INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 07 ISSUE: 04 | APRIL - 2023 IMPACT FACTOR: 8.176 ISSN: 2582-3930

# E-VEHICLE BATTERY MANAGEMENT SYSTEM USING IoT

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*Abstract*— **The use of electric vehicles has significantly expanded as a result of changes in the automotive sector. As combustion engines and fuel tanks are replaced by an electric motor and battery in electric vehicles, the design becomes straightforward and controllable at the component level. In order to integrate the battery safely, modifications are needed to locate the battery pack safe zone in an EV. In order to ensure the safety of electric vehicles, a Battery Management System (BMS), which controls the electronics of a rechargeable battery, whether a cell or a battery pack, becomes essential. By ensuring that the cell runs within its safe operating limitations, it protects both the user and the battery. BMS tracks the battery's State of Health (SOH), gathers information, manages external elements that affect the cell, and balances them to maintain uniform voltage across cells. In order to provide details about the battery's power status, it may also include additional features and functions like fuel gauge integration, smart bus communication protocols, General Purpose Input Output (GPIO) options, cell balancing, wireless charging, embedded battery chargers, and protection circuitry. The device can use this information to intelligently preserve power.**

## I.INTRODUCTION

A vehicle that runs on electricity rather than petrol or diesel is known as an electric vehicle (EV). In electric vehicles (EVs), an electric motor is driven by a battery pack that stores electricity produced by the onboard charger or regenerative braking system of the car. Due to its potential to lessen reliance on fossil fuels, reduce emissions, and save on fuel costs, EVs have grown in popularity in recent years. There are various different kinds of EVs on the market, including hybrid electric cars (HEVs), which combine an electric motor with a petrol engine, and all-electric vehicles (AEVs), which are propelled only by electricity. Extended-range electric cars (E-REVs) include a small petrol engine that is used to generate electricity for the electric motor, whilst plug-in hybrid electric vehicles (PHEVs) are a type of HEV that can be charged by connecting them into an external power source. Less running costs, less dependency on fossil fuels, and lower emissions are just a few advantages of EVs. They do, however, have significant drawbacks, such as a short driving range and the requirement for charging infrastructure.

## II. EXISTING METHOD

Present-Day System For portable equipment that needs higher voltages, battery packs with two or more cells connected in series are utilised. For instance, a battery pack with four series-connected 3.6V Li-ion cells, or 4S, generates14 volts nominal. In comparison, a six-cell lead acid string with 2V/cell will create 12V, while a four-alkaline battery with 1.5V/cell will provide 6V. The voltage rises when cells are added to a string, but the capacity stays the same. Among the system's flaws are some of the following: Extreme heat may make series charging problematic, especially if the batteries are passively cooled. The battery's entire life cycle will be significantly impacted by this. Repeated use of this technology may not be good for the battery's health because series charging generally has the tendency to shorten a battery's life more quickly. As a consequence, users may have to replace the battery pack sooner.

## III. PROPOSED METHOD

In the proposed method the battery will charge as one battery at a time in parallel mode. One or more cells can be connected in parallel if higher currents are required but larger cells are not readily available or do not meet the design restriction. Most battery chemistries allow parallel configurations with little side effect. The shown pack's nominal voltage stays at 3.60V, but its capacity (Ah) and runtime are quadrupled. A failing cell will reduce the total load capacity in a parallel circuit even if it is less important in a parallel circuit than in a series circuit for a cell to develop high resistance or open. It is akin to a four-cylinder engine that only fires three of its cylinders. An electrical short, on the other hand, poses a greater risk of fire since the damaged cell pulls power from the healthy cells. Most purported electrical shorts exhibit mild symptoms, including increased self-discharge.

## IV. WORKING PRINCIPLE

"The basic operation of this system is to switch the battery connection from series to parallel when it changes to battery mode. Under normal circumstances, the battery will remain in series connection to provide the required output for

the electric vehicle to run. When it changes to parallel connection, the batteries connected in series will be separated using relays. In this project, the relays play a major role in switching off all other battery connections except for one, which remains on."

