

Solar panel based smart hybrid vehicle control system design and implementation

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ABSTRACT:

In India, vehicles mostly operate on petroleum products and only very few number of vehicles operate on battery. When the vehicles are operated in fuel, it pollutes the atmosphere by emitting carbon monoxide in abundant. Air pollution is the major issue laid by all developing countries across the world. Automobiles have to find an alternate source of power for operation due to the shortage of fossil fuel producing diesel and petrol. Hybrid electric vehicle (HVE) is the new technology found since CO₂ is emitted in large quantity by the vehicle. In this paper we introduced a new system vehicle whose motor is run by both battery as well as internal combustion engine run with fuel as petrol. In this system a solar panel and a generator attached to the wheel to charge the battery are used. This system can operate on the three mode and compared to present automobiles it is more efficient regenerating braking implemented in these system. Due to energy regeneration fuel combustion, charging time emission rate get reduced. Mechanical and electronic system both sector are combined in these paper which indicate the fuel economic growth. In this paper along with solar charging use of energy management in a smart way is made.

KEYWORDS: Electric motor, Internal Combustion Engine, Fuel Economy Hybrid electric vehicle.

1. INTRODUCTION:

Use of hybrid vehicle has been increased in recent days. A hybrid vehicle is one in which more than single power is combined to drive the vehicle. The major in modern world nowadays is the energy issue alternate transportation made is used in this paper which increases the fuel. Economy as an increased benefit. Compare to other transportation mode pollution factor is less. Better operating range and performance is provided by IC engine but environmental pollution and less fuel economy problem occur. Global warming is also caused by CO₂ emission. IC engine is combined with electric motor benefit can be achieved by high amount such as high efficiency less emission. Electric motor is combined with IC engine to provide an hybrid electric vehicle suggested in these paper. This electric vehicle is used for slow drive condition such as in traffic signals and urban areas for long highway drive and for hill climbing IC combustion engine is used to drive the vehicle. In India dynamic and more

efficient scooters has to be designed suitable for urban state.

2. LITERATURE REVIEW:

In this section existing papers related to the problem consider in these paper are referred to gain. Some knowledge is which contribute to the current problem. Front wheel contain a hub motor driven by battery and rear wheel vehicle fuel by petrol driven by IC engine. For low power and high power application battery drive and gasoline engine are respectively used. Issue related to battery life can be solved by this technology implementation by making use of solar charging method many advantage are present in this system such as small engine size, less emission large operating life, less fuel consumption. Relays are used to automatically select the driving mode. Solar power is used to charge the easily which is free and continuous. Several characteristics such as high reliability, handling capacity are possessed by the system compare to other bike. It is eco friendly in electric mode. To improve human efficiency self sustained hybrid vehicle is determined by the system design using microcontroller along with this system an anti crash warning system and a balanced tire pressure monitoring system is provided.

3. EXISTING SYSTEM:

In existing system cycles and scooter are provided by electricity. Lead acid battery stores the electricity to drive one are more electric motor. For recharging it usually take eight hours.

3.1. Recharge time

Charging time of vehicle is large than the time to fill the petrol tank but can be done by overnight.

3.2. Climatic condition

During cold weather condition, power of the battery reduced up to 20 %.

3.3. Sudden battery dead

In the middle of journey battery can die suddenly without a warning of decreased power.

4. PROPOSED WORK:

The proposed system employs the following components.

4.1. RELAYS

A relay is an electromagnetic switch that can be operated by supplying a small amount of electric current. For operation defined as relay mode of operation can be changed using relay referred in figure 1.

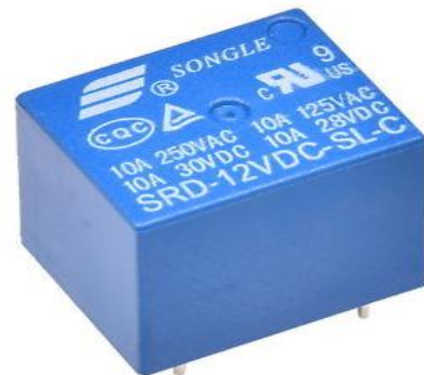


Figure 1 Relay SRD-12V DC-SL-C

4.2. BLDC MOTOR

It is a direct current drive permanent magnet electric motor consist of commutation system that is electronically controlled refer in the following figure.



