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Electric Vehicle Battery Management System and Fire Protection

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ABSTRACT:

Nowadays, the majority of automakers produce electrical cars for two- and four-wheel drive. Consequently, batteries become a crucial component and better techniques for figuring out how much a car can charge are needed. To prevent overcharging or deep discharge of batteries, an effective battery management system must be designed and developed. To lessen damage, increase the longevity of electric vehicles, and protect the electronics they power, electric vehicles should have an accurate state of charge estimation. This project proposes a real-time Battery Monitoring System (BMS) that shows the critical metrics and uses the State of charge (Soc) technique. Using the Arduino environment, the appropriate sensing technology, a central processor, and interface devices, the suggested BMS is realised on a hardware platform.

Keywords: Electric vehicles, battery technology, infrastructure, eco-friendly driving, BMS , Fire protection

INTRODUCTION:

Electric vehicles, or EVs, are becoming more and more popular as gas prices climb. This circumstance has forced several automakers to look for other fuel sources. The ecology can benefit from the use of electrical energy sources since they produce less pollutants. When it comes to preserving the environment and optimising energy efficiency, EVs are quite advantageous. Rechargeable lithium-ion batteries are commonly found in electric vehicles. It's smaller than lead acid, though. Actually, compared to a lead-acid battery, it has a 6–10 times longer energy life cycle and continually delivers power. A lithium-ion battery's lifespan may be shortened by a number of things, such as excessive charging and extreme draining. On the other hand, the dimensions of the battery and the vehicle's body usually lead to a restricted working range for electric cars (EVs). Concerns about battery technology security are currently significantly limiting the deployment of electric vehicles. For example, overcharging a battery can result in a considerable reduction in battery life as well as a serious risk to safety, such as a fire. Therefore, EVs need to have a battery monitoring system that can alert the user to changes in the battery's condition in order to avert the aforementioned problems.

METHODOLOGY:

An excellent and creative proposal is made for a Battery Management System (BMS) for electric vehicles (EVs) that includes a fee temperature and fire safety system. This suggested device aims to improve the safety and dependability of EV batteries by solving important concerns about temperature control while charging and reducing the likelihood of fire occurrences. The BMS's free temperature control feature prevents overheating and overcooling by ensuring that the battery works at its optimal temperature while charging. It keeps an eye on the battery cells' temperature and modifies the charging parameters accordingly. The suggested BMS maximises charging performance, prolongs battery life, and lowers the risk of thermal runaway by maintaining the proper temperature.. In addition, the BMS fire protection system provides additional security. It uses a combination of smart sensors,advanced algorithms and firefighting mechanisms-to find and prevent potential health threats.

Sensors constantly monitor various parameters such as temperature, voltage and current day and detect strange conditions that can cause the fireplace to malfunction. In the event of a fire, the machine initiates countermeasures on the spot, including keeping the damaged battery module isolated, activating the vendor's fire extinguisher and alerting the occupants of the car and the emergency services. The proposed BMS incorporates modern technology and components to achieve these functions. High-precision temperature sensors allow precise temperature monitoring at the cell level, which allows manipulation of the specific charging method. Intelligent algorithms examine temperature records in real time, dynamically adjusting charging parameters to maintain optimal temperature ranges.

To ensure fire safety, BMS uses advanced flame detection sensors that can detect the early stage of a fire. These sensors are strategically placed within the battery compartment, ensuring comprehensive coverage. When a potential fire is detected, the system initiates a rapid response and activates a range

of fire extinguishing methods, including gas-based solid or foam-based extinguishers, to quickly extinguish the fire and reduce damage. The proposed electric vehicle BMS with charging temperature and stack protection machine addresses important safety issues related to electric vehicles. Actively managing temperature during charging and integrating ignition detection and shutdown mechanisms significantly reduce the risk of battery overheating, heat escape and fire. With the growing popularity of electric vehicles, the introduction of such advanced BMS can bring more desirable protection, reliability and peace of mind to electric vehicle owners and customers. This study describes how an embedded system is used to monitor the battery status of electric vehicles. It is clear that the battery of an electric car is the only source of energy. However, gradually reducing the power of the vehicle will reduce the efficiency of the vehicle. This is a major problem in battery manufacturing. This study introduces the idea of vehicle performance monitoring, which enables direct monitoring using embedded system technology. The two main components of the proposed embedded battery monitoring system for Arduino are the monitoring device and the user interface. The system detects battery discharge, displays the test results and guides the user to take action via the LCD screen..

