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IOT BASED BATTERY MANAGEMENT SYSTEM AND BATTERY COOLING SYSTEM FOR EV BATTERY BANK

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A B S T R A C T:

The increasing adoption of EVs requires efficient battery management systems for optimal performance, safety, and increased battery life. An investigation of an IoT-based intelligent smart battery management system for EVs is presented. Here, real-time monitoring and analysis of important key parameters such as temperature are considered. It includes sensors, a microcontroller, and wireless communication transferring data to a cloud platform, hence allowing remote monitoring and control. It utilizes adaptive cooling to avoid overheating. It contains a display showing the status of the battery. The experimental results showed that the system had improved the performance of the battery, prevented thermal runaway for safety purposes, and made the lifespan of the battery longer.

Keywords: IoT Based battery management system, Continuous temperature detection, Cooling System for Ev battery Bank

Introduction

The rise of electric vehicles (EVs) is transforming the global automotive industry. Unlike traditional internal combustion engine vehicles, EVs offer smoother rides, reduced emissions, and decreased dependence on fossil fuels. However, a pivotal factor in their success lies in the battery system. Efficient battery management is essential to optimize energy use, prolong battery life, and ensure safety. Intelligent battery management systems play a crucial role in enhancing EV performance and reliability. By continuously monitoring and regulating battery parameters such as temperature, these systems prevent premature degradation and mitigate the risk of thermal runaway. Moreover, smart battery management reduces maintenance costs, improves user experience, and boosts confidence in driving range.

Despite advancements in battery technology, challenges persist in temperature regulation and battery monitoring for EVs. Achieving precise, real- time monitoring of battery parameters remains complex due to the intricate chemistry and dynamics of batteries. Additionally, ensuring thermal stability and preventing overheating in high-power EV batteries necessitate advanced temperature protection mechanisms. Traditional battery management systems often lack the precision and adaptability required to address these challenges effectively. To address these issues, this research proposes an Internet of Things (IoT)-based battery management system for EVs. This system integrates real-time monitoring of battery parameters, including temperature, through IoT-enabled sensors and communication modules. An adaptive cooling mechanism is incorporated to prevent overheating, and a display provides up-to-date battery status.

Experimental results demonstrate that the system significantly enhances battery efficiency, prevents thermal runaway, and improves the overall reliability and safety of the EV battery. The proposed system shows promising potential for advancing EV battery management. The emergence of Internet of Things (IoT) technology offers a hopeful solution to overcome the limitations of traditional battery management systems. The Internet of Things (IoT) makes it possible to seamlessly integrate sensors, communication modules, and data analytics algorithms

LITERATURE REVIEW:

This gives a review of Advanced Cooling Strategies for Battery Thermal Management Systems in Electric Vehicles would examine the cutting-edge developments in managing the thermal conditions of battery packs in electric vehicles (EVs). Efficient thermal management is crucial for maintaining battery performance, enhancing safety, and extending the lifespan of EV batteries. This also discusses the designing of a Coolant-Based Battery Cooling System in an Electric Vehicle would explore the various approaches and developments in coolant based thermal management systems for EV battery packs. Battery temperature regulation is a key factor in ensuring the optimal performance, safety, and longevity of electric vehicle batteries, and coolant- based systems are widely recognized for their efficiency in managing heat dissipation.

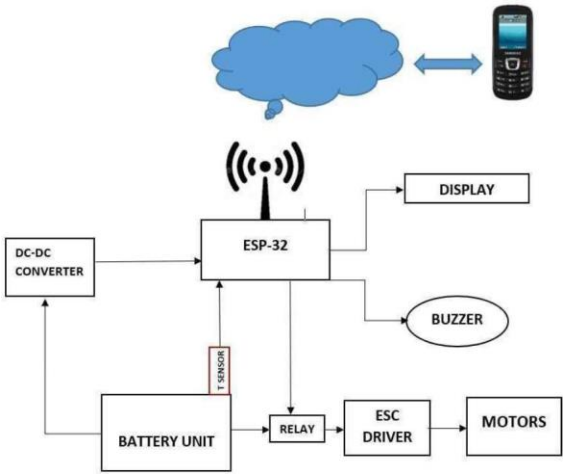
Research carried out to detect the continuous temperature of battery through the IoT so that the battery temperature will be detected continuous so that the battery will not get damage or will not get overheated.

