Electric Vehicle With Charge Monitor And Fire Protection

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Abstract- *A smart battery pack can manage its own charging, generate error reports, detect and notify the device of any low-charge condition, and predict how long the battery will last or its remaining run-time.Battery Management Systems (BMS) are used in a variety of business and current structures to increase the battery's capacity, assess its condition, prevent its demolition, and lengthen its lifespan.It also provides information about the current, voltage, and temperature of the cell and continuously self-corrects any errors to maintain its prediction accuracy. Smart battery packs are usually designed for use in portable devices such as laptops and have embedded electronics that improve the battery's reliability, safety, lifespan, and functionality. These features enable the development of end products that are user-friendly and more reliable.Li-ion batteries' decreased cost and enhanced performance led to an impressive dispersion of electric vehicles. In the meantime, reports of fire occurrences involving electric vehicles that were simply parked or being charged were made. In particular for domestic or subterranean charging, the possible downsides of this technology may have an impact on safety in the coming years. This study describes the creation of a brand-new battery-based system concept that is used to reduce oxygen in a sealed container to charge electric vehicles while also protecting them from fire.*

Keywords- Open CV; Driver Drowsiness; Facial recognition; Safety system.

I. INTRODUCTION

Battery Management Systems (BMS) are utilised in many business and current structures to improve battery action, assess battery health, prevent battery demolition, and lengthen battery life.The majority of battery modules are now fitted with battery management systems (BMS), which help to prevent accidents and increase battery life. By tracking variables like the voltage, current, and temperature of the battery, a BMS's primary job is to assure the safety of the operation.

The sophisticated BMS also offers safeguarding features like anomalous voltages, over-charge/discharge current, or over-temperatures. The basic parts of a BMS are numerous battery modules, different types of sensors, and electronic control units (ECU). To generate a high voltage and produce electricity, a battery module is constructed from numerous battery strings. Due to their high charge density and light weight, lithium-ion batteries have proven to be the battery that makers of electric vehicles are most interested in. The nature of these batteries is extremely unstable despite the fact that they have a lot of power for their size. This necessitates the monitoring of the voltage and current because it is crucial that these batteries never be overcharged or underdischarged under any circumstances. The fact that an EV battery pack is made up of many individual cells and that each cell needs to be individually monitored for safety and effective operation makes this procedure a little more difficult. This monitoring is done by a system specifically designed for this purpose called the Battery Management System. extensive currents.

II. LITERATURESURVEY

1)Abhishek Prakash, Unnati K More, Sarita Kushwaha, Aviraj B Gholap, Prof Kishore Muley, EV Battery Protection System (2022) .

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 ATmega328P and sensors like smoke sensor, temperature sensor to monitor the parameters like temperature, leak gases 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.[1]

2)Min-Joon Kim, Sung-Hun Chae and Yeon-Kug Moon, Adaptive Battery State-of-Charge Estimation Method for Electric Vehicle Battery Management System (2020).

We suggest an extended Kalman-filter (EKF)-based adaptive battery SOC estimate approach in this paper. Compared to the so-called conventional coulomb counting method, EKF based methods can demonstrate excellent tracking performance but with a significant computational complexity. The suggested method is often based on the traditional coulomb counting method, with EKF tracking and a pre-defined battery model being used to correct it on occasion. With significantly less calculation, the proposed technique performed nearly as well as the EKF when put into practise and tested by computer simulation.[2]

3) Rakshitha Ravi, Usha Surendra. Battery Management Systems (BMS) for EV: Electric Vehicles and the Future of Energy-Efficient Transportation (2021)

Transit vehicles powered by internal combustion engines are gradually giving way to battery-powered electric vehicles in the current trend. The transition to electric cars (EVs) from conventional gasoline-powered vehicles was sparked by the necessity for such vehicles. Electric traction motors are used in an electric vehicle's propulsion system. It might potentially be self-contained using a battery, solar panels, or an electrical generator to convert gasoline. It could also be fueled by a collector system by electricity from sources outside the vehicle.

