cars.

7. Result analysis

The result analysis of this paper i.e. Automated Solar Electric Hybrid Vehicle is represented below. By the theoretical calculation and with the help of the this module, the suitable electric propulsion motor for the hybrid vehicle is chosen and implemented in the hardware module along with the respective automated output that we got. The result output is in the form of waveform presented below. The speed, voltage and current response waveform with respect to time and the drive analysis is also been presented. In future, the specification can be modified to the efficiency of the automated hybrid electric vehicle.

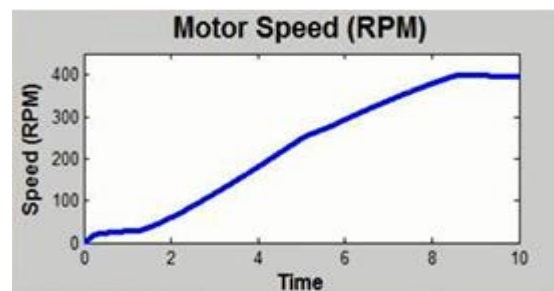


Fig.4. Graphical output of Motor speed vs time

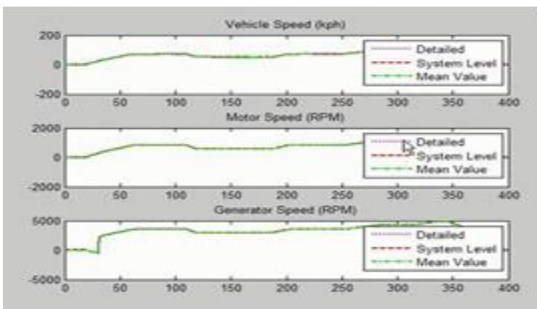


Fig. 4.(a). Speed response of the system with respect to drive cycle

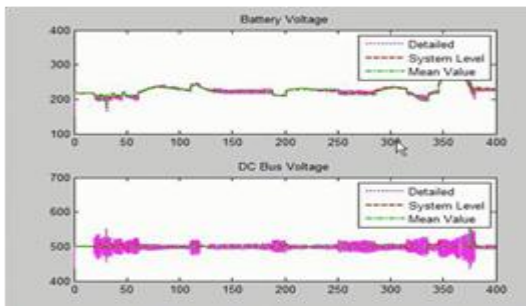


Fig. 4.(b). Voltage response with respect to drive cycle

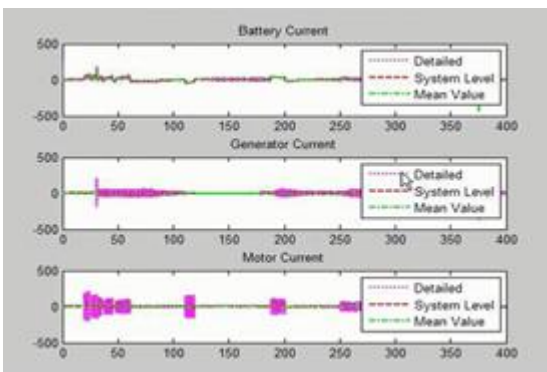


Fig. 4(c). The current response with respect to drive cycle

8. Conclusion

The automated solar hybrid vehicle solves the causes related to the environment pollution and obstacle detection. For this dependency on fossil fuels as well as on other sources are less and also it helps in detecting the obstacles. Automated Solar hybrid vehicles have some disadvantages like small speed range, high initial cost. And also the rate of conversion of energy is (only 17%). But these type of disadvantages can be easily overcome by conducting again new research in these areas; relating to the problems of solar cells can be solved by using the ultra efficient solar cells which gives approximately of (30-35)% efficiency. The solar hybrid automation systems have a reliable prospective market

which we all should start using these systems in our day to day life.

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