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Predictive Maintenance And Battery Life Saver For Electric Vehicles

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Abstract

N*owadays, people changed their vehicle types from fossil fuel vehicles to electric vehicles. Eco-friendly and save more energy. Electric scooters are made up of two main components. BLDC motor as best motor and the battery is used for energy storage device. Therefore, maintaining the battery life requires the development of monitoring and diagnostic tools. The design of the device is necessarily optimized to optimize the use of batteries and is designed to monitor and detect interruptions or damage to the batteries used in electric scooters. The parameters used in the design are voltage, current, temperature and battery capacity. In addition, by optimizing the use of the battery, all parameters are managed by the CAN (Controller Area Network) protocol. The settings will be displayed on the Android smart phone and it will check that the scooter is working and will notify you when the battery is dead or in good condition. Problems such as overheating and cellular imbalance have occurred. Based on the experimental results, the maximum tension was found to be minimum.*

Keywords — *Battery, State of charge (SOC), CAN, USB, state-of-power, and state-of-health*

1.INTRODUCTION

The need for green technologies has a major impact on the auto industry. The fuel consumption of conventional cars has attracted worldwide attention. As a result, the need for green electric vehicles is increasing. Currently, a lot of research is being done on electric vehicles. Especially research on battery design and performance. Batteries should last a long time and be small. Therefore, to control battery operation, it is necessary to develop a compact and integrated battery.

It describes an integrated battery management system (BMS) based on the concept of galvanic isolation. In addition to the battery module and module control module, this system also has a packaging control module. This is intended to give an accurate assessment of the health of the battery. Despite significant advances in rechargeable battery materials and chemistry, rechargeable systems are generally too large and inadequate. This means that an energy consumption of more than 20 to 50% is guaranteed. This increases the weight, volume and purchase costs. An effective battery management system is necessary to reduce this conservatism.

Internal variables such as load status (SOC), nutritional status, health status (SOH) are precisely controlled. Pluggable cells must have similar electrical properties. A multi-level modular battery management system can eliminate these limitations. In addition to this method, there is also a system to manage battery communication between the master and slave cards. This method has advantages in terms of program code efficiency and is easy to

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develop. The battery management system is designed for reconfigurable batteries. The system has excellent performance and is easy to adjust.

1.1 BATTERY STATE OF CHARGE (SOC)

The state of charge (SOC) is an important parameter for the batteries and the relationship between the remaining capacity and total capacity. The fully charged state is 100% and the state of discharge is 0%, but the battery capacity may change depending on the discharge current and voltage stop is different from SOC 0%.

1.2 BATTERY MANAGEMENT SYSTEM (BMS)

Lithium-ion batteries are of interest to electric vehicle manufacturers because of their high charge density and light weight. Although these batteries can be oversized, they are inherently very unstable. It is very important that these batteries are never recharged or discharged. Therefore, it is necessary to control the voltage and current. This process is a special management system called special because many cells are assembled to form an EV battery and each cell must be monitored individually for safe and efficient operation. It's a little more complicated because it requires a system. drums. In addition, to get the most out of the battery, all items must be fully charged and discharged at the same voltage at the same time, which again requires BMS. In addition, BMS is responsible for many other functions described below.

1.3 BATTERY LOSSES AND EFFICIENCY

The loss of energy during charging or discharging is represented by a loss of voltage. Battery performance can be determined by the relationship between the discharged voltage and the charge. The battery terminal voltage is low during discharge and, when charging, above potential due to chemical reactions. The higher the SOC, the higher the discharge efficiency of the battery. If the SOC is low, the battery charging efficiency will be high. Since the point of maximum efficiency is in the range of 50% SOC, the battery management system of the electric vehicle system places the SOC battery in the medium range to improve operational efficiency and increase the temperature caused by the loss of energy represented. It must be deleted.

1.4 UNBALANCE CELL VOLTAGE

The battery contains series and parallel batteries. Since each battery cell has a different internal barrier, the voltage of the battery cells may not match the voltage of the other cells. This condition will worsen if it is not interrupted and the minimum voltage of the battery cells will decrease. A problem with one of the battery cells will result in suboptimal battery performance. BMS is necessary to avoid a voltage imbalance between cells. The BMS function measures the voltage of each cell and compares the cells to the overvoltage for balance. The high voltage elements will be discharged by the discharge resistor. The amount of energy discharged depends on the capacity of the battery. Therefore, BMS has a balancing capacity which corresponds to the capacity of the battery.

This project developed real-time monitoring and identification of BMS. BMS has been observed using the concept of master and slave plates. BMS has several sensors installed, namely temperature, voltage and current sensors. The parameters received in real time from each sensor are displayed on the mobile Bluetooth interface. So you can learn and analyze battery performance in real time. The novelty of this study was that the BMS was used as an application to monitor the state of the battery and identify the state of EV electric vehicles with mobile interfaces.

2. EXISTING SYSTEM

In this existing system, concerns about the reduction of fossil fuel reserves and the increase in pollution problems have increased considerably in recent years. Electric vehicles increasingly promise to shift traditional energy demands from raw fossil energy to electricity in the transportation sector. A distributed charge protocol for electric vehicles has been introduced to use the elasticity of electric vehicle loads to fill the channels of the charge profile. Coordinated hierarchical control has been introduced to coordinate the charging of rechargeable electric vehicles (EPI) in buildings.

Disadvantages

Great loss of renewable energy.

Safe system maintenance required highly skilled operators.

