

A

Project Report

On

**BATTERY MONITORING SYSTEM FOR
ELECTRICAL VEHICLE**

Submitted in partial fulfillment of the requirement

for the award of the Degree of

BACHELOR OF TECHNOLOGY

In

ELECTRICAL AND ELECTRONICS ENGINEERING

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MAY, 2020

DECLARATION

We declare that the work presented in this report titled "**BatteryMonitoring System of Electric Vechile**", submitted to the Department of Electrical Engineering, Galgotias University, Greater Noida, for the Bachelor of Technology in Electrical Engineering is our original work. We have not plagiarized unless cited or the same report has not submitted anywhere for the award of any other degree. We understand that any violation of the above will be cause for disciplinary action by the university against us as per the University rule.

Place:

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CERTIFICATE

This is to certify that the project titled **“Battery Monitoring System of Electric Vehicle”** is the bona fide work carried out by Ankita Dwivedi, Nand Kishor Singh students, during the academic year 2019-20. We approve this project for submission in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Electrical and Electronics Engineering, Galgotias University.

Dr.PratimaWalde

Project Guide(s)

The Project is Satisfactory / Unsatisfactory.

Internal Examiner (s)

External Examiner

Approved by

Dean

ABSTRACT

The project is focused mainly on the applications of BMS in our day to day life. In this project we are going to monitor different aspects of battery and how they are affected by the condition of a battery. The several factor includes voltage, heat and abnormality of voltage. In electric vehicle industry battery is the key source and the life, condition, status, plays a vital role in the health of a car as well as the person driving it. So, we combined two technologies that is, one is to monitor a battery by monitoring its different aspects and another is to send and receive real time data with a user interfacing with our system

It is clear that an electrical automobile undoubtedly depends on the provision of strength from a battery. However, the number of energy provided to the EV is reducing bit by bit that ends up in the performance degradation. This can be a primary problem for battery performance. During this work, the idea of watching the performance of the battery with the usage of BMS strategies is planned. The planned BMS system is developed and this machine consists of 2 major elements i) monitor and ii) interface. Supported experimental results, the device is capable to watch degraded battery overall performance and sends notification messages to the user for more action.

ACKNOWLEDGEMENT

I express my deepest sense of gratitude and highly respected thanks to our very helpful respected mentor Dr. Pratima Walde(Associate Professor, SECE) Galgotias University for guiding us and supporting us and encouraging us to complete this project. I would also like to thank our respected dean Dr. Priestly Shan (Dean, SECE) Galgotias University to giving me this opportunity to work on this project to gain work and experience.

At last but not least I would like to thank my colleges and all the other faculties for the constant motivation and the blessing to face the challenges that I have encountered in the journey of this project.

Thank you

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INTRODUCTION

As the climatic condition on the earth is getting worst day by day and the major problem is to raise the global temperature which is because of carbon emission. The CV vehicle plays a major role in the emission of carbon originated gases and to overcome this problem various manufacturers like TESLA designed an electric vehicle which is cost efficient as well as sustainably a good technology in future to rely on but the main problem with electric vehicle is the maintenance monitoring and charging.

So we made a technology which can monitor the condition of a battery the charging % of a battery and send the data to a user and in case if any miss happening happens then to notify a proper authority to help the person in need by this technology we simultaneously solve two problems

1. Environmental and another 2. The problem related to electric vehicle

It is clear that an electrical automobile undoubtedly depends on the provision of strength from a battery. However, the number of energy provided to the auto is reducing bit by bit that ends up in the performance degradation this can be a primary problem for battery manufacture during this work, the idea of watching the performance of the auto the usage of BMS strategies is planned, so the watching are often dead directly the planned arduino-based battery watching machine consists of 2 major elements i) monitor and ii) interface supported experimental results, the device is capable to watch degraded battery overall performance and sends notification messages to the user for more action.

