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SMART BATTERY MANAGEMENT SYSTEM

Aniket Ghadge[*1], Ayush Mahadik[*2], Prof. Sagar Kadu[*3]

[*1,2]Department Of Automobile Saraswati College Of Engineering Kharghar Mumbai, Maharashtra, India.

[*3]Prof., Department Of Automobile Engineering, Saraswati College Of Engineering, Kharghar, Maharashtra, India.

ABSTRACT

Battery management systems (BMS) are used to monitor and control the charging and discharging of rechargeable batteries in an electric vehicle making operation more economical. A battery management system keeps the battery safe, and reliable and extends aging without entering a damaging state. To maintain battery condition, various monitoring techniques of voltage, current, and ambient temperature are used. Various analog/digital sensors with microcontrollers are used for monitoring purposes.

This paper describes the components and their function for a lithium-ion BMS and our approach to model-based design.

Keywords: Analysis, Micro Controller, Autonomous Vehicle, Battery Management System.

I. INTRODUCTION

Electric vehicles are equipped with a large number of battery cells which require an effective battery management system (BMS) while they are providing necessary power. The performance and operation of each battery cell and the whole pack are controlled and monitored by means of a battery management system (BMS). Electric vehicles (EVs) are powered by one or more electric motors or traction motors. An electric vehicle can be powered by non-renewable sources or self-contained batteries, solar panels, and fuel cells to generate electricity which is an expensive option. Nowadays, the modern world demands high technology that can solve our present and future problems. If we look at India's problems in particular, we can understand that scarcity of fossil fuels is the main problem. As we all know, fuel (petrol and diesel) rates are increasing day by day. Due to fossil fuels, a lot of pollution is generated all over the world. So, we have to move towards electric vehicles where we can use renewable energy sources instead of these conventional sources. By using renewable energy sources like solar energy, and wind energy we can get electrical energy for further use. In electric vehicles, battery management systems monitor and control the charging and discharging of rechargeable batteries, making operations more cost-effective. A battery management system keeps the battery safe and reliable while increasing aging without damaging it. Various monitoring techniques are used to maintain battery condition including voltage, current, and ambient temperature.

II. LITERATURE REVIEW

Governments around the world are implementing electric car Legislation to reduce dependence on oil, reduce greenhouse gas emissions, and improve air quality. Annual Global Electric Car Sales have increased steadily in recent years, only marginally From a hundred in 2010 to over 500,000 in 2015 and over 750,000 in 2016. In September 2015, the global market for electric vehicles hit 1 million units, rising rapidly to 2 million units in January 2017. Early market growth for electric vehicles continues, but several obstacles prevent their further expansion Withdrawal The high cost of new technology, relative Convenience in terms of range and charge duration, and Consumer awareness of technology availability and Feasibility are among these constraints. This final criterion, Often referred to as "customer awareness", is important.

This Wider awareness and understanding of potential The advantages of electric vehicles are crucial for the development of electric vehicle markets. Governments at various levels, automakers and dealers, Electric utilities, and other groups are involved in all variations of Programs to increase consumer awareness about electric Vehicles. These communication efforts include the development of Print and online information and tools, public organizing Events and workshops, increasing exposure to electric vehicles From fleet and car-sharing services, developing action Plans for electric vehicle readiness, highly visible implementation Management of technology demonstration projects, social media marketing campaigns, and more. These

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actions are essential Because many potential customers usually lack a strong understanding of what electric vehicles are, their benefits are offered, available models, and associated incentives.

III. METHODOLOGY

3.1 BMS

The proposed BMS is implemented as shown in Figure 1 Using battery monitor IC BQ76PL536 and MEGA 2560 Microcontroller 11. Generally, fuel gauge IC and secondary protection IC are used in BMS design. They are analog front-end device that provides various functionalities such as analog to digital conversion, temporary Collection of data, raise alerts.

