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Smart Battery Protection System for Electric Vehicles

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ABSTRACT
The Main objective of this project is to detect the any abnormal fault in the lithium-ion battery. The purpose of our research is to use ESP 32 microcontroller and sensors like smoke sensor, temperature sensor to monitor the parameters like temperature in surrounding of Lithium-ion battery of Electric vehicle. And protect it from unwanted situations occur during charging and discharging also with the help of solenoid valve, the condition of hazardous fire can be stopped. Also , control the overvoltage, over current ,overheat, overcharging and provide protection to the battery.

I. INTRODUCTION

To providing safety of lithium ion batteries in EV is the priority of automobile industry . The main goal of this paper to reduce the problem fault in circuit of EV Battery. and provide protection to the EV battery. In this project module we are using different types of sensors to constant monitoring the different parameter of battery and if any faulty situation are occurs in the circuit i.e big change in parameter values or parameter value cross the limit value which is set on the coding of Android system, and simultanerasy it shows the real time data on the display and the Android application This System takes action on it and provide protection to the EV.

II. LITERATURE REVIEW

The planning of making model on smart battery protection system for EV is very innovative and creative thinking which we have actually implemented in the project module . For that we have collected so many different research paper blocks notes which is related to the project title and research on it we have collected very critical information about lithium ion battery which provide the qualitative energy to the EV as compared to lead acid battery and high capacity to storage and main point of lithium and battery is safe but we need to improve the safety so to improving the safety of the battery we need to control and monitoring the different parameter of battery so we can continuously monitor the parameter and we can set limit and if any change in circuit like fault action system takes action on it automatic or manually and provided safety to the circuit to complete literature review survey we are finding different research paper for study. Of the EV battery protection system which is mention in below.

A) Battery management system in EV

A Battery management system BMS which manage the electronics of rechargeable battery whether sale or battery pack thus become a crucial factor in insuring electric vehicle safety it safeguard both the user and the battery by insuring that the sale operates with in its shape operating parameters.

The over side that BMS provides usually including

- Monitoring the battery
- Providing better protection
- Estimating the battery over operation all state
- Continuously optimizing battery performance

Reporting operational status to the external devices

B) EV Battery protection system

The battery protection system (BPS) will protect the battery from the almost any external accidents occurrence that would normally cause damaged to the lithium battery.

C) EV battery reliability improvement

The focus on reliability of EV battery which involves recognizing failure types testing on this element the reliability feature being identified and as a result the battery life will be prolonged.

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D) **Research on BMS for light EV**

The system mainly contain battery protection system module, battery equalization module, battery data management module it monitors real time data on Android system.

E) **Review of EV energy storage and management system**

The energy storage system (ESS) is very prominent that is used in electric vehicle micro grade and renewable energy system EV have the future electricity supply over the pickup load period in energy management system different kinds of energy storage devices (ESD) have been used in EV battery super capacitor fuel cell the battery is the electric chemical storage devices provide electricity the ESD cell voltage imbalance occurs because of the under charge over charge and temperature profile the lifetime of ESDcell is increased to minimize the cell voltage imbalance and Temperature hazards.

III. HARDWARE

- ESP32 Microcontroller
- Relay
- Fan
- 12 V 2A Battery
- Adaptor
- Voltage Sensor
- Current Sensor
- 10 RPM Motor
- Temperature Sensor DHT 11
- MQ6
- 20*4 Display
- 1X module
- Platform Equipments
- Mobile Application

IV. SPECIFICATIONS OF ESP32

ESP32 has a lot more features than ESP8266 and it is difficult to include all the specifications in this Getting Started with ESP32 guide. So, I made a list of some of the important specifications of ESP32 here. But for complete set of specifications, I strongly suggest you to refer to the Datasheet.

- ✓ Single or Dual-Core 32-bit LX6 Microprocessor with clock frequency up to 240 MHz.
- ✓ 520 KB of SRAM, 448 KB of ROM and 16 KB of RTC SRAM.
- ✓ Supports 802.11 b/g/n Wi-Fi connectivity with speeds up to 150 Mbps.
- ✓ Support for both Classic Bluetooth v4.2 and BLE specifications.
- ✓ 34 Programmable GPIOs.
- ✓ Up to 18 channels of 12-bit SAR ADC and 2 channels of 8-bit DAC
- ✓ Serial Connectivity include 4 x SPI, 2 x I2C, 2 x I2S, 3 x UART.
- ✓ Ethernet MAC for physical LAN Communication (requires external PHY).
- ✓ 1 Host controller for SD/SDIO/MMC and 1 Slave controller for SDIO/SPI.
- ✓ Motor PWM and up to 16-channels of LED PWM.
- ✓ Secure Boot and Flash Encryption.
- ✓ Cryptographic Hardware Acceleration for AES, Hash (SHA-2), RSA, ECC and RNG.

