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IOT Enabled Smart Charging Station For Electric Vehicles

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ABSTRACT-The smart charging station is designed to charge electric vehicles using solar energy. The process involves the use of a solar panel to collect energy from the sun, which is then converted into electricity and used to charge the EV module. The maximum power generated by the solar panel can be monitored using an IOT device, and any reductions in the power system can be tracked. An MPPT controller is used to track the maximum power generated by the solar panel. The system is connected to an Arduino Uno and a rechargeable battery that distributes the charge. The amount of charge generated and distributed can be viewed on an LCD. The status of the battery getting charged can be checked using a web page that displays the amount of charge transferred to the charge module. Additionally, the web page displays the location of nearly available charging stations. An alert message is sent through IOT if there is any reduction in the power system.

KEYWORDS*:* electric vehicle,charging,battery,iot,lcd.

I.INTRODUCTION

The Internet of Things (IoT) is a network that connects physical devices, appliances, vehicles, and other items embedded with electronics, software, sensors, and connectivity, allowing them to exchange data. Smart charging stations for electric vehicles are a critical part of the infrastructure that supplies electric energy for recharging EVs. With the growing need for widely distributed publicly accessible charging stations, there is a demand for stations that can support faster charging at higher voltages and currents. These charging stations offer a range of heavy-duty connectors that conform to the variety of electric charging connector standards. As EVs become more prevalent, the calculation of Status of Charge (SOC) for batteries will play an increasingly vital role in the future. The shortage of charging stations may hinder the adoption of EVs, leading to fewer people embracing electric vehicles.

Smart charging is set to play an instrumental role in the future of cities, and charging infrastructure will move away from a simple "socket in the street" to an IoT-connected device. EV charging infrastructure should serve as a multipurpose asset, offering features such as digital advertising and Wi-Fi to energy balancing, helping to future-proof and increase the commercial viability of charging networks. A system that utilizes IoT technology can improve the performance of EV charging and monitor its impacts. A proposed system involves a smart application that connects with the grid and enables users to access information about different tariff rates, including the rate for power delivery to the grid and tariff rate for taking power from the grid. This system focuses on determining the SOC value and sending data to the IoT Application, allowing users to view data and manage their EV charging needs.

II. PROBLEM STATEMENT

The demand for widely distributed publicly accessible charging stations is increasing, with some stations requiring faster charging at higher voltages and currents beyond what is available from residential electric supply. To accommodate this need, these charging stations are equipped with heavy-duty connectors that conform to various electric charging connector standards.

III. METHODOLOGY

In this system, an RFID Reader is utilized to authenticate the user by swiping their RFID Tag. Once the user is identified, they can log in to the IoT application to proceed with the charging process. The charging station is equipped with solar power backed up by batteries. When the EV is connected to the charging station, the system determines the State of Charge and shares the data with the network. The user can view the present battery condition and then choose between fast or slow charging modes. The cost of charging time is calculated based on the mode selected. With RFID technology, the user can have a prepaid balance linked to their identity. After the charging process is completed, the

cost is automatically debited from the RFID Tag. This system proves to be a useful application in daily life and for the future..