BMS means various things to different people. To some it's simply Battery Monitoring, keeping a check on the key operational parameters during charging and discharging like voltages and currents and also the battery internal and ambient temperature. The monitoring circuits would normally provide inputs to protection devices which might generate alarms or disconnect the battery from the load or charger should any of the parameters become out of limits.

For the facility or plant engineer accountable for standby power who's battery is that the last line of defence against an influence blackout or a telecommunications network outage BMS means Battery Monitoring Systems. Such systems encompass not only the monitoring and protection of the battery but also methods for keeping it able to deliver full power when called upon and methods for prolonging its life. This includes everything from controlling the charging regime to planned maintenance.

Designing a BMS

In order to regulate battery performance and safety it's necessary to grasp what has to be controlled and why it needs controlling. this needs an thorough understanding of the elemental cell performance characteristics and battery failure modes particularly Lithium battery failures.

BMS Building Blocks

There are three main objectives common to all or any Battery Monitoring Systems

- Protect the cells or the battery from damage
- Prolong the lifetime of the battery
- Maintain the battery in a very state during which it can fulfil the functional requirements of the appliance that it absolutely was specified.

To achieve these objectives the BMS may incorporate one or more of the subsequent functions.

- Cell Protection Protecting the battery from out of tolerance operating conditions is prime to all or any BMS applications. In practice the BMS must provide full cell protection to hide almost any eventuality. Operating electric battery outside of its specified design limits will inevitably result in failure of the battery. other than the inconvenience, the price of replacing the battery is prohibitive. this is often particularly true for top voltage and high power automotive batteries which must operate in hostile environments and which at the identical time are subject to abuse by the user.

- Charge control this is often a vital feature of BMS. More batteries are damaged by inappropriate charging than by the other cause.

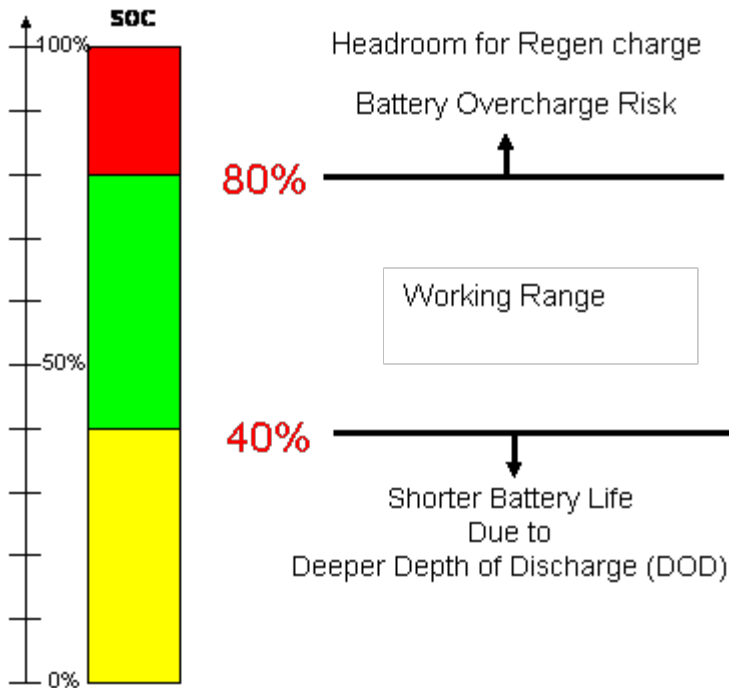
- Demand Monitoring While ultimately associated with the operation of the battery itself,

demand Monitoring refers to the appliance during which the battery is employed. Its objective is to minimise this drain on the battery by designing power saving techniques into the applications circuitry and thus prolong the time between battery charges.

- SOC Determination Many applications require a knowledge of the State of Charge (SOC) of the battery or of the individual cells within the battery chain. this could simply be for providing the user with a sign of the capacity left within the battery, or it may be needed in a very feedback circuit to confirm optimum control of the charging process.