3.2 IC BQ76PL536

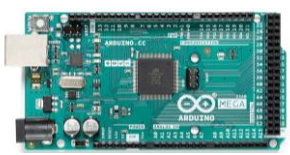
Battery Monitoring Fuel Gauge IC (BQ76PL536)12 is a battery monitor IC with 3 to 6 series cells and Can provide protection features like over-voltage, under voltage and over-temperature. It is especially worthy For automotive applications it is used in EVs, HEV, and Uninterruptible Power Systems (UPS). It has 9 ADCs Inputs for measuring six cell voltages, one cell voltage, and two temperatures from thermistors. There are many EEPROM registers to store intermediate values. by The vertical stack interface of this IC can be up to 192 cells inspected. It converts the analog cell voltage to digital values and sends it to the MCU on request via SPI Communication Interface 13. Initially, the microcontroller sends a broadcast message to all BQ devices connected to it. All BQ devices Answer it by reset. Now finds the microcontroller Each and every IC and assigns it a unique address. everyone The BQ device has a north and south communication interface To communicate with other BQ devices. All communication between the IC and the MCU is through the SPI interface Using this unique address. Communication takes place in Data packet format. A packet must contain an IC Address, read or write address registration, no Bytes, and cycle redundancy check (CRC). The microcontroller continuously reads all cell voltage, pack voltage pack the temperature, and display it on the LCD module. It also monitors the voltage difference between cells and Balances cells if imbalance thresholds are reached.

ADVANTAGES OF NEW BATTERY MANAGEMENT SYSTEM

1. No need for external charging
2. Does not require extra space in the vehicle
3. Efficient power delivery throughout the system
4. Best way to inclination problems
5. Makes the vehicle fully autonomous
6. Saves money on excessive charging stations
7. No need to pay additional charges for charging purposes.
8. This is a system that will continue for a long time.
9. Eliminates the need for unnecessary electricity Production, cost reduction.
10. Reduces non-renewable fuel use.
11. Environmental and eco-friendly system.

HARDWARE

1) Micro Controller Unit (Arduino MEGA 2560):



2) Main Board:

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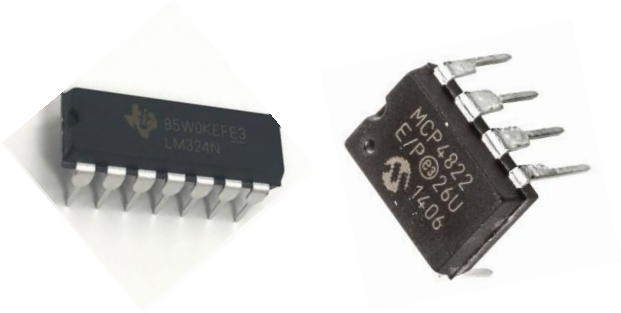
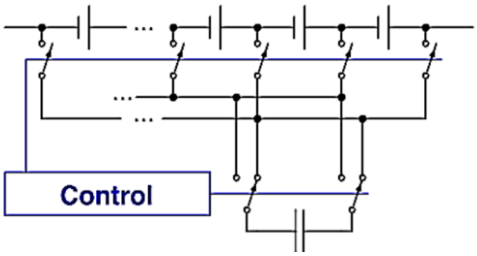
3) The Charge control board(IC BQ76PL536):

4) The Discharge Control (MCP4822, LM324):



5) The Monitoring board

6) The Balancing board:



IV. CONCLUSION

We convert normal vehicles into electric vehicles because it is pollution free and its running cost is low Compared to other types of vehicle. using a battery management system, we improve battery efficiency. In the battery management system, we connect 2 batteries and make new batteries for vehicles. An advanced battery management system can significantly improve electric vehicle performance. A battery Electric vehicle that promotes guaranteed safety, efficiency, and reliable battery performance. Also, they provide solutions for Inclination, power, and heating problems for electric vehicles.

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