Li-ion battery

- ✓ This Rechargeable battery is a 12V 6800mah Li-ion Battery and it is specially designed for powering the system device which use 12V DC power. 6800mAh.
- ✓ Built-in ON/OFF switch to save power usage
- ✓ Input voltage: 12.6V
- ✓ Input current:350ma (standard) / 1000ma
- ✓ Output voltage: 12.6-10.80V
- ✓ Output current:1-2A
- ✓ The charger input: 100-240V AC,50HZ/60HZ 130mA
- ✓ The charger output :12V, 500mA
- ✓ Line interface specification 5.5 * 2.1 MM
- ✓ Product life: Circulation charge and discharge are more than 500 times.
- ✓ Package include:
- ✓ 1 X 12V DC 6800mAh Li-ion Battery
- ✓ 1 X AC Adapter

V. PROBLEM STATEMENT

The protection and preventation place very important role in the EV system the system are keylink to each other when there is any abnormal condition in the EV system protection should have the role of play it duty for it's safety and protection the various problem is caused in the system create and abnormal conditions of prevention should be needed there are various problem created in the system of EV

1. Over charging of the battery
2. Over voltage flowing in the system
3. High power supply flow in the system
4. Fire due to high temperature
5. High temperature.

So there are lots of problem created in the EV system for which we have to need preventation system

Problem create the system and balance show the preventation should on the basis of

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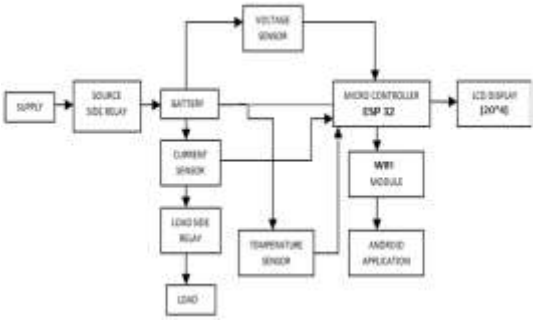
problems statement as show in figure by using technical the problem are balanced.

Example for the high temperature the EV system have the high temperature at battery due to this problem there will take fire so cooling system is used.

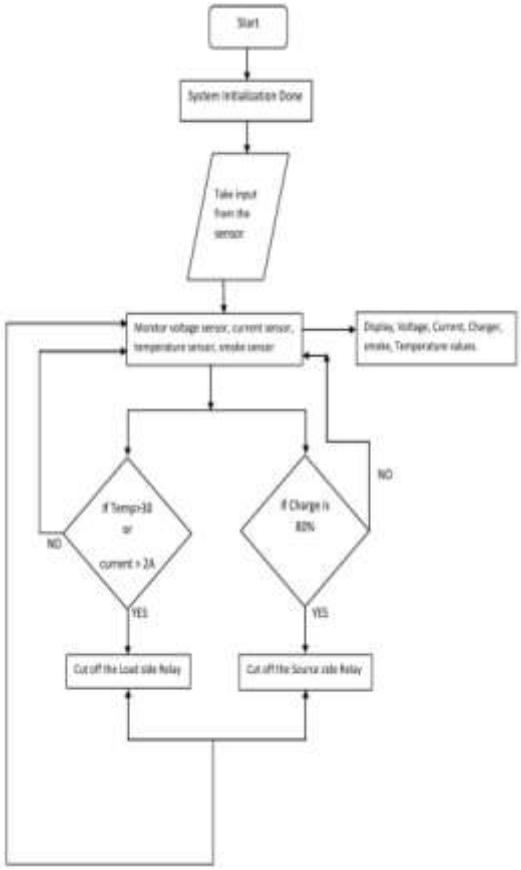


VI. WORKING PRINCIPLE:

In EV Protection and preventation should have an abnormal role for the safety and better Conditions of Electric vehicle. The working Principle is based on the Some Conditioning of the Electrical vehicle it is classified as the system flow in the electrical Vehicle i.e. hardware and software based. Hardware plays an important role for basic preventation in the system and software are work for the analysis of the battery for its preventation and the safety purpose.

Role of hardware is the in the different Form like microcontroller is used for the Control and monitors the all system, the instrument like sensor, are the very important part which have the sensing system used for preventation of the battery.

Role of software is the for analysis interpret it on the main screen or the display of the EV various types of applications are used for monitoring of EV battery parameter but they are all interlink with the hardware application. So thus Hardware and software place and very important role. Principle of EV protection of EV is to define the basic preventation of EV define the problem in problem statement and also allows the preventation. They are different method are used for different parameter but principle is one for all.



VII. PROPOSED METHODOLOGY

A. Block Diagram

Fig. 1 shows the block diagram of the methodology proposed, and Fig. 2 gives the flowchart, which states the process flow of parameter monitoring and controlling actions initiated. for automatic cut off of the battery after the completion of charging to avoid the damages caused due to overcharging and deep charging. The temperature sensor can sense the fire based on the conditions used in the program and send a notification to the user.