- SOH Determination The State of Health (SOH) could be a measure of a battery's capability to deliver its specified output. this is often vital for assessing the readiness of emergency power equipment and is an indicator of whether maintenance actions are needed.

- Cell Balancing In multi-cell battery chains small differences between cells because of production tolerances or operating conditions tend to be magnified with each charge / discharge cycle. Weaker cells become overstressed during charging causing them to become even weaker, until they eventually fail causing premature failure of the battery. Cell balancing could be a way of compensating for weaker cells by equalising the charge on all the cells within the chain and thus extending battery life.



Battery Monitoring

As well as lecture the charger, the Intelligent Battery may refer to the user or to other systems of which the battery is also part. The signals it provides is wont to activate warning lights or to tell the user about the condition of the battery and the way much charge it's left.

Monitoring the battery condition is a vital a part of all Battery Monitoring Systems. within the first of the subsequent two examples, the control actions are manual, - the facility plant maintenance engineer fixes any deficiencies. within the second example the battery is an element of an Automatic system made up from several interlinked feedback loops controlling the battery itself and its role as a part of the vehicle energy Monitoring system.

The functions of a BMS suitable for a hybrid electric vehicle are as follows:

- Monitoring the conditions of individual cells which conjure the battery
- Maintaining all the cells within their operating limits
- Protecting the cells from out of tolerance conditions
- Providing a "Fail Safe" mechanism just in case of uncontrolled conditions, loss of communications or abuse
- Isolating the battery in cases of emergency

PROBLEM STATEMENT

- The main challenge associated with that after successful completion of hardware work then we have to connect it with cloud based system because all feedback data of BMS will be feed by the system to the cloud.
- As user don't know the health condition of a battery and they has to go to proper place to get to know about battery condition which is not convenient and efficient as well.
- User can get stuck in any area because of battery failure and might not get proper authority to help them

SOLUTION

The solution is to use the monitoring system in electric vehicle for measuring condition of battery and further operations. A battery tracking system for EV that can notify the person about battery situation is important to solve the said issues. Previous battery monitoring system handiest display and locate the condition of the battery and alarmed the consumer through battery indicator interior the automobile. Due to the development of the layout of notification device, internet of things (IoT) generation may be used to inform the producer and users regarding the battery status. This can be considered as one of the maintenance support system that can be achieved with the aid of the producer.

Literature Survey

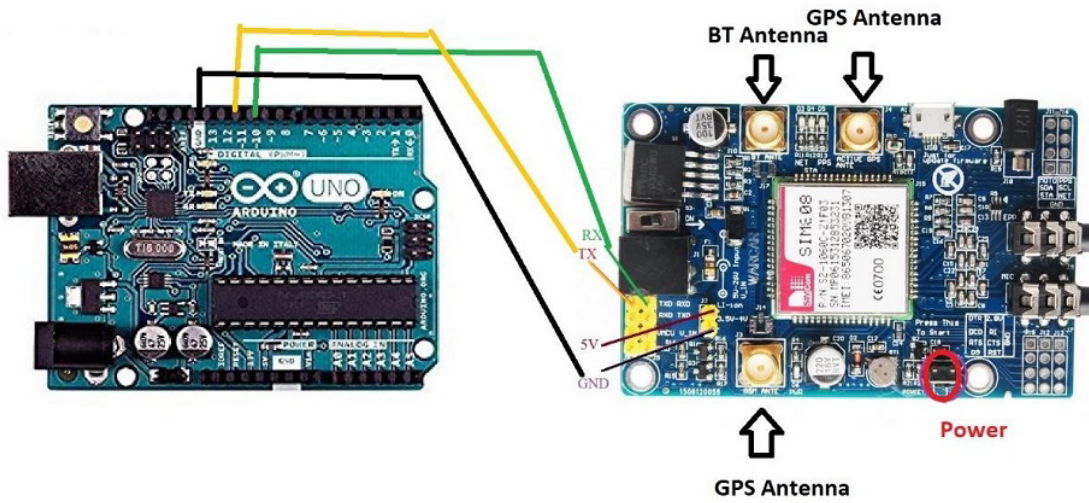
With the improvement of cell arrangements in the 1970's for expanding the absence of frequencies in the radiotelephone administrations which in go lead to presentation of AMPS (Advanced Mobile Phone System) where the transmission was simple based. This was known to be the first era in quite a while. The subsequent age depended on computerized transmission and was called with different condensing as GSM (Global System for Mobile interchanges), ERMES (European Radio Messaging System). Different Cordless phone guidelines were likewise presented during this time as it were. The third era has ascended with the unification of various advances; some of them which are prevalently known are FPLMTS (Future Public Land Mobile Telecommunications System),