Figure 2: 2KW BLDC Motor

4.3. PIC 16F877A

PIC 16F877A comprises of 256 bytes memory, Analog-to-Digital converter, Comparators, and functions like capture/PWM/compare. It also consists of synchronous serial port and a Universal Asynchronous Receiver Transmitter (USART) as shown in following figure 3.



Figure 3 PIC 16F876A Model

4.4. BACKUP BATTERY 6V

Chemical energy is converted into the electrical energy by an electro chemical cell referred as battery which is a protected as enclosed material.



Figure 4 6V Backup Battery

4.5. MAIN BATTERY

It is a lead-acid battery which employs the method of current constant voltage for charging terminal voltage. It is raised by the regulated current up to it reaches the upper charge limit at that point current drops because of saturation time of charging is 12-16 hours and 36-48 hours for stationary batteries of large sizes. Charging time can be reduced to 8-10 hours using multistage charge methods and higher charge current without full topping charge. The charging time for lead acid battery is higher when compared with other type of batteries.



Figure 5 Main Battery

4.6 SOLAR PANEL

Generating power from solar panels is the fast growing technology which is very much beneficial to the environment. Sunlight is converted into electrical energy by a process that is drastically improved over few years and it is efficient improved then before.

5. MODES OF OPERATION

Three modes of operation proposed in this system are

5.1. MODE 1: BATTERY MODE

Electric vehicle is one that operates in this mode based on only battery the vehicle runs at any speed using motor. For low speed and high traffic situation these mode is employed.

Battery mode consumes only low fuel. In this mode a high signal is sent from microcontroller to relay to turn on the battery circuit.

5.2. MODE 2: ENGINE MODE

Like battery mode IC engine decides the vehicle motion. A three way switch is connected to the self starter motor. Engine is started by starting the self starter motor in this mode. A low signal is sent from microcontroller to relay in this mode at a

speed of 750ms. Starter turn on the engine and the power is cut to the motor.

5.3. MODE3: AUTOMATIC MODE

Automatic mode works using electric and IC is the most effective and significant mode. In battery mode if the vehicle is started microcontroller programming cutoff the battery and starts the engine at certain condition of battery level. When battery is low ignition is low and the relay switches automatically to petrol mode.

6. BLOCK DIAGRAM

The block diagram showing the visual representation of the paper is referred in figures 6.

6.1. DESCRIPTION

6.1.1. CHARGING CIRCUIT

Solar energy and regenerative breaking are the true energy conversion system by which battery can be charged.

1. Solar Energy:

A photo voltaic module is a assembly consisting 6*10 photo voltaic solar cell that supplies by generating solar electricity to the battery.

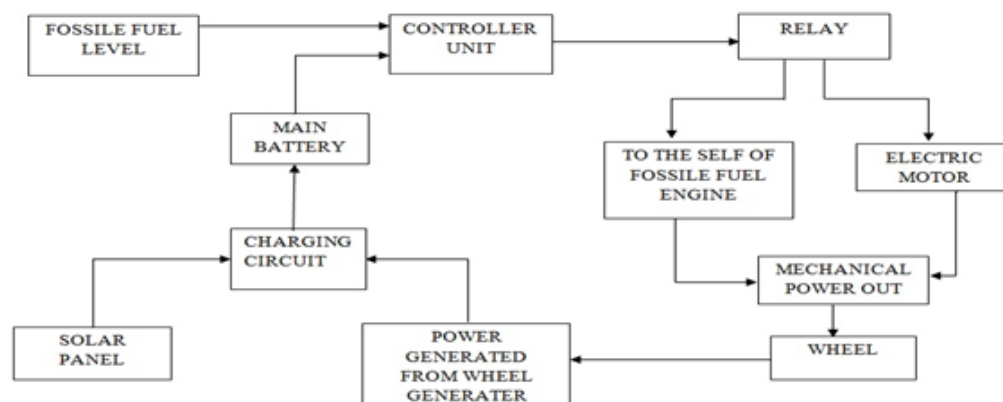


Figure 6 Proposed work block diagram

II. Regenerative Braking:

Regenerative braking is an energy reaction systems which convert kinetic energy to electric energy which can be used immediately are stored in battery to slow down the hybrid electric vehicle. When brake is applied during slow drive motor fixed in the rare converts mechanical to electrical energy by acting as a generator. Regenerative braking produce electrical energy that is stored in battery for future purpose.

