Applying IOT to an Electric Vehicle Battery Monitoring System

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ABSTRACT- This study discusses the value of the internet of things (IoT) in monitoring the overall performance of batteries used in electric vehicles. Undoubtedly, a battery serves as a clean energy source for an electric car. But the car's power source is gradually running out, which makes the car perform worse. That is the primary issue with battery production. This image proposes the use of IoT technology to monitor the whole performance of the car in order to finish the monitoring instantly. The monitoring device and the user interface are the two most important parts of the recommended battery monitoring device, which is mostly based on the Internet of Things.

I.INTRODUCTION

These days, the rising cost of gas has made electric vehicles (EVs) more and more popular. As a result of those circumstances, numerous automakers are searching for energy resources other than gasoline substitutes. Because there is less pollution, using electrical power resources may also benefit the environment. In a similar vein, EVs have enormous benefits in terms of environmental safety and electricity savings. The majority of EVs use lithium-ion batteries, which are rechargeable. When compared to lead acid, it is much smaller. In actuality, it has a constant energy and a six to ten times longer power cycle than a lead acid battery. A lithium ion batteries life cycle may be decreased for a variety of reasons, including deep discharges and overcharging. However, due of the size and shape of the battery and the vehicle, EVs usually have a limited range of travel. Nowadays, safeguarding current battery technology is a crucial factor limiting the usage of EVs. Overcharging a battery, for example, can cause substantial safety risks, such as fire, in addition to significantly reducing the battery's lifespan. To avoid the aforementioned issues, an EV battery tracking device that can alert the user to battery conditions is required. Previous battery tracking devices just revealed and ascertained the battery's condition and alerted the user through the vehicle's battery indicator.

Owing to advancements in notification device design, the internet of things (IoT) generation can be utilized to inform consumers and producers about the popularity of batteries. This could be categorized as maintenance

assistance. in a way that the manufacturer could finish. IoT leverages internet connectivity beyond conventional applications, allowing a wide range of devices and everyday objects to be connected online and put the industry at a person's fingertips. Motivated by the aforementioned issues, this work proposes the design and development of an IoT-era battery monitoring system. This is how the rest of the document is prepared. Phase 2 evaluates various wireless communication technologies and wireless battery monitoring systems for businesses and electric vehicles (EVs); Phase 3 shows the device's design and implementation; Section 4 details the various tests conducted; Section 5 addresses the primary challenges encountered; and Section 6 provides the paintings' conclusions.

II.RELATED WORK

Technology Based on Wireless Communication

Wireless communication is one type of voice data transmission that is conducted and supplied wirelessly. This is a general term that encompasses all approaches and strategies for connecting and communicating wirelessly between two or more devices using devices, wi-fi signals, and technology for wireless voice interaction. Several historical periods have been represented in the artworks that came before, including GSM, ZigBee, GPRS, Android, WIFI, and Bluetooth connections for wi-fi battery tracking devices. One well-known form of wireless communication is the Global System for Mobile Communications, or GSM. It uses frequencies in the 900MHz–1800MHz band to function. There are advantages and disadvantages to the GSM module. The fact that GSM operates flawlessly everywhere is one of its advantages. The literature contains a wealth of information on battery monitoring and control based on wireless communication. The Global Positioning System (GPS) sends location- and time-specific data to a GPS receiver worldwide using GPS satellite television for computers. It synchronizes the procedure to send out these repeated notifications at the same time and in real time. Since light travels at the speed of light, some satellites are similarly far distant from others, meaning that signals from these satellites arrive at a GPS receiver at hardly perceptible periods.