UMTS (Universal Mobile Telecommunication System), and IMT-2000. The word GSM Refers to Global System for Mobile Correspondences. These days numerous individuals are demonstrating parcel important to find out about GSM related ideas. Along these lines, here we have reviewed a rundown of different GSM based ventures thoughts which are having more request and exceptionally fascinating to learn. The accompanying ventures dependent on GSM innovation we reviewed would give better thought regarding the GSM innovation for all intents and purposes. By and by, the remote correspondence has reported its appearance on enormous stage and the world is going versatile. We need to control everything and without moving an inch. This remote of apparatuses is conceivable through Embedded Systems. The primary point of this undertaking will be to structure a SMS driven programmed show toolbox which can supplant the as of now utilized programmable electronic showcase. It is proposed to structure get cum show toolbox which can be modified from an approved cell phone. The message to be shown is sent through a SMS from an approved transmitter. The toolbox gets the SMS, Validates the sending Mobile Identification Number (MIN) and shows the ideal data after fundamental code transformations. GSM based

information obtaining is a procedure control framework that empowers a site administrator to screen and control forms that are circulated among different remote destinations.

COMPONENTS

- i. Arduino UNO
- ii. SIM808 GSM Shield
- iii. Voltage Sensor
- iv. Lithium ions batteries
- v. Antennas
- vi. GSM sim



SYSTEM OVERVIEW

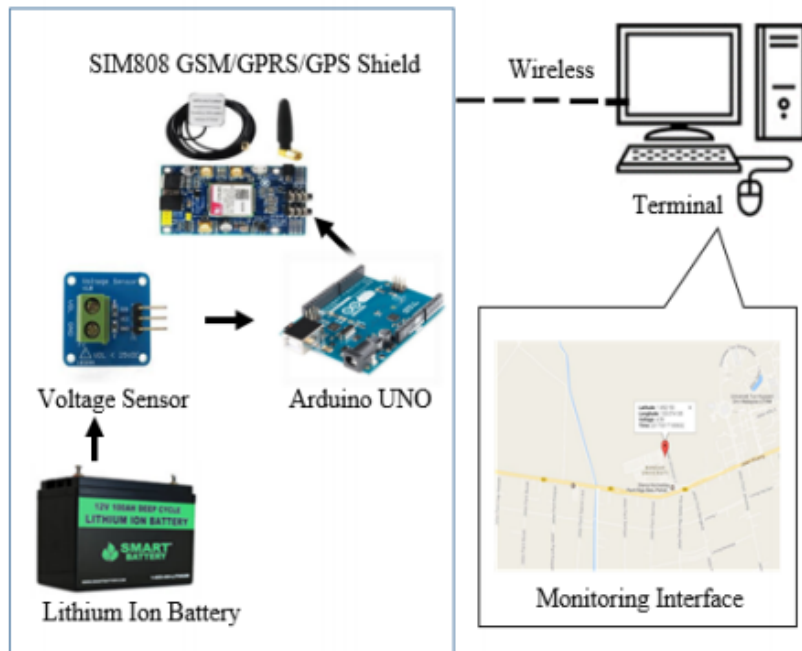


Fig 1 –Overview of a proposed System

In the Fig.1, the proposed system of or project is shown, First step towards the progress is to measure the voltage level of a battery available in the car then the SIM module we are using SIM808V 3.2 reads the current location of a vehicle then they are will be a heat sensor which will continuously working on detecting heat of a battery. As the voltage sensor program with the arduino will display the current battery charged percentage and we will set a certain limit beyond that if a battery charge percentage go then it will notify a user and we will also a threshold heat unit beyond that if battery temperature goes then both sensor which are connected to arduino will send a signal to module which will eventually send your the current location to a proper authority