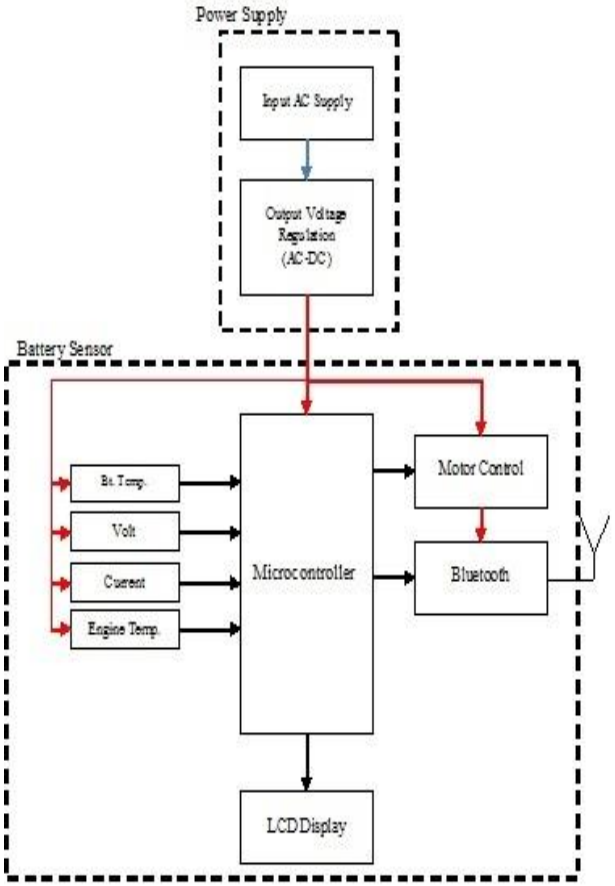
Project reduction The cost reduction period is behind expectations.

3. PROPOSED SYSTEM

Reliable Battery management is essential for safety. Several reasons can cause battery failure, such as battery wear and structural defects. Manual battery monitoring systems are similar to traditional battery monitoring systems. In other words, it does not store data in the database. However, it only shows the data collected in real time. Therefore, it is very important to use wireless technology to remotely control a battery system. There are several wireless battery monitoring systems developed for the industry, including uninterruptible power supplies. They are important for providing uninterruptible household and commercial power supplies in the event of a power failure.

The system consists of several devices that send signals to interfaces such as Bluetooth. The function of the interface itself is to present the measurement data to the user for reading. The subject of electric vehicle testing is batteries. Each battery pack consists of a 12V / 48V battery with two or three parallel batteries arranged. The battery has several cells in series. The battery has various sensors such as a temperature sensor, a current sensor and a voltage sensor. The BMS module has several sensors. BMS has a main card, a slave card and an auxiliary card for the USB CAN bus location.

3.1 PROPOSED BLOCK DIAGRAM



3.2 SYSTEM RECEIVER

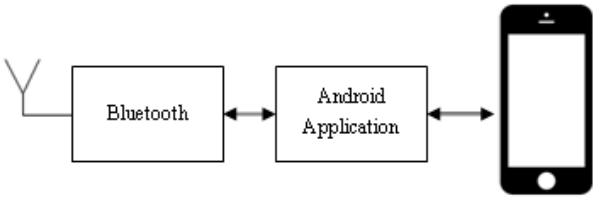


Figure 1 : Mobile Phone Bluetooth Interface

The figure shows the outline of the proposed system. For the system to work, the voltage sensor first measures the voltage level of the lead-acid battery. At the same time, mobile applications based on the Bluetooth interface use the mobile GPS function to read the position of the car. Battery voltage readings and vehicle position are sent to Aurdino. Nano-micro controller for processing. As shown, the processed data is sent wirelessly to the computer's battery monitoring user interface via the mobile APK. If the data transfer is successful, the computer's battery monitoring interface will display the updated battery status data. An email notification is sent to notify the user when the battery is low. The online battery system can not only measure the battery voltage but also communicate with the battery monitoring system to obtain the battery parameters. The working outline of the system is described in the next section.

3.3 MICROCONTROLLER BOARD

The main board is the main BMS controller which functions to process data, collect it and display the results of the process to the user. It also contributes to control and security. This motherboard uses an Arduino NANO microcontroller based on ATMega328. The microcontroller has a real-time operating system and is capable of multitasking with a transmission timer which reaches 16 MHz. On the main board, it consists of several series of modules, such as the controller module, the current sensor module, the temperature module, voltage sensor, controller module, communication module, voltage measurement module, master d work, engine, etc. Control module.

3.4 BLUETOOTH MODULE

Bluetooth is a data transfer to exchange data without using intermediate cables (wireless) as long as the distance is not too great. The Bluetooth module used is the HC-05 module. This Bluetooth module is a Bluetooth Serial Port Protocol (SPP) module which can be easily used for wireless serial communication to convert the serial port to Bluetooth. Bluetooth HC-05 uses 2.4 GHz radio waves and uses Bluetooth V2.0 + EDR (Enhanced Data Rate) modulation up to 3 Mbps.

3.5 APK INTERFACE

APK files are designed to display real-time data during uploads and downloads. Therefore, these studies monitored the entire download process from start to finish. In the APK interface design, the data displayed includes battery voltage, battery current, SOC, and battery temperature, as shown.

4. CONCLUSION

The battery monitoring system has already been developed and is working well. The balancing element is an action to avoid damage to the battery caused by different voltages between the cells. The difference in cell voltage shortens the life of the battery and can lead to its immediate failure. It was also done to add functionality to the system and improve it. The system can be used in smart phones by developing a smart phone application that allows the user to monitor the battery and inform the user of the deterioration of the battery. You can use it to get a better Internet connection compared to existing GPRS and GSM technologies to improve your Internet connection.

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