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Battery Monitoring System for Electric Vehicle Using IoT

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Abstract— -It is necessary to move to the use of electric vehicles, as theyrepresent the next generation of transportation. Electrical vehicle batteries may be damaged due to overcharging or over-discharging, so they need to precisely estimate the state of charge to extend their lifespanand protect the connected components they power. This proposed system presents battery management and monitoring system *of* electric vehicles, low-cost and IoT-based, in real-time, and easily used to help users through an application supporting the Internet of Things technology to display the essential information required about the battery's status as battery capacity and the charging and consuming current. This information is updated and displayed in real-time. This proposed system used to estimate the battery load, estimated hours of discharging and estimate the life of the battery using charging and discharging cycle. The GSM used to give alert if any of the parameter reaches above the threshold value of the EV parameter like battery, temperature, motor speed etc,. The proposed system is implemented using an microcontroller, Blynk IoT platform and sensors.

Keywords— Electric vehicle, Battery Parameters, Monitoring, Control, SOC, SOH, Internet of Things.

I.INTRODUCTION

In today's hectic environment, electric vehicles play an important role in mobility. Electric vehicles (EVs) produce noemissions and help to keep our environment clean. To help theglobal environment grow green, the Indian government has tackled and launched the upgrading and manufacture of electric cars in the country. Electric vehicles improve power efficiency and provide fuel alternatives. EVs are battery electric vehicles that run entirely on energy and are more efficient than others. A hybrid electric vehicle is one that uses both an engine and a battery. A fuel cell electric car is one that operates on electricity generated by chemical energy. Electric vehicles (EVs) have emerged as a promising solution for sustainable transportation. However, one of the major challenges in EVs is the limited range of travel, which is dependent on the capacity and health of the battery. Therefore, it is crucial to monitor the state of the battery to ensure the reliable and efficient use of EVs. In recent years, the Internet of Things (IoT) has gained significant attention in various industries, including automotive, due to its potential to provide real-time monitoring and control of devices remotely. The application of IoT in EVs can improve the performance and efficiency ofthe battery, as well as enhance the driving experience of the users. This paper proposes an IoT-based battery monitoring system for electric vehicles. The system consists of battery sensors, microcontroller, wireless communication module, and cloud server. The battery sensors measure the voltage, current, and temperature of the battery and send the data to themicrocontroller. The microcontroller processes the data and transmits it to the cloud server through the wireless communication module. Thecloud server stores the data and analyzes it to generate insights about the battery's health. Theproposed system provides real-time monitoring of the battery's state, enabling the optimization of the battery's performance and prolonging its lifespan. Moreover, the data generated by the system can be used to predict

the remaining range of the EV, which can help the driver plan the journey more efficiently.

II. RELATED WORK

To revise the problem objectives literature survey has been conducted. So many papers are collected and draw backsare identified. Efforts have been made to overcome this drawback. :

a) IoT-Based Battery Monitoring System for Electric Vehicle

In this paper describes, the idea of monitoring the performanceof the vehicle using IoT techniques is proposed, so that the monitoring can be done directly. The proposed IoT-based battery monitoring system is consists of two major partsi)monitoring device and ii) user interface. Based on experimental results, the system is capable to detect degraded battery performance and sends notification messages to the userfor further action.

b) IOT Based Electronic Motor MonitoringSystem For Electric Vehicle

This paper presents an implementation of the Internet of Things (IoT) system applied to the Electric Motor condition monitoring in electric vehicles (EVs). There is no doubt that electric vehicles (EVs) depend upon the electric motor and battery. The design and testing of the prototype using an Arduino Uno microcontroller and SIM900AGSM module are made to check load, vibration, temperature, and voltage information for the motor condition monitoring with the helpof a load sensor, vibration sensor, temperature sensor, and voltage sensor respectively. The experimental results reveal that the IoT system is capable of sensing vital electric motor parameters and an automatic notification is sent to operators or owners when the electric motor abnormality is detected inreal-time.

c) IoT enabled Electric Vehicle's Battery MonitoringSystem

This paper proposes a real-time Batter Monitoring System(BMS)using coulomb counting method fo -r SoC Estimation and messaging based MQTT as the Communication protocol. The proposed BMS is implem -ented on hardware platform using appropriate sensing technology, central processor interfacing devices and the Node-RED environment. An optimization model aimed at maximizing the trade revenue for EV's aggrega -tor is presented aimed at enabling the smart charging.

d) A Critical Approach towards a Smarter BatteryManagement System for Electric Vehicle

