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Electric Vehicle Battery Fault Monitoring Using IOT

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ABSTRACT: Our system monitor current, voltage and temperature condition which is collected from the LI-ION battery's like voltage sensor, current sensor, temperature sensor and the remaining charge capacity in a real-time scenario. The information collected from all the associated battery clients in the system's is analysis. The malfunction of the battery status are continuously monitored based on sudden charge and discharge voltage of battery bank by using of this sensors and battery conditions are viewed in the cloud and mobile application with the help of IOT module. To send the notification to mobile app to alert user of the vehicle .By using the sensors, continuously monitoring the battery and displayed thevoltage, current and temperature values in the OLED screen to detect the fault and prevent the vehicle fromthe accidents and to indicate the fault. If any tedious are find in the battery automatically motor off.

KEYWORDS: Electric vehicle, IOT, Mobile app, current sensor, temperature sensor, voltage sensor,OLED, Battery.

I. INTRODUCTION

Nowadays, electric vehicle (EV) is becoming popular since the fuel prices becoming more expensive. Due to the scenario, many vehicle manufacture looking for alternatives of energy sources other than gas. The use of electrical energy sources may improve the environment since there is less pollution. In addition, EV produces great advantages in terms of energy saving and environmental protection. Most EVs used rechargeable battery which is lithium ion battery. It issmaller to be compared with lead acid. In fact, it has a constant power, and energy's life cycle is 6 to 10 times greater compared with lead acid battery. Lithium ion battery life cycle can be shortened by some reasons such as overcharging and deep discharges. On the other hand, EV usually has limitedrange of travelling due to battery size and body structure. Now, an important reason that limits the application of EV is the safety of existing battery technology. For example, overcharging battery not only could significantly shorten the life of the battery,but also cause serious safety accidents such as fire. Therefore, a battery monitoring system for EV that can notify the user about battery condition is necessary to prevent the stated problems. Previous battery monitoring system only monitoring and detectthe condition of the battery and alarmed the user via battery indicator inside the vehicle. Due to the advancement of the design of notification system,internet of things (IOT) technology can be used to notify the manufacturer and users regarding the battery status. This can be considered as one of the maintenance support procedure that can be done by the manufacturer. IOT utilizes internet connectivity beyond traditional application, where diverse of devices and everyday things can be connected via the internet, making the world is at the user's finger tip. Motivating by the stated problems, in this work, the design and development of a battery monitoring system using IOT technology is proposed.

II. EXISTING METHOD

Battery is the most essential component of any vehicle. So, perfect maintenance of any battery isvery much essential for it to function properly. Lead Acid batteries which are more commonly used in the vehicle battery is need to be efficiently monitored, for it to perform better under all circumstances. So, a more systematic battery management system needs to be implemented so that the performance of the battery can be monitored continuously. When it comes to battery, the two most important parameters are the State Of Charging (SOC) and State of Health (SOH) of the battery. There are several coherent methods to calculate these parameters. But these methods cannot provide correct results, as the battery materials, atmosphere surrounding the battery, the load put on to the battery, will affect these parameters. Overcharging of the battery leads to emission of gases like Hydrogen, Oxygen etc. This Battery Management System (BMS) aims atdetecting the emission of these gases from the battery, when it is overcharged, and monitors the other basic parameters such as Voltage, Current, Temperature of the battery using STM controller and sensors but the parameters are not displayed to the clients. It is also equipped with GPS module, which enables tracking of vehicles.

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EXISTING SYSTEM DISADVANTAGES

1. There is no SOC estimation and cannot display the condition in it.
2. There is no current measurement.
3. There is no user interface.
4. There is no temperature measurement.
5. There is no cooling system.
6. IOT is not present which would be easy to get information through mobile.

III. PROPOSED SYSTEM

In this proposed system, EV battery fault monitoring system. Temperature sensor, voltage sensor, current sensor are connected and used to monitor the battery condition and the lithium ion batteries are arranged in series and parallel are connect to the charger module to get the power supply to the vehicle .While charging, parameters collected information with use of all three sensor is fetched by Node MCU and triggers the relay for cutoff charging.The information collect from all the associated battery clients in the system is analyzed. The malfunction of the battery status are continuously monitored based on sudden charge & discharge voltage of battery bank. If any tedious find the battery automatically motor off and battery conditions are viewed in the cloud and mobile application with help of IOT module.When our device detects any malfunction. The condition will be monitored real-time through mobile application and the client gets the notification through the mobile application. If the temperature, current and voltage are displayed in the OLED and the buzzer is alarmed and by using the relay to cut off the motor and stop the vehicle.

PROPOSED SYSTEM ADVANTAGES

- Use the unlicensed ISM frequency band.
- It is a flexible solution that can be easily adapted.
- It is scalable.
- It supports bi-directional communication.
- Provides a high level of security due toencryption algorithms.
- Provides energy efficiency.