As things stand, the transport system will become more sophisticated thanks to Internet of things (IoT) based technologies. Both traffic congestion and public safety will be improved by this method. Prompt reporting of driving irregularities 1 can contribute to saving the lives of those involved in collisions. Audio and video-based analysis, as well as sensors, can be used to solve traffic crashes. This work presents a quick information exchange method that includes the event's date, time, and precise geographic location Google map URL, swiftness, and the path traced using global position system (GPS) information.

METHODOLOGY:

We are working on a complete voltage and current measurement system for electric vehicles (EVs) where all the electric parameters of the battery will be accurately measured and recorded in real-time.

As part of this system, we want to implement an IoT- based temperature monitoring system that continuously measures the temperature of the battery. If this temperature exceeds a normal baseline level, an alert will be transmitted to the user/driver. We will implement a simple automatic cooling mechanism to cool the battery to its regular operating temperature when it reaches a preset temperature threshold. Additionally, an LCD will provide a simple to use screen displaying the temperature condition of the battery. Finally, we will add an additional IoT-based monitoring document that will enable the user to monitor the EV battery in real time. The user/driver can see alerts, and take action, when necessary, with a IoT-based mobile application.

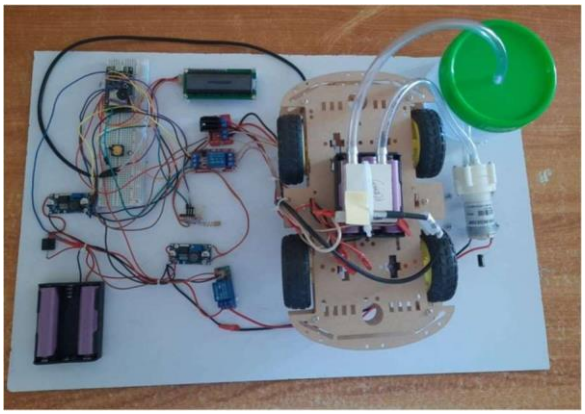


Block Diagram

WORKING:

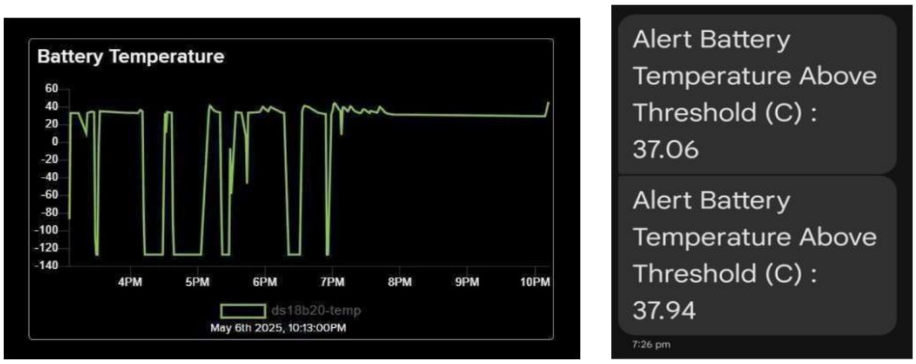
The below Figure shows the physical implementation of an IoT-based battery management system and cooling of EV battery bank. The hardware system uses various parts

System Model



The above Figure presents the IoT based battery management system and cooling of EV battery bank prototype in its detached and assembled state.

It consists of the 18650 battery, IRF520 Mosfet, GSM Sim 800L, Buck converter, LCD display, Water pump, ESP 32, DSB1820, Push button. The push button is attached to the battery on one side and other side to buck converter. The assembly is attached to the EV battery bank. The battery bank is attached on the car model. When the battery starts heating at certain temp. the coolant starts to cool down the battery. Here the battery status and battery get long-life. Here also the battery gives the live status of battery temp. The temperature is shown in the IoT. The DSB1820 is a temperature sensor that sense the heat and sends the signal and coolant gets activated. Fig. shows the entire prototype of the IoT based battery management system and cooling of EV battery bank, and it is clear that all reported components in the hardware part have been used to build it.



Message Displayed on Mobile and Temperature Displayed on IoT

CONCLUSION

The IoT based battery management system and cooling of electric vehicle battery bank project successfully achieved its target of optimally promoting the efficiency and cooling of the battery and the high precision and accuracy were verifiable and innumerable reliability. The sensor that was embedded into the battery system was used to accurately detect heat and to provide accurate results. The transmission of the messages to the mobile devices was accomplished through GSM SIM 800L use. The message was sent every time when the heat of the battery reached a peak. The liquid coolant assisted in cooling down the battery and substantially assisted in conserving and prolonging the life of the battery.

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