SYSTEM FLOW CHART

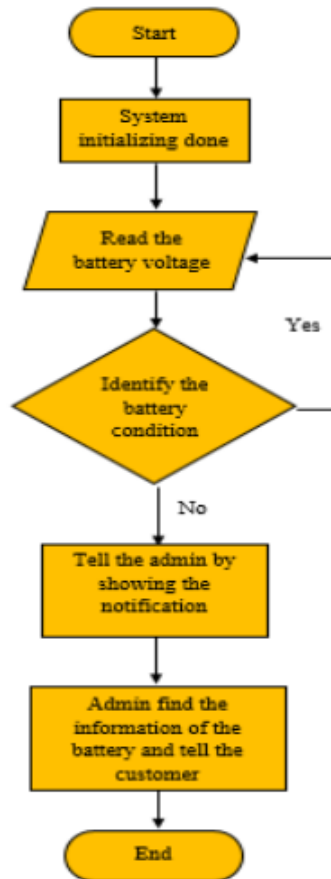


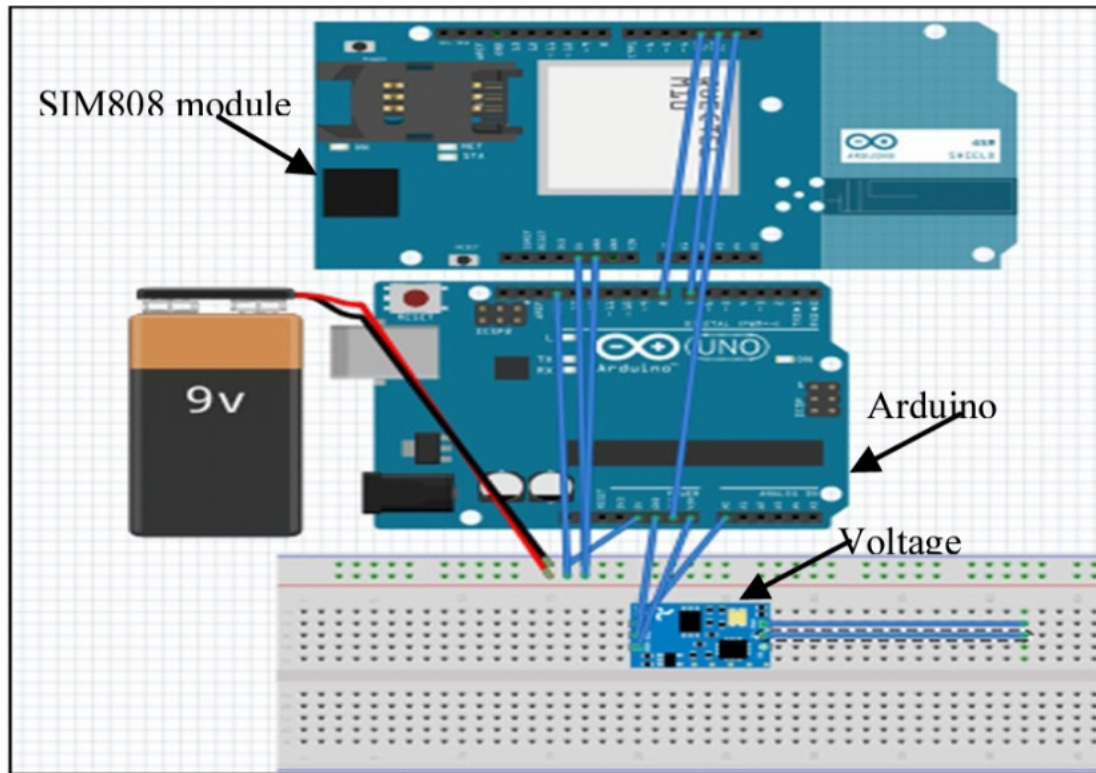
Fig 2 – System Flow Chart

This flow chart shows the algorithm of a system step

1. To Measure the Battery voltage and send data to Arduino
2. By interpreting a data system will decide condition of a battery if condition is ok then it will revert back to step 1 otherwise next step will follow
3. To send a notification to an administrator
4. To tell the admin by showing the notification

Hardware Design

Fig 3 – Hardware Interface circuit



Initially, in order to verify the suitability of the hardware parts, the design of the system was developed. Figure 3 illustrates the circuit design of the system. The figure shows the system is consists of a voltage sensor, an Arduino Uno microcontroller, a SIM808 GSM/GPRS/GPS module and a 9V battery for power supply. The actual hardware design of the proposed IoT-based battery monitoring system.

Voltage Sensor Experiment