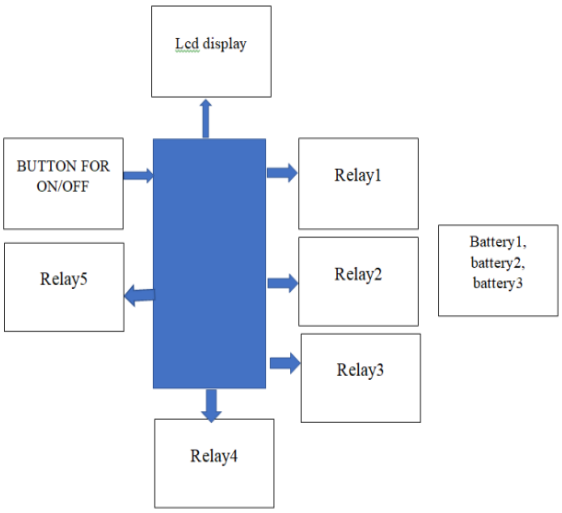


Fig. 4.1. Block Diagram

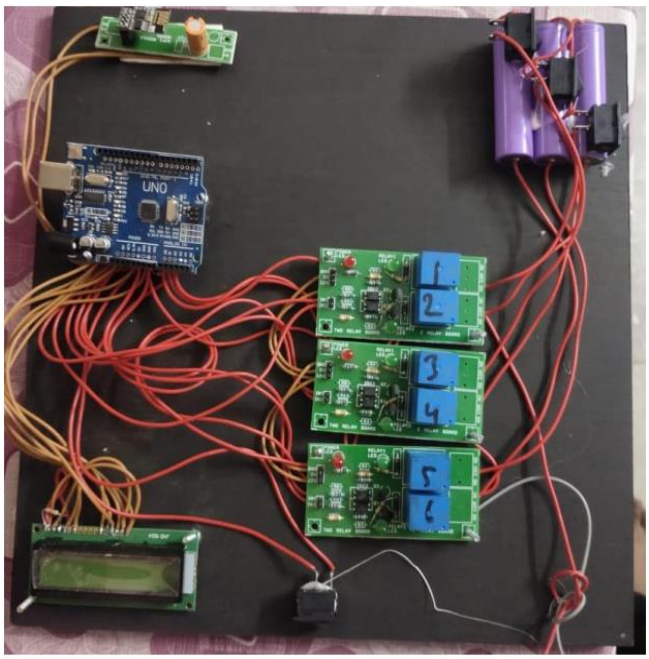

Fig.4.2. Output

## V. HARDWARE DESCRIPTION

### A. *RELAY*

In electronics, a relay is an electrically operated switch that uses an electromagnet to mechanically open or close its contacts. Relays are typically used to control one circuit by an input signal from another circuit. They provide electrical isolation between the input and output circuits, which allows them to be used to interface low-power control signals with high-power loads. Relays consist of a coil, a set of contacts, and a mechanical mechanism that connects or disconnects the contacts when the coil is energized or de-energized. When an electrical signal is applied to the coil, it creates a magnetic field that moves the contacts to make or break a connection between two points in a circuit. Relays come in various configurations, including normally open (NO), normally closed (NC), and changeover (CO) relays. NO relays have contacts that are open when the relay is not energized, while NC relays have contacts that are closed when the relay is not energized. CO relays have both NO and NC contacts and can be used to switch between two different circuits.

Fig5.1.LCD Display

### B. *LCD DISPLAY*

A type of flat panel display known as an LCD (Liquid Crystal Display) operates primarily using liquid crystals. LCD derives its meaning directly from its name. It is the fusion of the solid and liquid phases of matter. A liquid crystal is used by LCDs to create viewable images. Comparing LCD technologies to cathode ray tube (CRT) technologies, displays may be made significantly thinner.


Fig5.2.LCD Display

*C. ON/OFF SWITCH*

An on/off switch in electronics is a type of switch that is used to control the power supply to a device or a circuit. It is a simple switch that either allows or interrupts the flow of electric current between the two terminals of the switch. The on/off switch can come in many different forms, including a rocker switch, toggle switch, push-button switch, or slide switch. These switches can be either manual or electronic. In a manual on/off switch, the user physically operates the switch to turn the device on or off. In an electronic on/off switch, the switch is controlled by an electronic circuit, such as a transistor or a relay. On/off switches are commonly used in a wide range of electronic devices, from simple battery-powered gadgets to complex industrial equipment. They are often located on the exterior of the device, so that the user can easily access and control the power supply to the device.