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BLOCK DIAGRAM

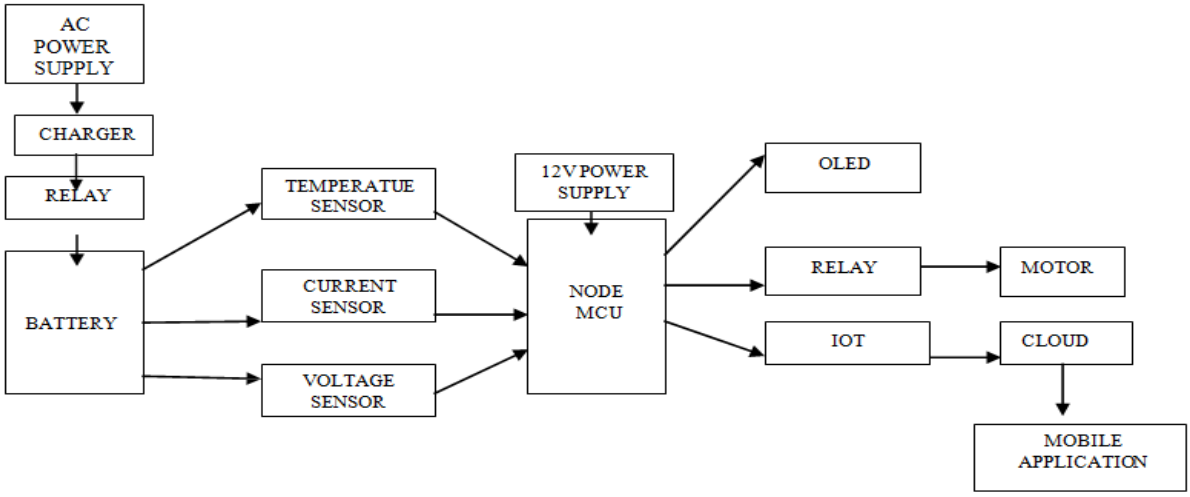

Fig.1 Block Diagram

BLOCK DIAGRAM EXPLANATION

The battery is connected with the temperature sensor, voltage sensor and current sensor. The sensors are connected with the node MCU and the 5v power is supplied to the node. The two relay are connected to the kit and one relay is connected between node and battery. Second relay is connected between the node and the motor. The AC power of system is supplied supplied to the charger module. The charger module provides the constant current to the battery and the battery is connected with the sensor to detect the temperature, current and voltage. The information are collected from the sensors and transferred to the node. The sensors are senses the fault and collect the fault and collect the information and if the temperature, current ,voltage ranges are high detected and by using the relay to cut off the motor and stop the battery functions. Here, using the lithium ion battery to equally discharged the charge in each cell and the cell are arranged in series and parallel the lithium ion battery. If the temperature, voltage, current is high and the information is send to the node and relay is cutoff. The motor is off and the buzzer is alarmed. The battery is discharging range also displayed in the mobile app and get the notification in the mobile app. If the parameters is high by using the IOT to send the notification to the mobile app. For the purpose of monitoring the battery and reduce the heat of the battery and to prevent from the accident.

