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EV Charging Station using RFID Technology based on Solar

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Abstract: *Electric vehicles, a new and developing technology in the electrical and transportation sectors, provide several benefits from an economic and environmental perspective. This study offers a thorough review of several electric car models as well as their ancillary equipment, such as battery chargers and charging stations. Commercial and prototype electric vehicles' electric range, battery size, charger power, and charging time have all been compared. The many types of electric vehicle charging stations and industry standards have been discussed, along with the impact of these stations on utility distribution networks.*

Keywords: Electric vehicle, charging station, battery charger, standards

I. INTRODUCTION

1.1 Background

As there are more electric vehicles (EVs) on the road, charging stations will be more common in both public and private garages. The demands of EV owners, parking garage operators, and the distribution grid will be satisfied by these stations. Just a few of the various responsibilities that these charging stations will perform for financial and security reasons include user permission, authentication, and billing. For the same reason, short-range RFID cards are required at other industrial charging stations like Coulomb and Blink. In both circumstances, the user must take additional actions in order to authorise charging. The authors in suggest using standard RFID tags within EVs and RFID scanners on parking garage entry gates in order to authorise, assign, and enable charging.

The phrase "Internet of Things" (sometimes referred to as "things linked internet") refers to a specific kind of network that makes use of RFID (radio frequency identification) to link any objects together and allow for the exchange and communication of information via the internet. Examining the technological benefits of RFID technology in the identification of electric vehicles and the centralised management of the battery charging compartment is the aim of this study. The application of RFID technology in battery charging stations is also covered. The output power supply used in this case is an SMPS (switching mode power supply).

1.2 Problem Statement

Because we use Google Sheets to store the data, the aim of an RFID-based EV charging station is to benefit from connectivity and big data processing choices. First, a data source from which use cases for driving patterns and functionality can be derived. Second, EV energy can be optimised via big data and cloud computing, leading to eco-driving, eco-routing, and cutting-edge features like smart fast charging and assured charging.

II. LITERATURE REVIEW

"An RFID-based Secure Electric Vehicle Charging System" by Zhou et al. (2019) presents an RFID-based secure charging system that includes secure communication and user authentication using a cloud server. The proposed system is tested on a hardware platform and shows improved security.

2."An Intelligent Electric Vehicle Charging System Based on RFID Technology" by Liu et al. (2019) proposes an intelligent EV charging system that uses RFID technology for user identification and payment. The proposed system is tested on a hardware platform and shows improved efficiency and user-friendliness.

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3. "Design and Implementation of an RFID-based Electric Vehicle Charging System" by Alotaibi et al. (2021) proposes an RFID-based EV charging system that includes user authentication, billing, and monitoring features. The proposed system is implemented on a hardware platform and shows improved reliability and user-friendliness.

As a result of extensive research on RFID-based EV charging systems in recent years, the suggested methods demonstrate increased effectiveness, security, and usability. The difficulties of scalability and interoperability in RFID-based EV charging systems, however, require more study.

III. METHODOLOGY

The methodology of an RFID-based EV charging station typically involves the following steps:

This system consist of ESP32 microcontroller . It has inbuilt Wi-Fi technology .

Input to the microcontroller are RFID reader to read RFID tags and 4*4 keypad to enter the amount of rupees and voltage level to charge the vehicle .

vehicle battery will be charge as per the amount entered by the customer.On LCD , detection of RFID tag with amount will be displayed for customer's information.

Once the vehicle starts to charge the battery , amount , customer name , date , and time will be saved in Google sheet via Google server.

Microcontroller provided current and voltage measurement to obtain the consumed power of EV which was stored in memory both in microcontroller temporally and transmitted into PC for permanent story of power consumption records.

The microcontroller system was developed capable of transmitting data by serial communication and interface the RFID technology for identification of users.

In this development, the control unit employed a microcontroller (MC)ESP32. The MC also interface to the central control system (personal computer) using RS485 communication method to send the information of time and power consume.

While, the panel display include the indicator of standby, under preparation, under running condition, and also display the power consume by user. In addition, the system provide the self-identification of state to prevent the malfunction.