Fig.5.3.ON/OFF SWITCH

*D. BATTERY:*

Batteries can achieve their desired operating voltage by connecting multiple cells either in series or parallel. When connected in series, the voltage potential of each cell is added to obtain the total terminal voltage. Parallel connections can increase the total ampere-hour (Ah) capacity by adding up the capacity of each cell. Some battery packs may utilize a combination of both series and parallel connections. For instance, laptop batteries may use four 3.6V Li-ion cells in series to achieve a nominal voltage of 14.4V, and two cells in parallel to increase the capacity from 2,400mAh to 4,800mAh. This type of configuration is often referred to as 4s2p, meaning four cells in series and two in parallel. To avoid electrical shorts, an insulating foil is often placed between the cells. It is crucial to use batteries of the same type with equal voltage and capacity (Ah) to avoid imbalances. Mixing batteries of different makes or sizes can result in weaker cells, which could cause an imbalance. This is especially significant in a series configuration, as the battery's strength is limited to the weakest cell in the chain. An analogy for this scenario would be a chain where each link represents a cell of the battery connected in series.


*Fig.5.4. piezoelectric sensor*

## VI . RESULT AND CONSLUSION

Battery system management is a crucial aspect of maximizing the performance and lifespan of a battery. Proper monitoring, control, and protection of the battery can enhance its efficiency, prolong its lifespan, and decrease the likelihood of failure. The utilization of a battery management system can facilitate the conversion of battery connections from series to parallel. This is essential for various applications, such as electric vehicles, renewable energy systems, and portable electronics. In conclusion, efficient battery system management is vital to ensure optimal battery performance, longevity, and reliability.

## REFERENCES

[1] Su-Hau et al (2004) focused on the highly efficient energy usage of the battery energy and proposed an integrated management system for electric motor.

[2] Unnewehr, L. E., and S. A. Nasar. Electric vehicle technology. New York, Wiley, c1982 .

[3] MacKenzie, James J., and Michael P. Walsh. Driving forces: motor vehicle trends and their implications for global warming, energy strategies and transportation planning. Washington, World Resources Institute, 1990.

[4] Modern batteries: an introduction to electrochemical power sources. Colin A. Vincent and others. London, Baltimore, E. Arnold, 1984.

[5]Nesbitt, Kevin, Daniel Sperling, and Mark DeLuchi. Initial assessment of roadway-powered electric vehicles. In Global warming: transportation and energy considerations, 1990. Washington, Transportation Research Board, National Research Council, 1990.

[6] S. Kimbrough, "Stability Enhancement and Traction Control of Road Vehicles", Int. J. System Sci., Vol. 21, No. 6, 1990, pp. 1105-1119.

[7] St. Germann, M. Wurtenberger and A. Daiss, "Monitoring of the Friction Coefficient between Tyre and Road

Surface", Proceedings of the 3 IEEE conference of Control Applications, Vol. 1, 1994, pp. 613-618.

[8] H. Sado, S.-I. Sakai and Y. Hori, "Road Condition Estimation for Traction Control in Electric Vehicle", Industrial Electronics, 1999. ISIE '99. Proceedings of the IEEE International Symposium, Vol. 2, 1999, pp. 973-978.

[9] J.-S. Lin & L.-C. Fu, "Model Analysis and Controller Design of Electric Motorcycles", Proceedings of American Control Conference, San Diego, June 1999.

[10] J. W. Pavlat & R. W. Diller, "An Energy Management System to Improve Electric Vehicle Range and Performance", IEEE AES System Magazine, June 1993.

[11] N. Jalil, N. A. Kheir and M. Salman, "A Rule Based Energy Management Strategy for a Series Hybrid Vehicle", Proceedings of the American Control Conference, Albuquerque, New Mexico, June 1997, pp. 689-693.

[12] J.-J. E. Slotine & W. Li, Applied Nonlinear Control, Prentice-Hall, Englewood Cliffs, NJ, 1991.

[13] P. A. Ioannou & J. Sun, Robust Adaptive Control, Prentice-Hall, Upper Saddle River, NJ, 1996.

[14] M.-Y. Lin, Residual Capacity Estimation of Electric Vehicle Batteries, Master Thesis, National Taiwan Univ., Taipei, Taiwan, 2002.