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CIRCUIT DIAGRAM

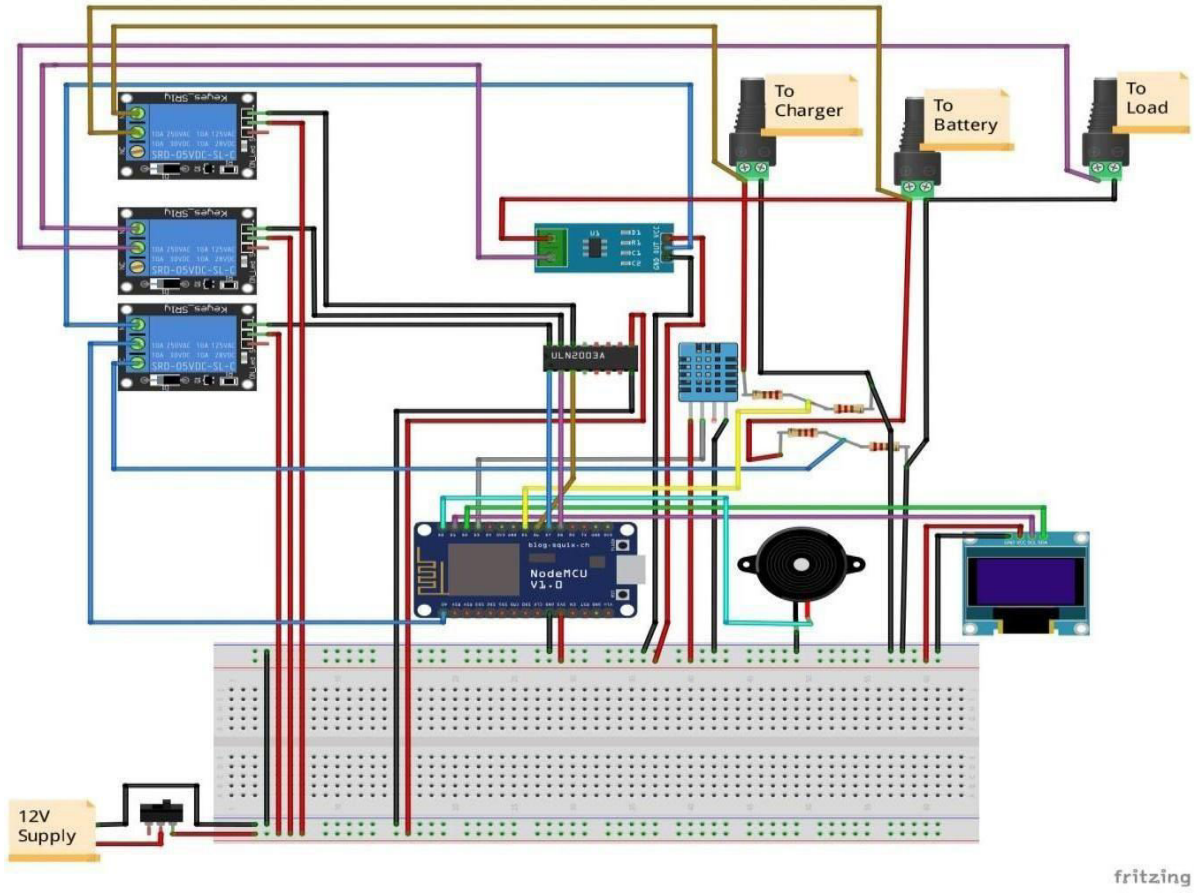

Fig.2 Circuit Diagram of electric vehicle battery fault monitoring system

CIRCUIT DIAGRAM

The circuit diagram shows the connection of the electric vehicle battery fault monitoring system. The periodical monitoring/observations are required for battery source to provide continuous power to the load without any interruption. Our proposed system monitors and stores parameters that provide an indication of the lithium ion state of charge, voltage, current, temperature, and the remaining charge capacity in a real-time scenario. Wireless local area network is used as the backbone network. The information collect from all the associated batteryclients in the system is analysed. An important reason that limits the application of EV is the safety of existing the battery technology of the vehicle. For example, overcharging battery not only could significantly shorten the life of the battery, but also cause serious safety accidents such as fire. Therefore, a battery monitoring system for EV that can notified.