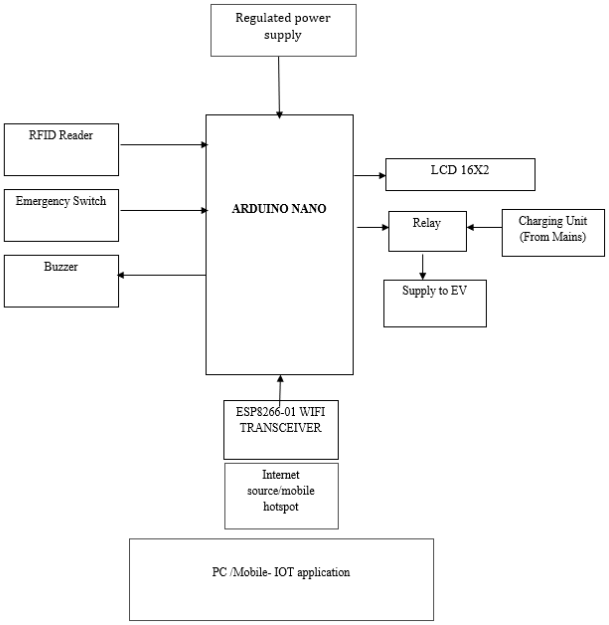

Fig.1 Block Diagram ofcharging Station

IV. FUNCTIONAL PARTITIONING

1. Arduino uno

The Arduino Uno is a microcontroller board that is based on the ATmega328 and the term "Uno" means one in Italian. The board features 14 digital I/O pins, 6 analog I/O pins, a power jack, a 16 MHz ceramic resonator, a USB connection, an RST button, and an ICSP header, which can support the microcontroller for further operation by connecting it to a computer. The Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a varietyof electronic projects. Additionally, it can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards, and can control relays, LEDs, servos, and motors as an output.

2. RFID Reader

Radio Frequency Identification (RFID) is a wireless technology that consists of two parts: tags and readers. The reader has one or more antennas that emit radio waves and receive signals back from the RFID tag. The tags communicate their identity and other information to nearby readers using radio waves and can either be passive or active. Passive RFID tags do not have a battery and are powered by the reader, while active RFID tags are powered by batteries. RFID tags can store a range of information, from a single serial number to several pages of data. Readers can be mobile or mounted on a post or overhead, and reader systems can be integrated into the architecture of a cabinet, room, or building.

3. WI FI TRANSCEIVER(ESP8266-01)

The ESP 01 ESP8266 Serial WIFI Wireless Transceiver Module is a compact system-on-chip (SOC) with a built-in TCP/IP protocol stack that allows any microcontroller to connect to a Wi-Fi network. It can operate as an application host or as a dedicated Wi-Fi networking module for another application processor. The module comes with pre-programmed firmware that supports an AT command set, which allows it to be easily interfaced with an Arduino board, providing Wi-Fi connectivity similar to that of a Wi-Fi Shield. The ESP8266 is a cost-effective board that has a large and growing community, providing a wealth of information and support. With its GPIO pins, the module can be integrated with various sensors and devices with minimal development time and hardware requirements. The on-chip integration minimizes the external circuitry, including the front-end module, which occupies minimal PCB space. The

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ESP8266 also supports APSD for VoIP applications and Bluetooth co-existence interfaces. It has a self-calibrated RF that enables it to function under different conditions without external RF components. There are numerous resources available online for the ESP8266, including instructions on how to transform it into an IoT solution.

4.VOLTAGE SENSOR

Voltage sensors are wireless tools that can be attached to any number of assets, machinery or equipment. They provide 24/7 monitoring, constantly watching for voltage data that could indicate a problem. Low voltage may signal a potential issue, while other assets may be in danger when voltage is too high. When thresholds are exceeded, alerts are immediately sent to a centralized computer system.Voltage sensors are wireless tools that can be attached to any number of assets, machinery or equipment. They provide 24/7 monitoring, constantly watching for voltage data that could indicate a problem. Low voltage may signal a potential issue, while other assets may be in danger when voltage is too high. When thresholds are exceeded, alerts are immediately sent to a centralized computer system.

V. ADVANTAGES

- Less man power required.
- Low maintenance with the help of IOT.
- The system is quick, automated, highly safe & User friendly.

- Using this idea, charging stations can be built easily and can be maintained in a well manner for domestic purposes.

VI.CONCLUSION

Internet of Things (IoT) technology can be used to monitor the status of batteries in electric vehicles and make them more efficient as energy storage systems. The cloud platform is used for managing the data collected by IoT sensors. With IoT, users can easily locate nearby charging stations and monitor changes in voltage levels from the supply. The data collected from IoT sensors can be stored in Arduino microcontrollers until the battery is fully charged. The database can be updated with the details of users who have charged their vehicles, and this information can be used to ensure equitable distribution of resources.

To reduce the environmental impact of transportation, it is important to minimize pollution caused by vehicle usage. This can be achieved by using renewable energy sources, such as solar power, to charge electric vehicles. The efficiency of this process can be improved by selecting the right components and using them in a way that maximizes energy production. By incorporating IoT technology into this process, we can ensure that energy is used more efficiently and that charging stations are utilized in a way that minimizes waste.