The time it takes for her signals to arrive at the receiver can be used to calculate the approximate distance to the GPS satellites. Once the receiver has assessed the distance to four GPS satellites, it may calculate its role in three dimensions. The accuracy of a function obtained using GPS depends on the type of receiver that is being utilized. The maximum client GPS devices have an accuracy of +/- 10m. Other kinds of receivers use the differential GPS (DGPS) technology to attain far higher accuracy. GSM/GPS was utilized in a study published in to control and track an EV battery. Android is an operating system for tablets, smartphones, and a growing number of other devices, such as wearable computers and in-car entertainment systems. Android is an open source software platform that runs on Linux, just like Linux. When a new SMS, email, or even something from a contemporary RSS reader arrives, the gadget is ready to alert you. Unfortunately, the tool always needs to have an active internet connection or at least a GPRS net connection in that place, in order to be ready to go online and fulfill users' demands. Moreover, battery waste has been caused by a number of methods used throughout the history of the working machine. An electric vehicle (EV) that runs solely on GPRS communication is equipped with a human interface for battery monitoring and an online monitoring terminal for sensing battery parameters (temperature and voltage). Rahman et al. proposed combining ZigBee communication with factor-to-point wireless architecture to develop an electric car battery control system. ZigBee was popular due to its high reliability, low power consumption, low cost, and quotes about coffee. They concluded that while wireless battery management systems are essential to balancing costs and extending battery life, they are not useful for controlling battery temperature, especially in

the case of electric vehicles (EVs). Additionally, Menghua et al. offered a lithium-ion battery monitoring tool for electric vehicles (EVs) that collects and leverages verbal WIFI interaction. It seems that there isn't a computerized tracking device that can inform the user about the battery's overall performance, mostly based on the previously published study. Thus, by guaranteeing high-quality batteries and improving human safety, the tracking device's integration of IoT generation can help to improve preventative maintenance.

Technology for wireless battery monitoring systems

Reliability in battery management is essential for safety. There are numerous reasons why batteries fail, two of them being deterioration and layout errors. Manual battery tracking devices are comparable to traditional battery monitoring systems in that they do not keep their statistics in a database. However, only show the data that was gathered in real time. Therefore, it is essential to remotely monitor battery structures via Wi-Fi generation. For usage in businesses, numerous wireless communication systems and battery tracking devices have been created. Furthermore, during power outages, the maintenance of power supplies for residential and commercial structures depends on uninterruptible power supplies, or UPSs. Suresh et al. presented a battery health monitoring gadget that runs on a PC. An all-GPRS communication-based EV has a consumer interface for battery monitoring and an online tracking terminal to evaluate battery parameters (temperature and voltage). Rahman and collaborators . proposed a battery control device for electric vehicles that uses point-to-factor Wi-Fi topology with ZigBee verbal interaction. ZigBee became more and more common due to its inexpensive cost, low power consumption, high reliability, and low record quotes. They discovered that although Wi-Fi battery control devices are necessary for electric vehicles (EVs) in particular to balance the charge and increase battery life, their use in controlling battery temperature isn't necessarily environmentally favourable. Menghua et al. most recently released a lithium-ion battery monitoring device for electric vehicles using Wi-Fi connection. On a phone, it collects and shows battery temperature, voltage, current, and other information. Based on the previously published research, it doesn't seem that a computerized monitoring tool that can notify the user of the battery's overall performance is available on the market. Therefore, the tracking machine as a whole can benefit from improved preventative maintenance to guarantee high-quality batteries and improve consumer safety through the incorporation of IoT technology.

Hardware Design

Initially, the system's design was developed using Fritzing software, which also verified that the hardware components were appropriate. Figure 2 displays the circuit design for the system. . The components of the system shown in the figure are a voltage sensor, an Arduino Uno microcontroller, a SIM808 GSM/GPRS/GPS module, and a 9V battery for power supply. Figure 3 shows the actual hardware configuration of the recommended Internet of Things battery monitoring device The system's circuit design is shown in Figure 2. A voltage sensor, an Arduino Uno microcontroller, a SIM808 GSM/GPRS/GPS module, and a 9V battery for power supply are the components of the system depicted in the figure..

