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AN INTELLIGENT POWER AND ENERGY MANAGEMENT SYSTEM FOR HYBRID ELECTRIC VEHICLE USING REINFORCEMENT LEARNING

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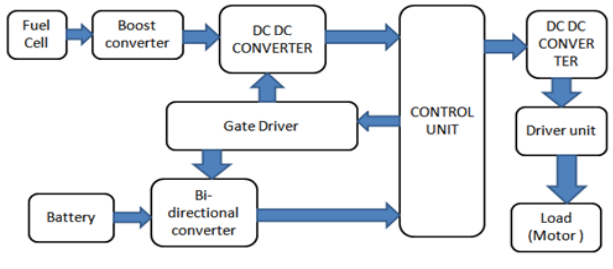
ABSTRACT-*The transport sector emits huge amount of emission and this emission can be overcome by hybrid electric vehicles due to its fuel cells and battery. In order to achieve optimal performance in fuel cells and batteries a power and energy management systems (PEMS) has been introduced.*

1. INTRODUCTION

According to the survey, the transport sector contributes highest energy consumption and leads to global emission. This is due to the passenger cars and freight transport. While using conventional engines emission will be high and these emission causes several health hazards and in turns affects the human life. Hence it is compulsory to unable the advanced technologies that promotes the emission less for transport applications. At present, we are using HEV (Hybrid electric vehicles) PHEVs (plugin hybrid electric vehicles). These HEV and PEMS method, batteries changing discharging can be changed. Q-learning is implemented in order to keep down fuel cell consumption for fuel cell hybrid electric vehicles. In this paper, PEMS method is introduced to minimize the fuel consumption.

2. BLOCK DIAGRAM



2.1 FUEL CELL

A device which converts chemical energy into electrical energy is known as fuel cell. Hydrogen gas and oxygen gas is used as a fuel in PEM cell. Water, electricity and heat as the product in fuel cell.

2.2 BOOST CONVERTER

Boost converter is also known as step-up converter or DC to DC power converter. It boosts from its input to output.

2.3 DC TO DC CONVERTER

DC to DC converter is also known as electric power converter. It converts direct current to another level. It uses both low and high-power transmission.

2.4 GATE DRIVER

A gate driver act as an amplifier and it acknowledges low power input and process it to produce a high-power input. It is given to the gate of a transistor such as power MOSFET

2.5 BI-DIRECTIONAL CONVERTER

Bi-directional converter is enabled a conversion between AC and DC, for same DC to DC, (or) vice versa in a single unit.

3. SYSTEM REQUIREMENTS AND HARDWARE REQUIREMENTS

- Atmega328 microcontroller
- Mosfet driver irf540
- Inverter
- Load
- Bridge rectifier
- Dc to dc converter
- Power supply
- Microcontroller PWM controller

3.1 ATMEGA328

The ATmega328 has 32 KB with 2 KB of SRAM and 1 KB of EEPROM.

3.2 DC MOTOR

A DC motor is plan to run on DC electric power. Examples for pure DC plans are Michael Faraday's homopolar motor and the ball bearing motor. The common DC motor types, which use internal and external commutation respectively to create an oscillating AC current from the DC source—so they are impure DC machines in a strict sense.

3.3 BRUSHED DC MOTOR

The classic DC motor create an oscillating current in a wound rotor with a help of split ring commutator. A rotor consists of one or more coils of wire which wound around a core on a shaft. The commutator and its brushes were connected by rotor coil which is in the electrical power source, and it trigger to producing electromagnetism.

3.4 MOTION DRIVE COMPONENTS

DC motor- directional motor in robot wheel is provided by this motor (left-right). For higher weights we need DC motors of high torque. The DC is connected to the axle of the rear wheel and is connected to a battery through a motor driver which is being signaled by the controller. DC motor- for driving linear motion the type of motor generally used is a DC motor with the higher RPM, it is connected to the rear wheels of the robot.

3.5 REGULATOR

The voltage regulator is used for two reasons: -

1. To regulate or vary the output voltage of the circuit.

2. To keep the output voltage constant at the desired value in-spite of variations in the supply voltage or in the load current

3.6 ELECTRONIC VOLTAGE REGULATOR

All electronic voltage regulators will have a stable voltage reference source which is provided by the reverse breakdown voltage to operate diode called Zener diode. The main reason to use a voltage regulator which is used to maintain a constant dc output voltage.

3.7 RESISTOR

It is a passive electrical component used to create resistance in the flow of electric current, all the electric and electronic networks, circuits can be found. The current is equal to the voltage across the final end. In almost all electrical networks and electronic circuits they can be found. The resistance is measured in ohms.

3.8 BATTERY:

Battery plays a crucial role in this project. Energy can be generated from different kind of sources like Solar, wind, also from fossil fuels etc. Such a device to store this kind of energy is a battery. Battery is a series arrangement of cells that generate electricity by a process of Electro-chemical reaction. The electrochemical reaction takes place while the batteries are reversible. These types of batteries can be charged and discharged for particular cycles. So, this is called as rechargeable batteries. For a battery it is always desirable that the energy delivered by it during its discharge period should be as high as possible. The output of the battery is always based on the usage materials in it.

3.9 DC TO DC CONVERTERS

DC to DC converters are used in small electronic devices such as cellular phones and laptop, computers which are supplied power from batteries. These electronic devices mostly contain several sub-circuits, each with its own voltage level needs different from that supplied by the battery. Or an external supply (sometimes higher or lower than the supply voltage). Switched DC to DC converters offer a method to increase voltage from a partially lowered battery voltage.

3.10 BOOSTCONVERTER

Step-up converter is a DC-to-DC power converter that steps up voltage. It is a SMPS containing required semiconductors and energy storage element. The boost converter can come from any suitable DC source, such as batteries, solar panels, rectifiers, and DC generators. Since power (P = V I {\display style P=VI} P=VI) must be conserved, the output current is lower than the source current

4. APPLICATION

Battery power systems mostly stack cells in series to achieve higher voltage. Boost converters can greater the voltage and minimize the number of cells.

4.1SOLAR-CHARGER-CIRCUIT

This circuit is used to charge Lead Acid or Ni-Cd batteries using the solar energy power. This circuit harvests solar energy to charge a 6-volt 4.5 Ah rechargeable battery for various applications. This charger has voltage and current with voltage cut-off facilities.

4.2LED

LED (LIGHT EMITTING DIODE) consists of a chip of semiconducting material impregnated, or doped, with impurities to create a p-n junction. The other diodes, current flows easily from the p-side, or anode, to the n-side

in forward direction. Charge-carriers—electrons and holes—flow into the junction from electrodes with variable voltages. When an electron reacts with hole, it falls into a minimum energy, and discharge energy in the form of a photon.

5. CONCLUSION

By implementing PEMS algorithm, the battery gets minimized. The SOC value of the batteries is maintained above the deserved value of 0.7per unit. PEMs algorithm is pollution free method and it reduces the power loss. The result indicates that the PEMs algorithm is able to improve the life time of the batteries and efficiency of the SOC.

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