The Battery Management System (BMS) is the most critical and essential component in electric vehicles. BMS assures reliability and guarantees the safety of the battery and its operation. The BMS must contain the functionality to calculate and monitor the cell balancing and charge controlling mechanisms to maintain reliability and as sure safety. The battery is an electrochemical product and thus acts differently under different environmental and operational conditions. The varying nature of a battery's performance makes it challengingto implement these functions. Evaluating a battery state, which includes the state of life, state of charge, and health, is an important task for a BMS. In this paper [5], the latest research and technologies for the state evaluation and improved performance of the batteries are studied.

e) IoT Based Battery Management System for Hybrid Electric Vehicle

This paper describes, in brief, the basic function of the BMS, Minimizing the risk of battery damage and Montoring the key parameters of the battery like the voltage, current, and temperature during both charging and discharging situations.

f) Battery Management System in Electric and HybridVehicles

This paper addresses concerns for current BMSs. State evaluation of a battery, including state of charge, health, and state of life, is a critical task for a BMS. By reviewing the latest methodologies for the state evaluation of batteries, the future challenges for BMSs are presented, and possible solutions arealso proposed.

g) Battery Management System in Electric Vehicles

This paper describes developing the system model for battery management in an electric vehicle by controlling the crucial parameters such as voltage, current, state of charge, state of health, state of life, and temperature. The BMS must be well maintained with battery reliability and safety. This paper also focused on studying BMS and optimizing the power performances of electric vehicles. Moreover, reducing greenhouse gases can greatly be achieved by using a battery management system.

h) IoT Based Smart Vehicles Monitoring System

This study proposes Smart Vehicle Monitoring System (SVMS) for early detection of accidents and also to prevents thefts. SVMS uses IoT technology to monitor the vehicle continuously and also to access and control remotely. The IoT devices placed in vehicles is designed using Raspberry pi (RPi)that is acquainted with sensors to detect accidents immediately. The RPi is also acquainted with a camera to find the severity of accident. To detect the severity, SVMS uses machine learning based image classification model. When the accidents happen the SVMS detects it immediately and finds the severity of the accident. Then the system will immediately inform that to the authorities. The SVMS also acquainted withGPS system. This will allow the SVMS to continuously keep track of vehicles location. This data will be used to find the vehicles location during an accident or theft. The results of SVMS system were promising in terms of efficiently detecting the accidents, finding the severity of accident and also detecting the location of vehicle.

III. THE PROPOSED MECHANISM

In existing system the battery management system for an electric vehicle is very attractive but requires a lot of care with the addition of a wireless system as it is a critical factor in e-mobility. It is observed that battery monitoring plays a vital role in EV's safety, the life of the battery and the proper operation of the battery system. It shows the potential ability of the system which simultaneously measures the temperature, humidity of the battery atmosphere along with the battery monitoring. Besides BMS, this monitoring technique can be implemented for other parts like the bearing, engine with reasonable customization. In existing system along with battery monitoring, we are ready including managing other parameters like voltage, current ,temperature, humidity, and fire sensing. As of now b using a battery management system with maintained reliability and safety, we can achieve a reduction of green house effectively.

IV. PROPOSED METHODOLOGY

A.Block Diagram

Fig 1Shows the block diagram of the methodology proposed.