6.1.2. CONTROLLING CIRCUIT

The circuit used for controlling posses some components like relay, fuel and battery level indicator, and microcontroller. Microcontroller is the main part of the controlling circuit. PIC 16F877A microcontroller is used in this proposed method. Battery level indicator continuously monitors the charge level and the relay is operated by the microcontroller with the signal from the indicator. When the charge is less than 25%, the relay will get a signal and it will be open. Vehicle runs in fossil fuel mode if the IC engine turns on.

6.1.3. MECHANICAL CIRCUIT

The electric motor operated by electric battery can be done in two ways and make use of the brushless DC motor.

In engine mode vehicle is driven by internal combustion engine. Alert system is also provided in addition using this system energy is regenerated and conservation of fossil fuel is made.

7. RESULTS:

Using CATIA V5 mechanical simulation setup is done for regenerative braking designed in surface design referred in figure 7.

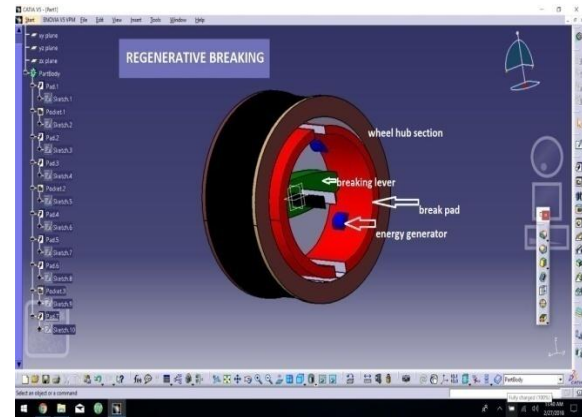


Figure 7 Regenerative Braking Mechanical simulation model

PROTEUS 7 profession is used to simulate electrical modes and using embedded C language program was written. Operation modes are designed and simulated in this software.

The simulation for battery and engine modes are referred in figure 8 respectively. Two sources fossil fuel and battery are used by HVE. For slow drive regenerative braking and battery is employed and for high speed drive IC engine is suitable but in engine mode change for regenerative braking is less.

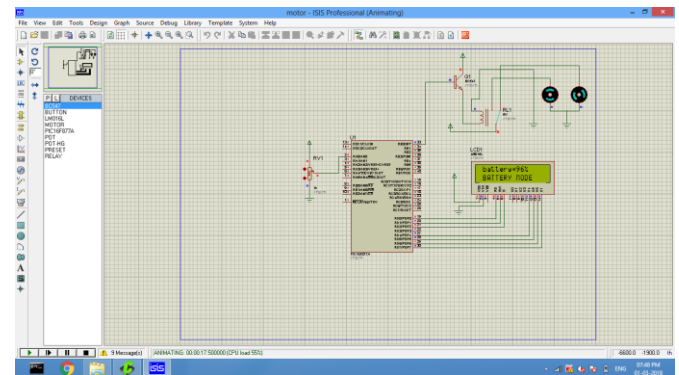


Figure 8 Battery Mode PROTEUS simulations

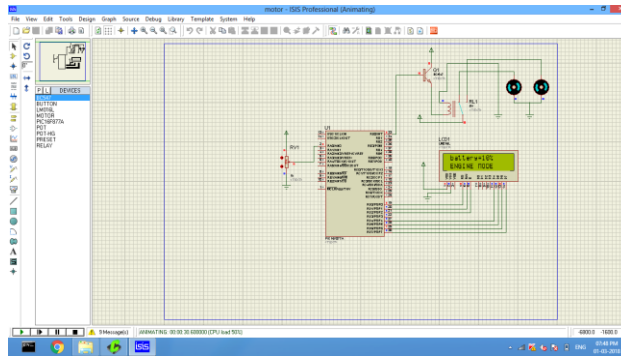


Figure 9 Battery mode PROTEUS simulation

Proposed system is efficient than normal electric vehicle. Battery recharge time is reduced and efficiency of solar charging in proposed system is high.

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