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IV. RESULT SOFTWARE RESULT

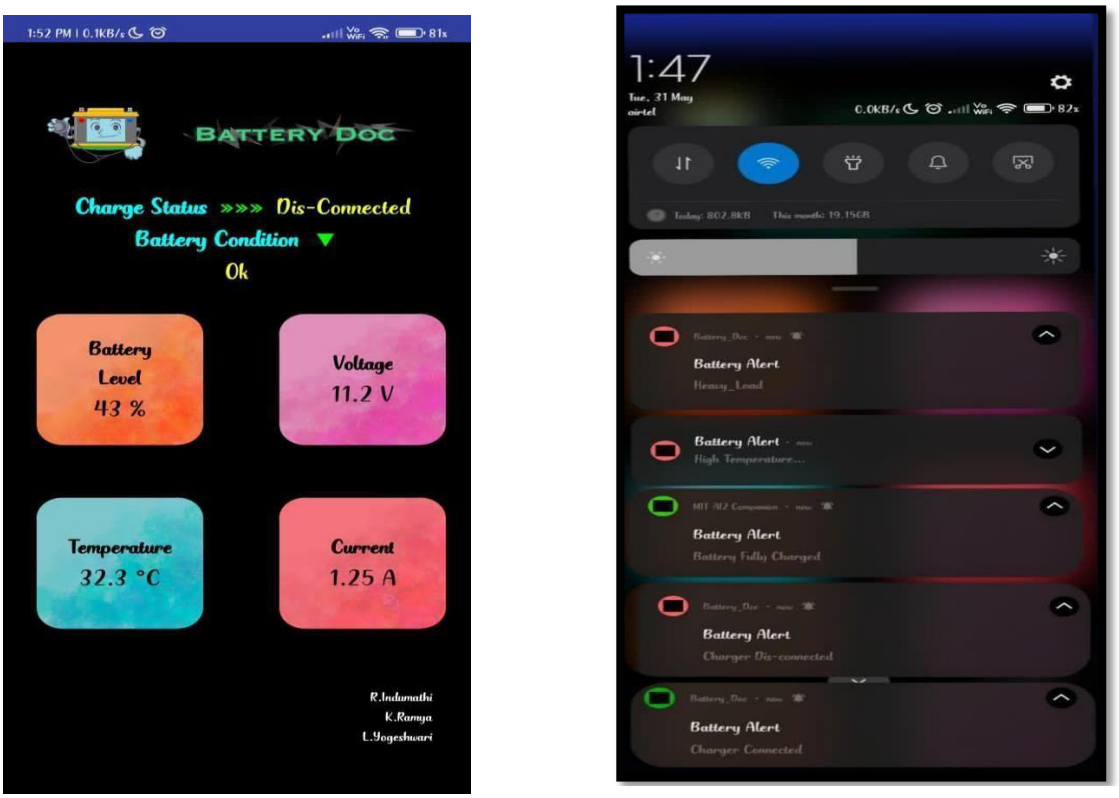

Fig.3 Output Frame

The information are collected from the sensors and transferred to the node. The temperature, voltage, current values is sendto the node and the informationare displayed in the mobile app. This contents are displayed in the mobile app and the app is build by C++ program using Arduino IDE software and the contents are displayed in the app. While charging, parameters collected with use of all three sensor is fetched by Node MCU and triggers the relay for cutoff charging. When our device detects any malfunction.The condition will be monitored real-time through mobile application**.** The condition is displayed by OLED and the information is send to the mobile app and every condition is send the notification to the mobile. The user by using the system to analysis the function of parameters like temperature, current, voltage, battery condition, battery status and the levelof the battery are displayed in the OLED and displayed in the mobile app .The information are send to the mobile continuously by monitoring the system. To alter the user and to avoid the accidents by using the electric vehicle.

HARDWARE PROTOTYPE

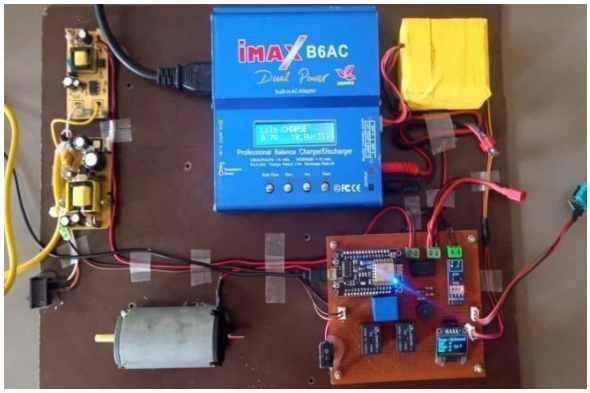

Fig.5 Input Frame

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In the above figure, Charger module to choose the type of battery using in this project and select thetype of battery. The start to charger the battery with the equal amount of current in each cells. The each cell charging the equal and the cells are arranged in the series and parallel to the connections for easily supply of current and to avoid the cell to burst. Connect the connections between the battery and the Node MCU and the sensors are senses and to send theinformation to the mobile app to the condition of the battery. The work has been implemented in real time using Node MCU (ESP32) module and OLED and project is working successfully.

V. CONCLUSION

After the implementation of smart battery system intothe vehicle, it is easy for customer to view the battery parameters like voltage, temperature and charge capacity in the display on the battery. Mobile application and real time data base as well. Our smart battery system is going to enhance the battery life by monitoring each cells of the battery individually while charging. Its switching the charger when detecting the malfunction like overcharging, over discharging, overheating and it will push notification to the mobile app. Also it cut off the vehicle power when detecting over heating of battery pack and also it offs the charging when battery gets full.

ADVANTAGES

- Use the unlicensed ISM frequency band.
- It is a flexible solution that can be easilyadapted.
- It is scalable.
- It supports bi-directional communication.
- Provides a high level of security due toencryption algorithms.
- Provides energy efficiency.

VI. FUTURE SCOPE

Developments in the EV space are taking place so rapidly, and will continue to, that potential investors will have to make measured decisions so as to ensure their returns are not only limited to the near term. Notonly is each stride towards truly zero-emission vehicles (ZEVs) a remarkable feat but also a step towards reducing the impact that human activity has had on the planet. Sustainable solutions towards energy storage on the whole, as well as EVs in particular, will offer resounding returns for generations to come and pave the way for a cleaner energy future wherein energy losses will be minimized to a great extent. We are talking about a future wherein sustainably generated energy powers electric vehicles for ranges of 1,000 km (621 miles) without ever having to be parked for more than a few minutes at a time.

APPLICATION

- It is clear that an electric vehicle totally dependson the source of energy from a battery.
- In this work, the idea of monitoring the performance of the vehicle using IOT techniquesis proposed, so that the monitoring can be done directly.
- The system is capable to detect degraded battery performance and sends notification messages to the user for furtheraction.
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