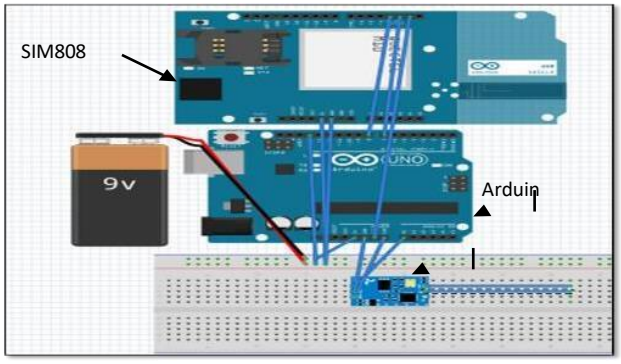

Fig. 1: The design of the circuit using Fritzing software

III. EXPERIMENTS AND ANALYSIS

This section presents the findings from the experiment and system analysis. We'll start by talking about the experiment's methods and conclusions regarding the voltage sensor and GSM module's features. This is to guarantee the circuits' integrity. We'll talk about experiments and results that support battery deterioration next.

Voltage Sensor Experiment

In this experiment, five (5) batteries were tested using a multimeter, as shown. These results were then compared to the values of the same batteries that were connected to the voltage sensor circuit. Showing the differences between the two values and the percentage of accuracy is the aim. The selected batteries' voltage levels were altered. The mix included both new and old. Table 1 shows the outcomes of the experiments. Because the batteries were a mix of new and used batteries, the values vary from one another as the table shows. According to the results, there is a good level of precision agreement between the voltage sensor and multimeter measurements. The accuracy percentage of each battery that has been measured is higher than 99%. Therefore, it can be concluded that the voltage sensor provides accurate values for battery measurement.

GPS Module Experiment

This paragraph's GPS coordinate accuracy was determined by confirming the SIM808 GSM/GPRS/GPS module's functionality. In addition, this experiment will determine the module's usefulness. The experimental configuration of the module is shown. For the studies, five (5) different target locations were employed, and GPS coordinates were obtained for each location. The GPS coordinates received from this page and the Google Maps page were then compared. The experiment's outcomes are shown. There are five (5) different target sites, according to the table. The table shows the coordinates of the target places, which were obtained using Google Maps and the SIM808 module. The results show that there is a reasonable degree of similarity in the precision between the coordinates received from Google Maps and the SIM808 module. The accuracy percentages of all the measured coordinates are nearly 100%.

It follows that the SIM808 module's valid coordinates can be utilized by the proposed Battery Monitoring System. An illustration of the location of a treat position measured time displayed in the output of the SIM808 module. The interface's upper left corner (represented by the red box) displays a selection window from which the admin or user can select Add customer, View customer, and Logout. By selecting Logout, the user can choose to securely log out. The list of battery monitoring devices under observation can be viewed by the customer. New battery monitoring devices are added by customers and are subject to surveillance. The interface displays a list with detailed information about the registered battery monitoring devices, including the user's address, phone number, and name, when the View customer button is pressed. The user can also view each device's battery information. To remove registered data, simply click Delete. The user interface for the created battery monitoring device is made to help the administrator or user monitor battery degeneration so that the user of the device can receive notifications.

CONCLUSION

In order to ensure that the battery's overall performance degradation could be tracked online, the article detailed the design and development of an Internet of Things (IoT)-based battery monitoring device for electric vehicles. The goal is to demonstrate that the concept can be discovered. The creation of an internet-based battery tracking user interface and the hardware for the battery monitoring gadget comprise the machine's advancement. The device uses a GPS unit to find the coordinates and displays them on the Google Maps application, allowing the machine to

successfully expose data over the internet, including location, battery condition, and time. By adding more functions to the device, more changes may be made to make it better. With the development of smart phone software, the technique may be used in smart phones to help users monitor their batteries and serve as a reminder when they are about to degrade. Compared to GPRS, Ethernet can be utilized to obtain a better internet connection in an effort to improve the connection.

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