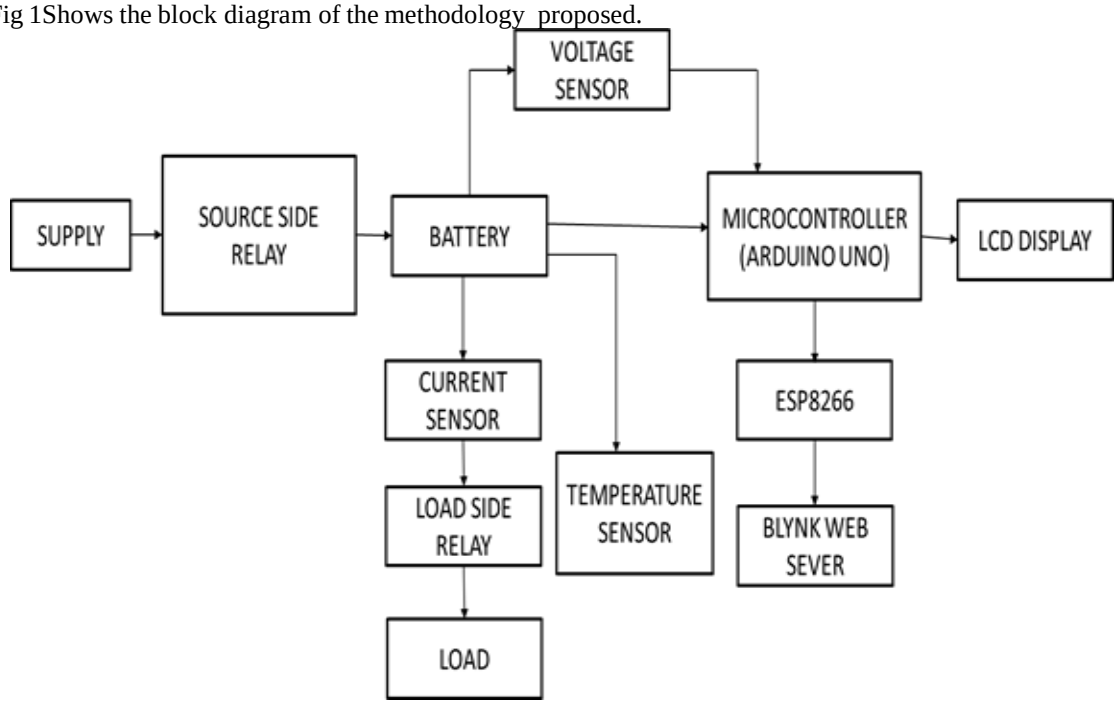

Fig 1. Block diagram of the proposed methodology

V.WORKING PRINCIPLE

The proposed system, the voltage sensor tests the voltage level of the lithium-ion battery in order for the device to work. At the same time, an ESP8266 to read data from the car. The voltage level readings from the battery of the vehicle are sent to an Atmega microcontroller for processing. The battery current has to be measured in

order to get the load current compared with the capacity of the battery and studied the discharging time which is updated in IoT. Temperature sensor is used to get battery temperature to protect battery from extreme temperature which effect the life of the battery and leads to damage the battery totally. The speed limit can be set to avoid over speed of the vehicle and updated in IoT. Braking sensor used to send SMS to registered person to intimate any parameter is abnormal over threshold value.

VI. HARDWARE MODULE

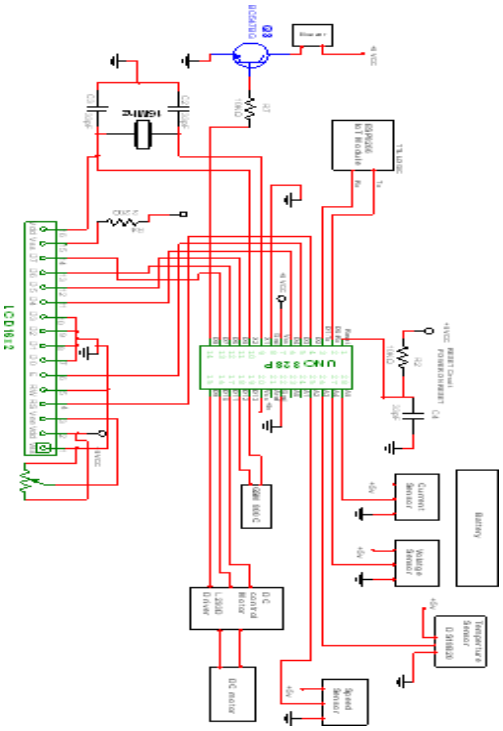

Fig 2.Hardware Module

VII.OUTPUT

Fig 3. Output

VIII. RESULT

The battery monitoring for an electric vehicle is very attractive but requires a lot of care . It is observed that battery monitoring plays a vital role in EV's safety, the life of the battery, and the proper operation of the battery system. It shows the potential ability of the system which simultaneously measures the temperature of the battery with the battery monitoring. In our project along with battery monitoring, we are ready including managing other parameters like voltage, current, temperature,. As of now by using a battery management system with maintained reliability and safety, we can achieve a reduction of green house gases effectively.

IX. CONCLUSION

Electric Vehicles are having enormous potential for future transport communication, by exchanging the present conventional vehicles. EVs will be becoming much eco-friendlier by saving the planet from global warming, by key reducing the greenhouse gases emitted from present vehicles. Sensors for automotive applications, some of them which are also common in EVs, are discussed in detail. Finally, we have reported about the various kinds of micro-fabricated sensors that are recently coming into play through MEMS-based researches and can be used for applications like motion sensing, battery sensing, energy harvesting, etc. This miniaturized sensor will help to reduce the cost, space, and give better sensing capability for the upcoming vehicles threshold value.

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