This is the phase 1 of our product it includes the change of a voltage by voltage sensor programmed with Arduino UNO and to get a data which will be the base of added interpretation we are going to do in future.

In Fig 5, The voltage is sensed by a multimeter to get the real actual value of voltage in the given battery. In Fig 6, the voltage is sensed using voltage sensor

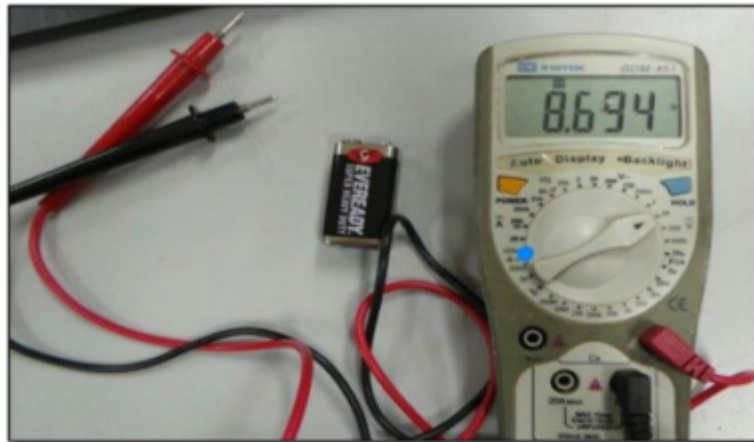


Fig. 5: Battery voltage measurement using multimeter

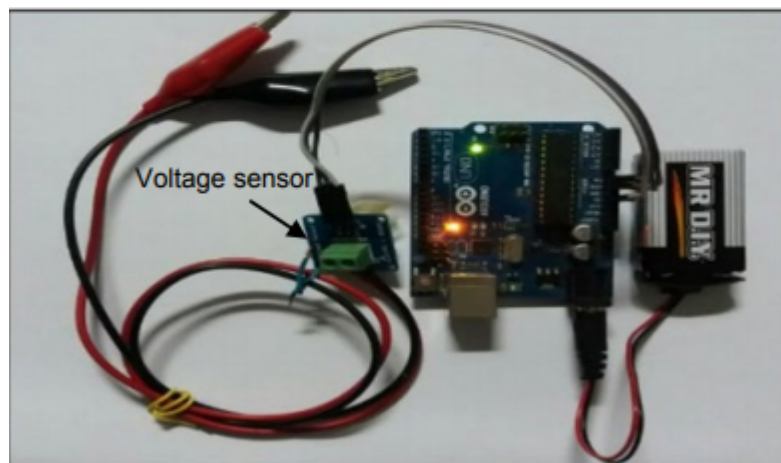


Fig. 6: Battery voltage measurement using voltage sensor circuit

Market Analysis

1. A China based company which launch their first electric bike in the Indian market on 2019 i.e. REVOLT 300, REVOLT 400

2. A Bangalore based startup made a electric scooter named Ather in some years ago.

As The two example given above These brands didn't survived in the INDIAN market and the problem with both of the brands is they didn't have that much security as well as the top notch service with their product and as the electric vehicle required good care so a quality service should be provided.