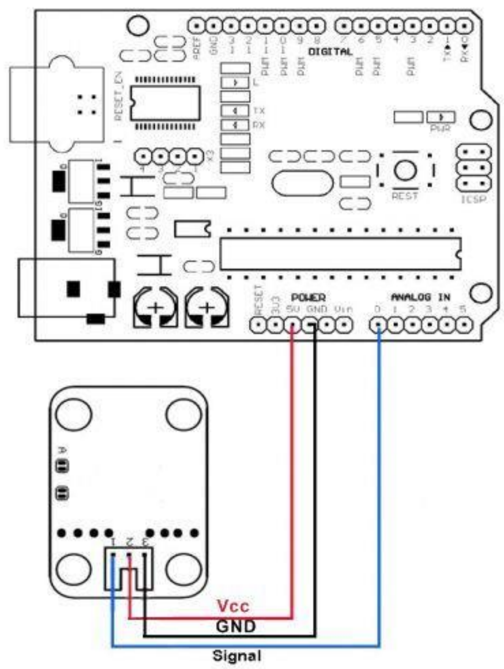
The performance of EV charging will undoubtedly be streamlined and the effects will be examined by a system with IOT. The Internet of Things will facilitate city life and enperiencing phenomenally quick development.Similar forces that are advancing the Internet of Things, such as more powerf ul processing capabilities and allpervasive networking, also m ake this shift possible.

The environment is less affected by them.[3]IOT will facilitate city living and improve city planning. The automotive and transportation industries are going through a phenomenally fast transition. [3]

III. PROPOSED SYSTEM

The smart battery system manages the battery charging as well as it protects the battery. The system constantly monitors the battery voltage and charging and discharge current along with the battery temperature. The system has two types of charging. Fast charging and slow charging. Slow charging is when the system charges the battery at lower current. To shift between these charging processes, a toggle switch is connected.When switched to fast charging, the system charges at higher current, also the system automatically switches off the charging as soon as the battery is fully charged to avoid any damage due to overcharging.To detect the temperature due to overcharging, the sensor is connected to a controller. The Keypad is interfaced in this circuit to allow the user to select charging or discharging mode. A DC motor is connected to the motor driver and to trip the motor down a relay circuit is also added.Incase of any disturbances or overheating, an alert signal is given with the help of buzzer.All these data and sensor values are displayed on LCD.

ONNECTING DIAGRAM



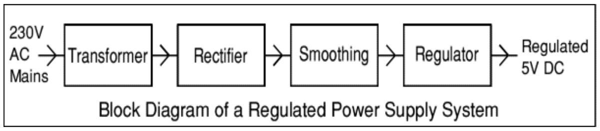
IV. HARDWARE DESCRIPTION

POWER SUPPLY UNIT

Power supplies are the name for electrical power sources. An item or system that supplies electrical or other types of energy to a load or group of loads is referred to as a power supply unit (PSU). The term is most frequently used in respect to electrical energy sources, less frequently in relation to mechanical ones, and rarely in relation to others.

LINEAR POWER SUPPLY

The voltage from the mains (wall outlet) is typically converted to a different, typically lower voltage by an AC driven linear power supply using a transformer. A rectifier is utilised for creating DC. A capacitor is employed to stabilise the rectifier's pulsing current. There will still be a few minor periodic ripples in the otherwise smooth direct stream. These pulses happen at a frequency similar to that of the AC power frequency, such as a multiple of 50 or 60 Hz.



Block Diagram of a Regulated Power Supply System

TRANSFORMER

Transformers efficiently convert AC power between different voltages. Because transformers can only run on AC, this is one of the reasons why mains electricity is AC.Step-up transformers increase voltage, whilst step-down transformers decrease it. A step-down transformer is often used to lower the mains voltage, which is typically reduced to a lower, safer value. In the UK, the mains voltage is dangerously high (230V).The terms primary and secondary coils are used to describe the input and output coils, respectively. The two coils are not electrically connected; instead, an alternating magnetic field produced in the soft-iron core of the transformer connects them. The two intersecting lines in the circuit symbol are a representation of the core. Power is practically equally dissipated by transformers since they don't waste much energy.