VIII. RESULT AND DISCUSSION

The electrical vehicle place very important role in the today's life in human being but due to an vertical and abnormal condition the human being are totally diverted through old IC engine technology used for the post year

The EV have various system each battery management and preventation figure place important condition the EV should have the various important parameter like

1. Current ⟶ High supply
2. Voltage ⟶ Flexible current supply
3. Fire ⟶ Any critical condition

4. Temperature ⟶ High heating

This type of various parameter would happen in the system critically they overlap with battery and battery conditioning of EV the EV if these basic parameter control by using various hardware and software tools.

The hardware and software have interconnection between each other and the co-ordinate place role for safety purpose of EV so result say that as electrical vehicle controlling change in the life the life does not change without changing preventation and monitoring of EV battery.

IX. CONCLUSION

The final approach for making these hardware model is to give easy way of protection. Because protection is main of the battery and battery work on the principal of its analysis and the prevention and monetary as we worked on the prevention of the battery it gives and battery life and good approach of human being towards the EV.

We tried 2 full fill almost all the missing requirement for this type of platform make this hardware module as much as .

- Flexible
- User friendly
- User interactive
- Latest use of technology

After all this feature there is lot more space lift in this platform show the development will continue. This all conclude that parameter we take in the module place important role or creating good equipment for EV and get better life for use decreasing the problem of global warming.

REFERENCES

[1]. Anjali Vekhande, Ashish Maske, IOT Based Battery Parameters Monitoring System for Electric Vehicle, International Journal of Creative Research Thoughts. 8(7) 2020.

[2]. P. Bansal and P. R. Nagaraj, Wireless Battery Management System for Electric Vehicles, IEEE Transportation Electrification Conference (ITEC-India). (2019) 1-5.

[3]. Gopiya Naik S, Subramanya Y.A, Raghu M, IoT Based Monitoring and Control of Faults in Power Distribution Transformers, SSRG International Journal of Electrical and Electronics Engineering. 7(12) (2020) 37-41.

[4]. M. Senthilkumar, K. P. Suresh, T. G. Sekar and C. Pazhanimuthu, Efficient Battery Monitoring System for E-Vehicles, 7th International Conference on Advanced Computing and Communication Systems (ICACCS). (2021) 833-836.

[5]. J. S. Lokhande, P. M. Daigavhane and M. Sarkar, A Critical Approach Towards a Smarter Battery Management System for Electric Vehicle, 4th International Conference on Trends in Electronics and Informatics (ICOEI). (2020) 232-235.

[6]. P. Sivaraman, C. Sharmeela, IoT Based Battery Management System for Hybrid Electric Vehicle, IJCRT. 7(5) (2020) 1-5.

[7]. Aviru Kumar Basu, Shreyansh Tatiya and Shantanu Bhattacharya, Overview of Electric Vehicles (E.V.s) and E.V. Sensors, Sensors for Automotive Aerospace Applications, Energy, Environment, and Sustainability. (2019) 978-981.

[8]. Yinjiao Xing, Eden W. M. Ma, Kwok-Leung Tsui, Micheal Pecht, Battery Management System in Electric and Hybrid Vehicles, Energies. 4(11) (2011) 1840-1857.

[9]. Hariprasad I, Priyanka R, Sandeep V, Ravi, O. Shekar, Battery Management System in Electric Vehicles, IJERT. 9(5) 2020.

[10]. Gopiya Naik. S, Manohara H.C, Uday M.J, Dual mode DC-DC Power Converter for Solar Battery Charger, SSRG International Journal of Electrical and Electronics Engineering. 7(7) (2020) 1-5.

[11]. T.Y. Jour, A.U Urooj, Shabana, Alrowais, Fadwa, Teekaraman, Yuvaraja, Manoharan, Hariprasath, Kuppusamy, Ramya P.Y, IoT Based Electric Vehicle Application Using Boosting Algorithm for Smart Cities, Journal of Energies. 14(4) (2021).

[12]. Hossam A. Gabbar, Ahmed M. Othman and Muhammad R. Abdussami, Review of Battery Management Systems (BMS) Development and Industrial Standards, Technologies. 9(2) 2021.

[13]. I. N Haq et al., Development of Battery Management System for Cell Monitoring and Protection, International Conference on Electrical Engineering and Computer Science. 24-25 (2014) 203-208.

[14]. M.S.H Liu et al., Intelligent Algorithms and Control Strategies for Battery Management System in Electric Vehicles:

Progress, Challenges and Future Outlook, Journal of Cleaner Production. (2021) 292.

[15]. Velev B et al., System for Control and Monitoring of LI-Ion Battery, Scientific Proceedings IX International Congress - Machines, Technologies, Materials. 4 (2012) 45-47.

[16]. D.W Gao, Energy Storage for Sustainable Microgrid. (2015).

[17]. R. K Chauhan and Kalpana Chauhan, Battery Monitoring and Control System for P.V. Based D.C. Microgrid, International Journal of Emerging Electric Power Systems. (2019).