Market Analysis Conclusion

So from the data given above we can conclude that the Indian market needs a quality service when it comes to EV and with our product company can provide a service where a user can be helped no matter where the location is without even any damage to a self and a vehicle by this we can analyze that their a need of our product in the market. In Fig 7 the sales data is given by which we can analyses that the sales is increasing exponantionally. So, need of BMS will also increase.



Electric Vehicle Sales Figures in India



Source:

Society of Manufacturers of Electric Vehicles

Fig – 6 – EV sales graph

ADVANTAGE

- The system will be more reliable and user friendly user can experience monitoring of the battery condition from his smart devices through our GSM module
- The hardware for the battery tracking tool and a internet-primarily based battery monitoring user interface. The system is capable to show statistics together with vicinity, battery situation and time via internet via incorporating GPS device to stumble on the coordinate and display it on the Google Maps application Further change can be finished to improve the gadget by using including extra features into the system. The gadget can be used in smart phones by means of developing Smartphone software that can assist consumer to screen battery and as a battery degradation reminder. In order to enhance the net connection, Ethernet can be used to get a better internet connection as compared to GPRS.
- You can use it on any device which conation lithium ion battery which make it more feasible than any other monitoring because now we don't have to make different monitoring system for different system.

DISADVANTAGE

- It will only work on a places where he network is available on remote location it will not work.
- User has to assign particular new SIM for this purpose
- User has to pay bill in order to use SMS and GPS function of a SIM
- When using on still system sending GPS location will be waste.

APPLICATIONS

The developed battery monitoring system is also consists of a web-based user interface. The user interface is capable to monitor multiple battery monitoring devices' locations, and the conditions of batteries. Therefore, the idea of the user interface has taken into consideration the situation where there is a need to monitor multiple batteries conditions.

With the growing recognition of worldwide warming round the sector, the demand for smooth gas/energy is on the upward push and as a end result there may be a continuous shift towards the electric motors (EVs) and hybrid electric powered vehicles (HEVs). Battery bureaucracy one of the maximum vital systems in any electric car. Battery performance is influenced by factors consisting of depth of discharge (DOD), temperature and charging set of rules. EVs and HEVs use battery control system (BMS) to address the implementation of tracking system parameters which includes contemporary, voltage and temperature.

The main application is plug and play feature with one time installation of the device it will make it maintained free and long working as it only need 5v amount of power to work it will not effect on the power consumption of a battery. The device will be more efficient.

We can also use it on other system rather than electric vehicles only the sending location feature will be useless otherwise all the system which uses battery needed a monitoring system and by this system one can easily get battery info anytime anywhere.

PROGRESS REPORT

This project is divided in to four phase

1. To monitor a voltage
2. To send a data on a phone
3. To monitor a temperature data
4. The Integral Interpretation of a data

Currently we did the first two phases in future we will proceed with another two phase.

RESULT AND DISUSSION

In the end we want to conclude that with lot and a different sensors we can monitor the performance of a battery as well as its condition the main idea behind this project is to develop a product which can work on iot and provide a safe environment for every one to drive a Electric Vehicle. We can also see that the potential of this product that it can be improve to a further research is done on it as we used SIM808 which will make this device more compatible cost efficient and reduced in size. So by this we conclude that battery monitoring system is a great futuristic technology.

We have implemented IOT and sensors together which is capable to measure battery temperature, Condition and no. of backup hours given by battery of hybrid vehicle and can record all these parameters with respect to time and display it on LCD as well as send itnon mobile. We have tried our level best to make the project as good as possible. The system will help to ensure the efficient working of battery

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