You should take note because as voltage falls, current rises.Based on the turn's ratio, which is a measurement of how many turns are on each coil, the voltages are compared. A step-down transformer has many turns on its primary (input) coil, which is connected to the high voltage mains supply, and few turns on its secondary (output) coil in order to create a low output voltage. Lamps, heaters, and certain AC motors can all be powered by the low voltage AC output. It cannot be used in electronic circuits without a rectifier and a smoothing capacitor..

Turns ratio=Vp/Vs=Nn/Ns and Power out=Power in

$$Vs*Is=Vp * Ip$$

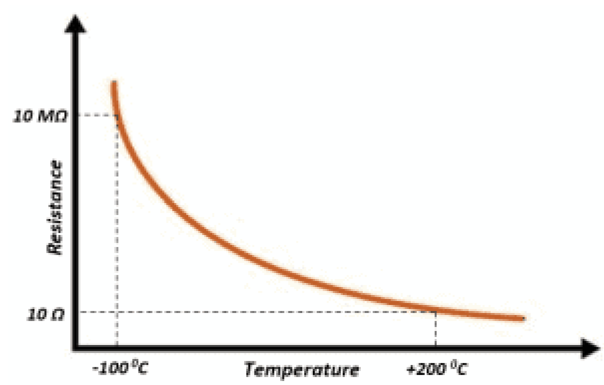
Vp = primary (input) voltage	Vs = secondary (output) voltage
Np = number of turns on primary coil	Ns = number of turns on secondary coil
Ip = primary (input) current	Is = secondary (output) current

BATTERY

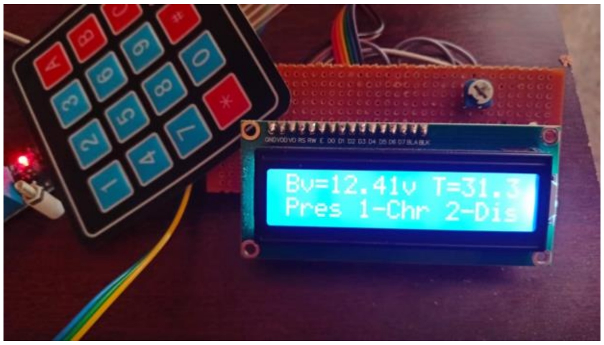
One or more electrochemical cells make up a battery, which in the context of electricity is a device that transforms chemical energy that has been stored into electrical energy. Batteries have become a common household item ever since Alessandro Volta created the first battery (also known as the "voltaic pile") in 1800. However, the Daniell cell, which was technologically superior, was not introduced until 1836. common power source for many household and industrial applications. According to a 2005 estimate, the worldwide battery industry generates US$48 billion in sales each year, with 6% annual growth.

V. WORKING PRINCIPLE OF DHT11 SENSOR

The thermistor and capacitive humidity detecting elements are both included in the DHT11 sensor. Between two electrodes of the humidity sensor capacitor, a moisture-holding substrate acts as a dielectric. When humidity levels change, the capacitance's value changes as well. The IC computes, decodes, and transforms these changing resistance values into digital form.A Negative Temperature Coefficient Thermistor is used in this sensor to measure temperature, and as temperature increases, the resistance value decreases. For a higher resistance value even for the smallest change in temperature, this sensor is often made of semiconductor ceramics or polymers.DHT11 has an accuracy of 2 degrees and a temperature range of 0 to 50 degrees Celsius..



DHT11 Four pins make up the sensor: VCC, GND, Data Pin, and a Not Connected Pin. The communication between the sensor and micro-controller is enabled via a pull-up resistor of 5k to 10k ohms.A NTC thermistor is utilised by this sensor to measure temperature.As shown in the graph below, the acronym "NTC" stands for "Negative Temperature Coefficient," which signifies that resistance decreases as temperature increases. This sensor is typically constructed of semiconductor ceramics or polymers to obtain a higher resistance value even for the smallest change in temperature. With pre-loaded calibration, this IC analyses and analyses the analogue signal.



coefficients, does analog to digital conversion and gives out a digital signal with the temperature and humidity.

