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Intelligent Battery Swapping System Using IOT

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Abstract: *Having a sufficient charging infrastructure is crucial to the quick uptake of electric vehicles (EVs). The availability of such infrastructure would eliminate several barriers related to the short range of EVs. An efficient battery swapping station (BSS) is one that*
strategy of powering EVs while reducing lengthy wait periods at Battery Charging Stations (BCS). In contrast to the BCS, the BSS charges the batteries beforehand and gets them ready for a far faster battery replacement. These charging stations may be able to offer special advantages to the power system since they can act as a middleman between EV owners and the grid. In this paper explores the benefits of developing the BSS from a number of angles. This paper explores the benefits of developing the BSS from a number of angles. In light of this, a model for battery charging scheduling from the viewpoint of the station owner is suggested. To demonstrate how the suggested approach may assist BSS owners in managing their assets by scheduling battery charging time, an example is given.

Keywords*:* Battery Swapping Station (BSS),Battery charging Station (BCS), Electric vechicle (EV)

I. INTRODUCTION

The focus of research and development firms today is on developing a battery swap station (BSS) architecture that might provide a solid framework for the installation of a substantial fleet of hybrid and electric vehicles (i.e. xEVs). By using a similar procedure to that employed in current gasoline refuelling stations, where the exhausted batteries are replaced with partially or fully charged ones after a short period of time, the BSS may calibrate its subsystem for the deployment of electric cars (EVs)

The BSS approach has come into existence as a feasible technology to the conventional EV recharging station plan since it provides a greater experience of commercial possibilities for the various stakeholders. This paper provides an introduction to BSS, including its architecture, techniques, benefits over charging stations, and key challenges. A S34X-smart switching station for xEVs is also suggested, and the main area of interest for BSS research is described. According to the authors, this is the first review of BSS. We are focusing on creating a system that can be used to embedded systems, IOT, and power electronics in addition to power electronics

II. LITERATURE REVIEW

In literature Review in this section. Author Adegbohun F. Jouanne A. von, Lee Autonomous Battery Swapping System and Methodologies of Electric Vehicles. Discuss Various Contributors . This paper focuses on a design model and methodology for increasing EV adoption through automated swapping of battery packs at battery sharing stations (BShS) as a part of a battery sharing network (BShN), which would become integral to the smart grid.

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 . Current battery swapping methodologies are reviewed and a new practical approach is proposed considering both the technical and socio-economic impacts. The proposed BShS/BShN provides novel solutions to some of the most preeminent challenges that EV adoption faces today such as range anxiety, grid reliability, and cost. Challenges and advancements specific to this solution are also discussed. [2]

Electric vehicles (EVs) have been deemed as being the future of mobility both by auto industry experts as well as major original equipment manufacturers (OEMs) globally. General Motors (GM) announced that it will release more than twenty new models by 2023; Daimler AG (Mercedes Benz parent company) announced that all of the models available will be electrified by 2022; Ford Motor Co. announced 40 electrified models by 2022; several other automakers have

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committed to an all-electric future In addition to the original equipment manufacturers' (OEMs') commitments to an all-electric future, government agencies across the world have also set various zero emission mandates. The California Air Resource Board (CARB), Zero Emission Vehicle (ZEV) regulation has a mandate to reduce emissions level by 40% in 2030 in comparison to the level in 1990, and 80% by 2050 through regulations and ZEV credits for automakers that produce a significant number of electrified vehicles. China's New Energy Vehicle (NEV) mandate is similar in implementation to CARB's policies, requiring 2.5% of vehicles sold to be ZEVs by 2018 and 8% by 2025. Norway and the Netherlands have also committed to 100% EVs by 2025 and 2030, respectively. According to [1], the EV market share is expected to grow from roughly 1% today to about 30% in Europe and around 15% in the U.S. by 2025, totalling 130 million by 2030 globally.[3]

III. METHODS AND TOOLS USED

We have used NodeMCU ESP8266 for its low cost WiFi microchip, Voltage sensor for voltage detection of battery GPS module for locating nearest BSS Solenoid lock to unlock the cabinet and many more equipment . A detailed description of the components are given below.