WORKING METHOD :

At startup, the device uses its own charging and monitoring circuit that allows the user to safely charge the 3S battery. It consists of an LCD screen, a modern sensor, a voltage sensor and a temperature sensor to extend this challenge. The machine is specially designed to protect the batteries from overheating and avoid accidents caused by fires or explosions. During charging, a voltage sensor is used to test the voltage and limit current flow into the battery using the charging circuits. The liquid crystal display shows the current voltage level values. When there is a charge, the advanced sensor keeps the battery at its maximum and shows the parameter on the LCD screen. The temperature sensor is also used to display the battery temperature during charging and discharging. If the battery temperature is found to be different from the mod values, the machine will normally cut off the input in addition to the output supply. A buzzer is an audio signalling device that produces a legitimate signal from an incoming electrical signal. In summary, an EV BMS with temperature and stack protection aims to ensure safe and reliable operation of the battery throughout its life. The temperature sensor accelerates up to 40 degrees Celsius, after which the buzzer gives an electrical signal in the form of a sound. The fireplace sensor detects the fireplace and gives an electrical signal with an acoustic signal.

FUTURE SCOPE

1. Improved fire detection structures to quick pick out battery overheating or hearth risks.

2. Better thermal management strategies to efficiently expend warmth and preserve top of the line battery temperatures.

3. Establishment of regulatory standards and certifications for stronger fireplace and temperature safety.

4. The future scope of EV BMS involves the combination of more state-of-the-art fire detection structures.

These structures thought to make use of superior sensors, such as smoke detectors or infrared cameras, to discover early symptoms of battery overheating or fire improvement. This early detection can enable prompt actions to mitigate the danger of fireplace and beautify typical protection.

RESULTS

The framework is intended to continually screen battery voltage current temperature and in a split second removed the info or result from battery when any uncommon way of behaving is recognized.

ADVANTAGES

1. Battery status monitoring and display of battery charge according to required input limits. Temperature monitoring with automatic shutdown. The frame uses lithium particle battery, battery charging and display frame, buttons, LCD screen, current sensor, voltage sensor and temperature sensor to advance this frame. The frame permanently screens and protects the battery of the electric car. Here we evaluate the frame according to the 3S lithium particle battery. Our specified frame not only shields the battery and charges it safely, but also protects it to prevent accidents.

2. When the frame is powered on, it uses its own charging and monitoring hardware, allowing the customer to charge the 3S battery in a safe location.

The voltage sensor is used to monitor the voltage during charging, and the current flow to the battery is interrupted by the charging devices.

3. The LCD screen also shows the continuous voltage level of the battery. When the battery is fully charged, the case will remove the battery and display Cutlery fully charged on the LCD screen.

When it joins the stack, the current sensor monitors the current drawn from the battery and displays the limit on the LCD screen.

4. The temperature sensor is used to display the battery temperature during charging and disconnection.

If the battery temperature is detected not of normal quality, the frame will naturally remove the input and output and display the temperature and warning on the LCD screen. In this way, the framework considers an intelligent and expert battery charging and security framework

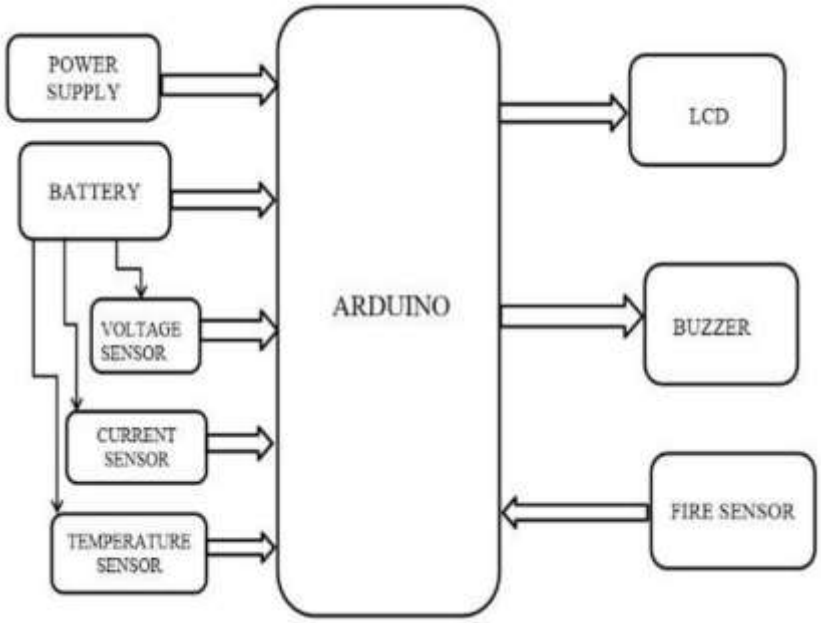

Fig 1 Block Diagram

CONCLUSION

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