

IOT Based Battery Swapping Station and Monitoring System for Electric Vehicle's

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ABSTRACT

The transportation industry contributes a significant amount of carbon emissions and pollutants to the environment globally. The adoption of electric vehicles (EVs) has a significant potential to not only reduce carbon emissions, but also to provide needed energy storage to contribute to the adoption of distributed renewable generation. Similarly, providing adequate charging infrastructure plays a momentous role in rapid proliferation of Electric Vehicles (EVs). Easy access to such infrastructure would remove various obstacles regarding limited EV mobility range. A Battery Swapping Station (BSS) is an effective approach in supplying power to the EVs, while mitigating long waiting times in a Battery Charging Station (BCS). The monitoring system for the Battery Swapping Station (BSS) would make it a easy and efficient task for users.

Keywords: Battery Swapping Station, Monitoring, Controller, Electric Vehicles

I. INTRODUCTION

The transportation industry contributes a significant amount of carbon emissions and pollutants to the environment globally. The adoption of electric vehicles (EVs) has a significant potential to not only reduce carbon emissions, but also to provide needed energy storage to contribute to the adoption of distributed renewable generation. Similarly, providing adequate charging infrastructure plays a momentous role in rapid proliferation of Electric Vehicles (EVs). Easy access to such infrastructure would remove

various obstacles regarding limited EV mobility range. A Battery Swapping Station (BSS) is an effective approach in supplying power to the EVs, while mitigating long waiting times in a Battery Charging Station (BCS). In contrast with the BCS, the BSS charges the batteries in advance and prepares them to be swapped in a considerably short time. Considering that these stations can serve as an intermediate entity between the EV owners and the power system, they can potentially provide unique benefits to the power system. Battery swapping stations are one of the best options for EV charging stations in India and even a

solution to the lack of EV charging infrastructure in India. The battery swapping stations take less time to charge your electric vehicle 100%. Just Swap the Drain Lithium-Ion Battery with a new one and be ready for longer drives. IOT is a network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors and connectivity which enables these things to connect and exchange data.

Like mentioned in above introduction, an EV user has to locate the Battery Swapping Station in order to swap the batteries from nearest possible station. For achieving following goal we need to create an IOT based system which will consist of various modules and sensors which will provide data to user through an user interface. Along with location service we can provide other information such as availability of battery, current and voltage parameters of battery, and allow access to the station or battery from the same user interface. This can be made possible using an Iot based system and cloud platform, where IOT system sense and collects the data which will be given to cloud server or platform which will store and analyse, and further can be displayed on a user interface.

II. METHODS AND MATERIAL

Use of IOT with the following infrastructure will help user to make Battery Swapping process an easy/efficient process as all the information such as location of Battery Swapping Station, availability of battery, battery parameters will be easily available on a user interface which can be accessed remotely through internet.

The system consists of a Wifi controller which is the brain of the system is interfaced with various sensors and modules. The controller controls the sensors and modules and the data from those is send to the blynk app platform using the inbuilt wifi module on the wifi controller.

The sensor and modules used in following system consist of a current sensor, a voltage divider, an IR sensor, a GPS module, a temperature sensor, a flame sensor and a relay module which is connected to a solenoid lock and a buzzer.

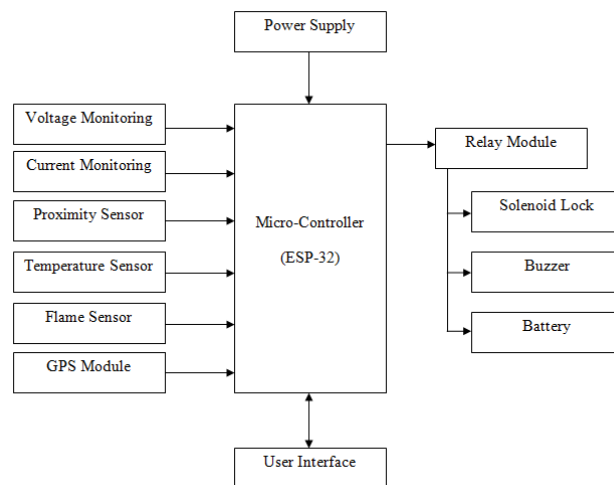


Figure 1. System Block Diagram

For software requirements we are using Arduino Integrated Development Environment – or Arduino Software (IDE) – contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

Blynk is an IoT platform for iOS or Android used to create a graphical interface or human machine interface (HMI) by compiling and providing the appropriate address on the available widgets.