- **ESP WIFI Controller** -NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added
- The NodeMCU is the Brain and the Heart of the Paper that constantly monitor the Input from the Sensors and takes the Action in the Output side as well as sends the Data to the Internet
- **GPS Module**- The Global Positioning System, formerly known as Navstar GPS, is owned and operated by the US government. It is a radio navigation system that relies on satellites. A satellite-based navigation system that delivers position and timing data is the Global Positioning System (GPS). Anyone having a GPS receiver and a clear line of sight to at least four GPS satellites is allowed to use the system. By accurately timing the signals provided by GPS satellites, a GPS receiver determines its location. Nowadays, GPS is widely utilized and has been integrated into smartphones
- **Voltage Sensor**- The Voltage Sensor is a **simple module** that can used with Arduino (or any other microcontroller with input tolerance of 5V) to measure external voltages that are greater than its maximum acceptable value i.e. 5V in case of Arduino. Following is the image of the Voltage Sensor Module used in this paper.
- In our Paper, the Voltage Sensor constantly monitors the Line Voltage of the Battery and sends the Data to the Mobile App. So that User can check the Availability of the Battery and its voltage from Remote Location.
- **Current Sensor-**This sensor **operates at 5V** and produces an Analog voltage output proportional to the measured current. ... The output of this current sensor is analogy, so to read it, we can directly measure the output voltage using voltmeter or measure it by using a microcontroller like Arduino through Analog Read pin or ADC pin.In our Paper, the Current sensor will constantly monitor the Current of the Battery and Send the command to the Mobile App. Which indicates the Charge Available in the Battery.
- **Proximity Sensor-**The connections for the IR sensor with the Arduino are as follows: Connect the negative wire on the IR sensor to GND on the Arduino. Connect the middle of the IR sensor which is the VCC to 5V on the Arduino. Connect the signal pin on the IR sensor to pin 8 on the Arduino.

In our Paper, the Proximity sensor will constantly monitor the the presence of the Battery in the Slot so that the Person can identify that the Battery is Present or Not in the Swapping Stationof either hosting an application or offloading all WiFi networking functions from another application processor. Nodemcu receives the output from ultrasonic sensor, load cell and gas sensor. This output is processed and then collected on the database.

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IV. FIGURES

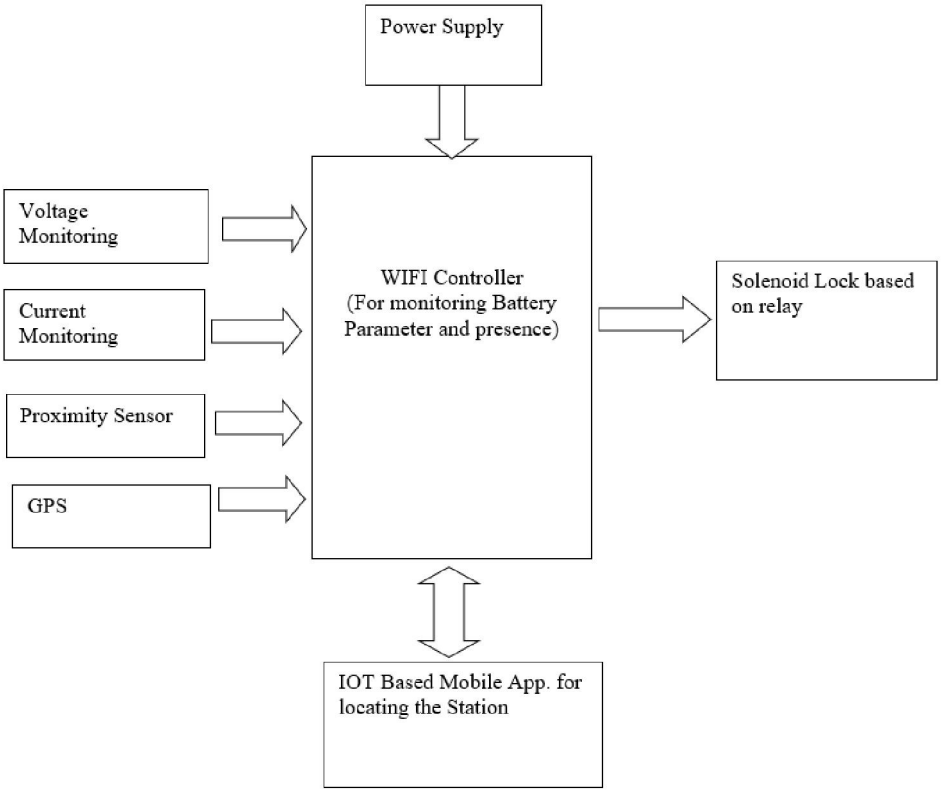

Fig 1 Block Diagram

Discussion: The Battery Swapping Station Propose the infrastructure for EV Vehicles In above block diagram we Measure the parameter from voltage and current sensor which shows the output on Blynk app Via Node MCU which connects the hardware with blynk app via WIFI and GPS module helps to get Latitude and Longitude of Swapping Station