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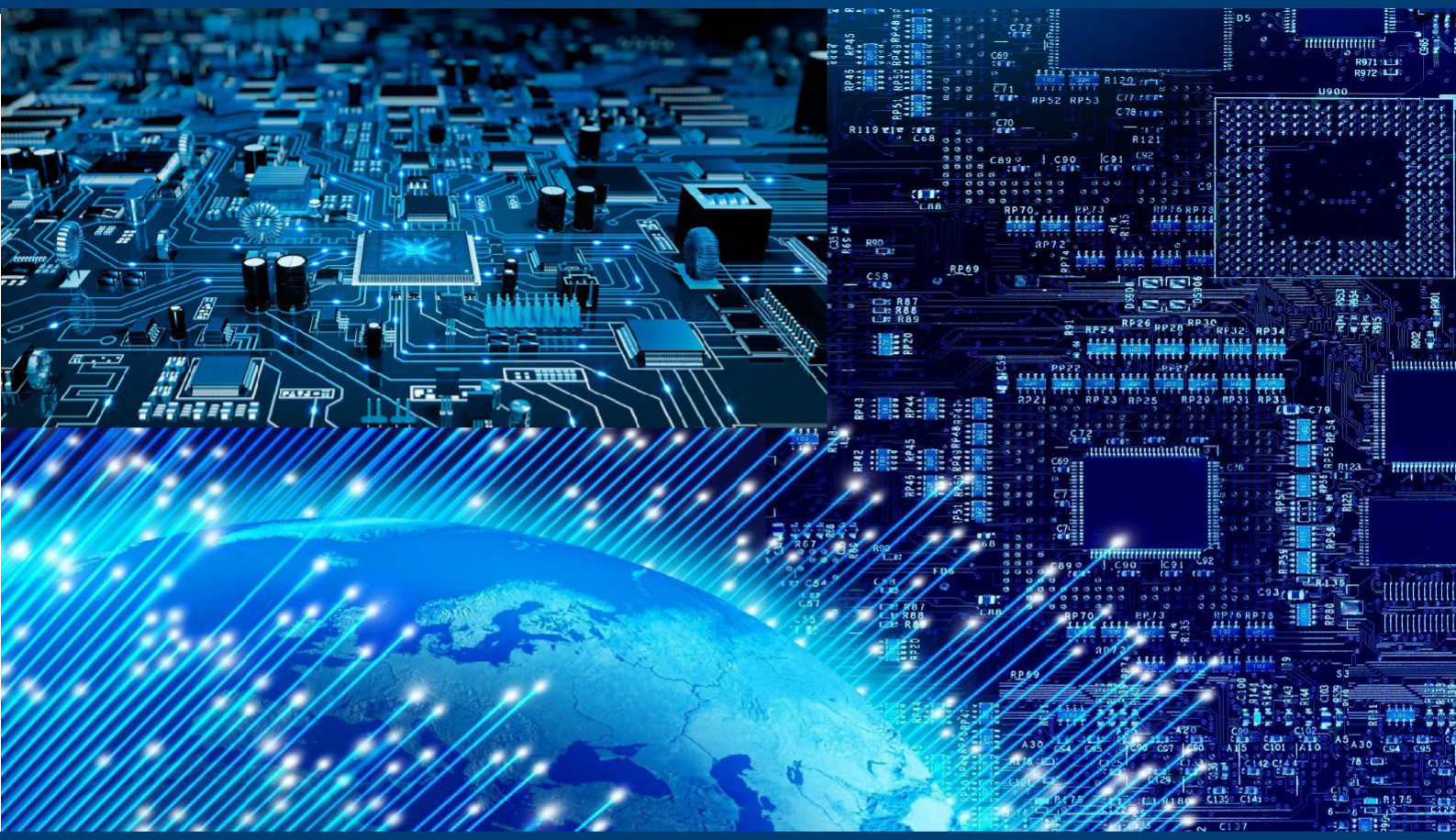

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