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DUAL BATTERY MANAGEMENT SYSTEM FOR HEVS

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ABSTRACT

The project introduces a two-battery charging system using an Arduino controller. Today Electric cars are facing many problems due to increased battery charging time. This paper provides a solution to reduce charging time by integrating a two-battery charging system. The proposed two-battery charging system contains a number of cells to make a complete battery. The battery is divided into two parts using a switch during charging and charging the battery from both sides to fully charge it using two chargers. The battery automatically disconnects from the charger when fully charged, that is, it arrives at a fixed location and starts charging when the battery reaches its limit. By using this feature, the battery charging time is reduced to about half the required charge time. This program displays current status, voltage and battery charging on the display board, which helps monitor battery performance.

I.INTRODUCTION

In recent years, environmental problems caused by fuel cars and fuel savings have worsened. The new, green, environmentally friendly and economical vehicles are not only important for the economic and social development of many countries, but also for future car development. The EV is a vehicle that emits zero pollution, miles and fuel vehicles can be compared to electric cars. And as a result of the ever-increasing cost of fuel, travel costs for IC-engine vehicles are increasing. It raises the price of gasoline in transportation costs, hence the cost of all products. Therefore, the use of electric vehicles is increasing day by day. Battery, Electric Vehicle, Controller are important parts of the E-vehicle system.

1.1.1 Batteries Used In Electric Vehicle

Lead-acid battery: Founded in 1859, nowadays, lead-acid batteries are no longer used for pulls, but to power the electrical circuit of utensils or components for combustion engines as a starter. The lead-acid battery not only provides a limited capacity despite its bulk and its critical weight, but has the advantage of being both inexpensive and easy to produce and reuse. Used as a major energy-saving device in electric vehicles until the 80s, it was quickly released into another, more efficient technology.Nickel-cadmium battery. If you used rechargeable batteries in the 90s, then you are already familiar with nickel-cadmium technology. The "Ni-Cd" accumulators have a host of advantages, with significant storage durability and a lifetime of approximately 500 to 1,000 charging cycles. However, they have suffered from memory impairment, a visual phenomenon that sees battery performance drop when under partial "charging" cycles. Used in the production of electric vehicles in the 90s, Ni-Cd batteries have now been banned due to cadmium poisoning

Nickel-metal hydride battery: With performance similar to Ni-Cd technology, nickel-metal hydride (Ni-MH) accumulators have seen long-term success due to the lack of heavy metals. This portable battery technology was very popular in the early 2000s, which is why it dominated the hybrid car market, until the advent of lithium-ion technology.

Lithium-ion battery: Developed in the early 90s, the lithium-ion battery gradually established itself as a leading technology, both in the transportation world and in the consumer electronics industry. With longevity, it offers the greatest dynamic of all competing technologies and is not subject to the effect of memory. However, it requires proper packaging and precise control of the charging process, usually obtained by a dedicated electronic circuit. Renault uses lithium-ion technology in ZOE and other electric vehicles in the range. In addition, the Group is working to incorporate its batteries into a circular economy that aims to extend its life span as much as possible.

Solid-state battery: Scientific research has long tested the concept of a solid state battery, but it is only 10 years since its continuation has made it possible to consider technological adoption by the automotive industry in the distant future. The goal behind it involves replacing the liquid electrolyte with a solid material that can take the form of a polymer plastic, inorganic powdered powder or a combination of both. In theory, this technology is a good thing: it makes it possible to increase energy density and stability while making temperature control easier. However, the stable state is still in the laboratory model phase. The lithium-ion battery still has a lot of health left over.

1.1.2 Advantages and Limitation of Li-ion Batteries
Advantages of Lithium Ion Battery:

¬ High power density - Lithium-ion batteries can have high power without being too large. It is one of the main reasons why it is so popular in the mobile devices industry.

¬ Small and light - Lithium-ion battery is lighter and smaller than other rechargeable batteries considering the battery capacity. This makes it especially useful for portable electronic devices where physical specifications such as weight and form factor are considered important areas of sale.

¬ Low self-discharge battery - Lithium-ion battery has a very low discharge rate of about 1.5-3.0 percent per month. That means the battery has a longer shelf life when not in use because it runs longer than other rechargeable batteries. Note that the nickel-metal hydride battery is self-discharging 20 percent per month.

¬ Non-memory effect - Lithium-ion battery has zero to minor memory effect. Note the effect of memory on the rechargeable batteries when they lose their maximum capacity when recharged. This memory effect is common on nickel-metal hydride batteries that are recharged.