V. RESULT

A function of software or a component is defined by the functional need. Calculations, technical details, data processing, and manipulation are all examples of functional requirements. A functional requirement is a particular feature that outlines the goals that a system must achieve. This paper stresses the current environmental circumstances and the efforts being made to change them. It is a societal application.

The voltage and current sensor are designed to measure the respective value of the battery and the proximity sensor will detect the battery presence in that specific cabinet and with help of NODEMCU we get the real time value and parameter over the Blynk app

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Fig 2 Blynk App Interface

The above Figures are of Blynk app interface and the Battery Swapping System where user get the All Details of BSS from Blynk App and can change the battery from BSS

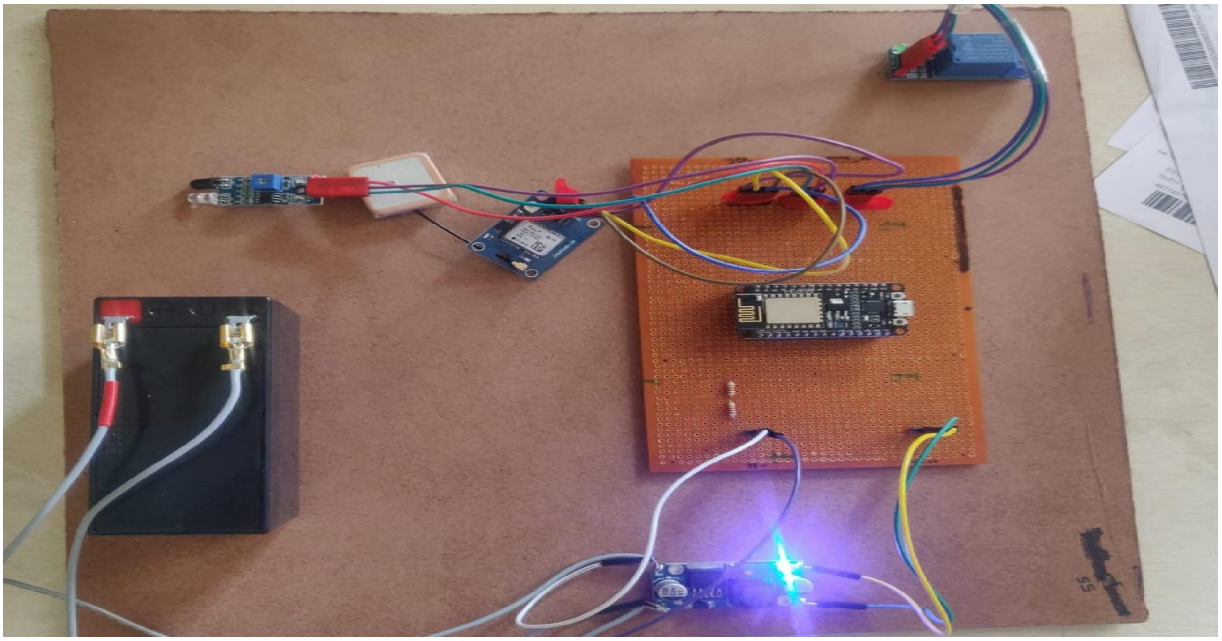

Fig 3 Hardware Output

VI. CONCLUSION

An IoT-based battery monitoring system for electric vehicle to ensure the battery performance degradation can be monitored online. The objective is to proof that the concept of the idea can be realized. The development of the system

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consists of the development of the hardware for the battery monitoring device and a web-based battery monitoring user interface. The system is capable to show information such as location, battery condition and time via internet by incorporating GPS system to detect the coordinate and display it on the Google Maps application Further modification can be done to improve the system by adding more functions into the system. The system can be used in smartphones by developing smartphone application that can help user to monitor battery and as a battery degradation reminder. In order to enhance the internet connection, Ethernet can be used to get a better internet connection compared to GPRS

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