VI. SOFTWARE DESCRIPTION

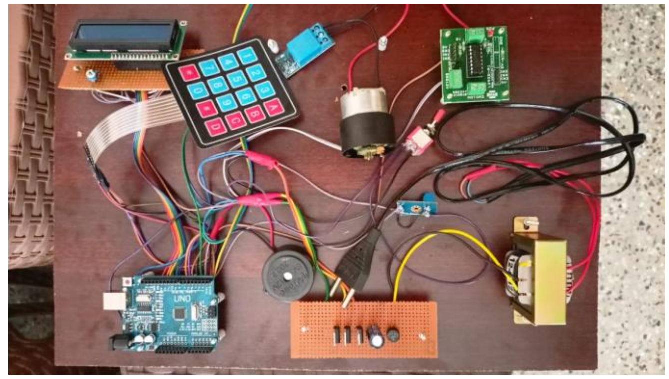
EMBEDDED C

To address difficulties of commonality between C extensions for various embedded devices, the C Standards group developed Embedded C as a set of language extensions for the C programming language. Exotic features like fixed-point arithmetic, numerous distinct memory banks, and basic I/O operations have historically required nonstandard extensions to be added to the C language.These issues were addressed by the C Standards Committee's 2008 expansion of the C language by creating a consistent standard that all implementations had to adhere to..

Some of the capabilities that are supplied that are not present in normal C include fixed-point arithmetic, named address spaces, and basic I/O hardware addressing. Embeded C makes extensive use of the main() function, variable definitions, datatype declarations, conditional statements (if, switch, case), loops (while, for), functions, arrays and strings, structures and unions, bit operations, macros, and more.In 2004 and 2006, respectively, a Technical Report and its second edition were issued.

EMBEDDED SYSTEMS PROGRAMMING

Creating programmes for desktop computers is not the same as programming embedded systems. Comparing embedded systems to computers, the following are some of their key features:



PCs use larger, more power-hungry components, but embedded systems frequently use smaller, less power-hungry ones. Limited ROM, RAM, stack space, and processing power are characteristics of embedded devices. Embedded systems depend more on its hardware than other types of systems.Two essential elements of embedded programming are code complexity and speed. size.

In contrast to code size, which depends on the programming language used and the quantity of available programme memory, code speed is governed by the processing speed and the time constraints. Embedded system programming seeks to do this by gaining the most functionalities in the least amount of time and space.

DIFFERENCE BETWEEN C AND EMBEDDED C

Despite having distinct appearances and being applied in various situations, C and embedded C are more alike than they are dissimilar. Although many of the constructs are similar, their applications vary. Embedded C is used for applications based on microcontrollers, whereas C is used for desktop computers. C hence enjoys the privilege of leveraging desktop PC resources like RAM, OS, etc. RAM is not a concern while programming desktop computers. An embedded processor's RAM, ROM, and I/Os are limited, but embedded C still needs to operate on them. The available programme memory must consequently be able to hold the code for the programmes. Code exceeding the limit may result in system failure.

Typically, executables produced by C (ANSI C) compilers depend on the OS. To run on the microcontrollers and microprocessors where it is needed, embedded C requires compilers to produce files that can be downloaded. In contrast to desktop computer application compilers, embedded compilers enable access to all resources. When compared to desktop computer applications, embedded systems frequently face real-time constraints. Consoles, which are available for desktop programmes, are frequently absent from embedded systems. Thus, the main difference between programming in C for embedded systems and other programming languages is how we approach the problem. For embedded applications, we must use resources efficiently, write code that is effective, and, if necessary, adhere to real-time limitations. The fundamental constructions, syntaxes, and function libraries of "C" are utilised in order to complete all of this.

VII. CONCLUSION

Your electric vehicle must have a reliable battery management system to function properly. Nowadays, electric vehicles are more popular than those powered by internal combustion engines because of their benefits and lack of restrictions. The final approach for making this hardware modules is to give a easy way of protection. We tried to fulfil almost all the missing requirement for these types of platforms make this hardware modules as much Flexible, User friendly, User interactive, Latest use of technology.

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