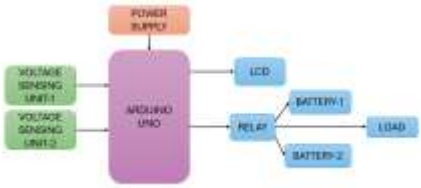
¬ Fast charging - Lithium-ion battery is faster than other rechargeable batteries. It actually takes a bit of time to charge compared to its counterparts.

¬ High open-circuit voltage - Lithium-ion battery has a higher voltage opening circuit than other liquid batteries such as lead acid, nickel-metal hydride, and nickel-cadmium.

¬ Long service life - Lithium-ion battery can handle hundreds of charging cycles. Some Lithium-ion batteries lose 20 percent of their initial capacity after 500 cycles, while the most advanced Lithium-ion batteries lose their power after 2000 cycles.

II.PROPOSED SYSTEM:

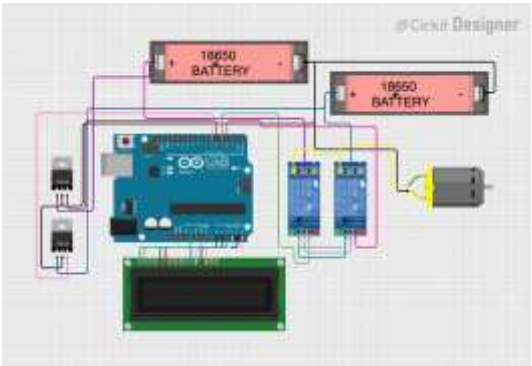
In this system we are using Arduino UNO as microcontroller for dual battery management. In this project we are using 2 batteries in electric vehicle.If one battery is completely discharged another battery will be automatically connected to the vehicle .And the discharged battery is automatically charged.



III.WORKING PRINCIPLE

The circuit is powered by a regulated power supply that provides voltage to the Arduino UNO, sensors, LCD, and relay circuit.There are two voltage sensing units (Unit 1 and Unit 2).Each unit measures the voltage level of Battery 1 and Battery 2 respectively.These sensors send analog voltage readings to the Arduino through its analog input pins (A0, A1).The Arduino acts as the brain of the system.It continuously monitors the voltage levels of both batteries using the sensing inputs.If Battery 1 voltage is above the threshold, it remains connected to the load.If Battery 1 voltage drops below the threshold, Arduino activates the relay to switch to Battery 2.When Battery 2 also goes low, it can alert the user or stop supplying the load.The relay acts as an electronic switch controlled by the Arduino.The LCD shows the real-time voltage levels of both batteries.The load (like a DC motor, light, or inverter) receives continuous power through the relay switching.This ensures uninterrupted operation even if one battery becomes weak.

Circuit Diagram:



IV. MODULE DESCRIPTION:

A.Arduino Uno:

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

B.RELAY

The relay is the device that open or closes the contacts to cause the operation of the other electric control. It detects the undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area through ON or OFF. Every electromechanical relay consists of Electromagnet Mechanically movable contact Switching points and Spring.

C.LI ION BATTERY:

Lithium-ion batteries power the lives of millions of people each day. From laptops and cell phones to hybrids and electric cars, this technology is growing in popularity due to its light weight, high energy density, and ability to recharge.

V.HARDWARE IMPLEMENTATION:

VI. CONCLUSION AND FUTURE DEVELOPMENT

This project is useful in reducing the battery charge of an electric car that requires an electric car in the latest cases. This program is also applicable to any type of charging system. So the two-battery charging system used saves time due to faster charging. This charging system charges the battery on both sides while dividing the battery cells into two parts and then charging them separately. This application can automatically turn on or off the charger according to the battery capacity. Disconnects the charger when the battery is fully charged to avoid overcharging. In this program the use of the display displays information about the battery and thermal power parameters. Provides a visual indication of the battery charge status. So by using this we can save the battery from overcharging or overheating. By using a battery indicator (LCD Display) we save the battery from overheating and as a result the battery life increases. In a two-battery charging system, the battery discharges evenly due to cell alignment to get the right output. In this way the twobattery charging system will appear to benefit the electric car as well as any other charging system.

Future development:

1. Smart Battery Health Monitoring
2. IoT Integration
3. Renewable Energy Integration
4. Automatic Load Management
5. Intelligent charging system

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