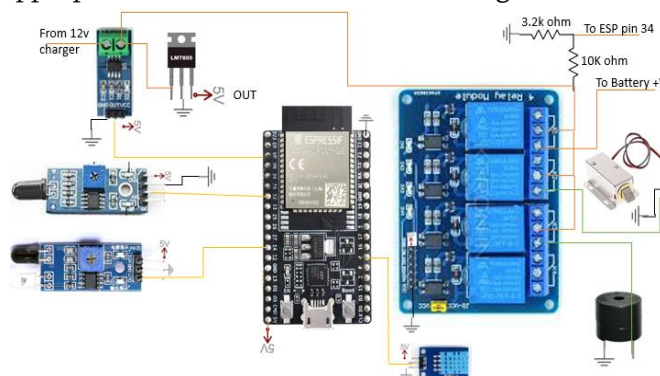


Figure 2. Circuit Diagram of the system

The above circuit diagram, shows the connection between the controller and the devices.

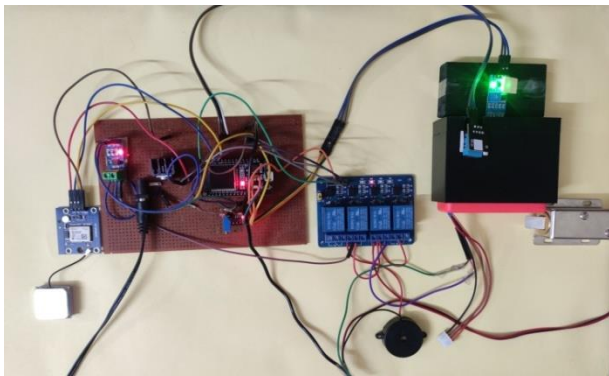


Figure 3. Implementation of the system

We can see the components and devices connected together and working together as a whole system.

III.RESULTS AND DISCUSSION

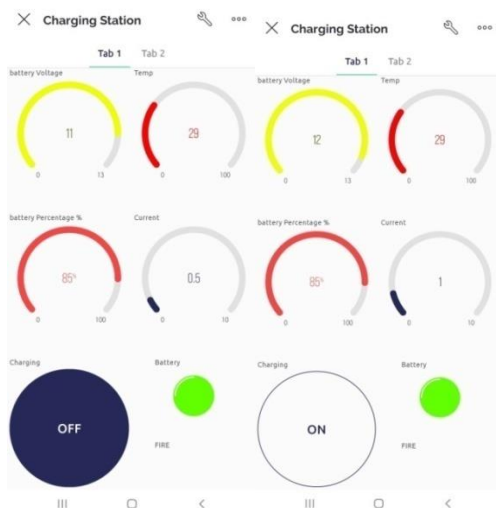


Figure 4. User interface on blynk app

In the interface above, we can see the monitoring and controlling parameters of a battery along with the availability status and also the fire safety status.

The monitoring parameters are voltage, current, temperature and percentage of a battery. Whereas, controlling parameters are charging and discharging of a battery. We can clearly see the difference in voltage and current parameter when the battery is being charged and not being charged.

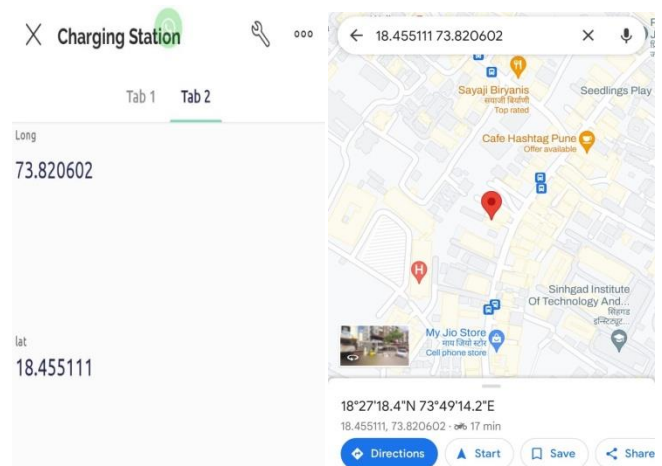


Figure 5. Latitude and Longitude data of GPS

The system currently provides latitudinal and longitudinal data which is then searched on maps give exact location of the GPS module which is connected to the system. It helps to locate the BSS.

For Future scope, we can add a dedicated battery management system for getting battery life information and other BMS parameters, along with a tracker id for the battery to get proper usage data. Making an use of a dedicated application for following system and relying on a third party app.

IV.CONCLUSION

In conclusion, battery swapping station is an innovative technology that offers a fast and convenient way to recharge electric vehicle batteries. By swapping out depleted batteries for fully charged ones in just a few minutes, electric vehicles can travel longer distances without the need for lengthy charging stops.

The Battery Swapping has its own advantages where the charging time is decreased by a total of hundred percent. Also it will help the issue of battery standardisation.

The BSS along with our system will help user to locate the station easily. It will also help the user to easily monitor and control the battery parameters along with checking the availability remotely using the user interface.

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