The methodology of an RFID-based EV charging station can vary depending on the specific implementation and the requirements of the system. However, the general approach involves user authentication and authorization, charging process management, billing and payment, and monitoring and maintenance.

The components of an RFID-based EV charging station typically include the following:

RFID reader: This component reads the RFID tag or card carried by the user and communicates with the charging station to authenticate the user and authorize the charging process.

RFID tag or card: This component is carried by the user and contains a unique identifier that is used for user authentication.

Charging station: This component manages the charging process and communicates with the electric vehicle to establish the charging parameters, such as the charging rate and time.

Billing and payment system: This component calculates the amount to be charged based on the charging parameters and the user's account details. The user can then make payment using a variety of methods, such as a credit card or a mobile payment app.

Communication network: This component enables communication between the various components of the charging station and with external systems, such as the user's account management system or a monitoring system.

Sensors and monitoring systems: These components can be used to detect any issues or anomalies during the charging process and provide data for monitoring and maintenance purposes.

Power supply: This component provides the electrical power necessary for charging the electric vehicle.

The specific components of an RFID-based EV charging station can vary depending on the specific implementation and the requirements of the system. However, the general components include an RFID reader, an RFID tag or card, a charging station, a billing and payment system, a communication network, sensors and monitoring systems, and a power supply.

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The calculation of components for an RFID-based EV charging station can depend on several factors, such as the expected usage rate, the type of electric vehicles being serviced, and the available power supply. However, some general calculations for the main components are:

RFID tag or card: The number of RFID tags or cards required will depend on the number of users and the expected frequency of usage. For example, if there are 100 regular users and each user charges their vehicle twice a week, then at least 200 RFID tags or cards would be required.

Depending on how many and what kind of electric vehicles are being serviced, as well as the power source that is available, charging stations will be needed. A minimum of 72 kW of power would be needed, for instance, if 10 electric vehicles were being serviced and each one needed a Level 2 charging station (7.2 kW).

Billing and payment system: The preferred payment choices and anticipated usage rate will determine the billing and payment system. The system must be configured to handle payment methods like credit cards and mobile payment apps, for instance, if consumers can pay with any of those. The needed processing power and network bandwidth might both change depending on the anticipated consumption rate.

Communication network: The size of the charging station and the anticipated consumption rate will determine the communication network. For instance, a high-speed communication network may be needed to handle the traffic if there are 10 charging stations and the predicted consumption rate is significant.

Sensors and monitoring systems: Depending on the intended level, the sensors and monitoring systems will be used.

IV. DESIGN MODEL

RFID Reader: An RFID reader scans the RFID tag or card that the user is carrying. The software in the charging station receives the unique identifier from the tag once it has been scanned by the RFID reader and is used for authentication and authorization.

Charging Station: The hardware of the charging station contains the power electronics needed to transform the grid's AC electricity into the DC power needed by the electric vehicle. The charging station also has a communication module for interacting with the network, the RFID reader, and the electric car.

RFID Middleware: The RFID middleware software is in charge of processing data from RFID tags, verifying user identity, and authorising charging. To start the charging process, the middleware software interacts with the charging station software.

Software for charging stations: The software for charging stations controls the charging process, including determining the rate of charge, keeping track of the charge state, and interacting with the electric car. Based on the charging rate and session length, the software also determines the cost of the charging session.

Billing and payment software: Based on the cost of the charging session, the billing and payment software determines the total amount that will be charged to the user's account. In order to deduct the charges from the user's account, the programme talks with the user's account management software.

User Management Software: The user management software controls the account of the user, including the user's balance, preferred charging rates, and RFID tag data. In order to make sure that the user is authorised to start the charging process and that the charges are deducted from their account, the programme connects with the RFID middleware, the billing software, and the payment software.

Monitoring and Maintenance Software: The monitoring and maintenance software is in charge of keeping track of the charging station's functioning, spotting any problems or errors as they arise, and notifying users and maintenance staff as necessary.

Software for managing networks: The software for managing networks controls communication between the charging station and other parts, such as the RFID reader, the electric car, and the billing and payment system.

In order to provide an effective and dependable charging solution for electric vehicles, an RFID-based EV charging station model would generally include hardware and software components that function together

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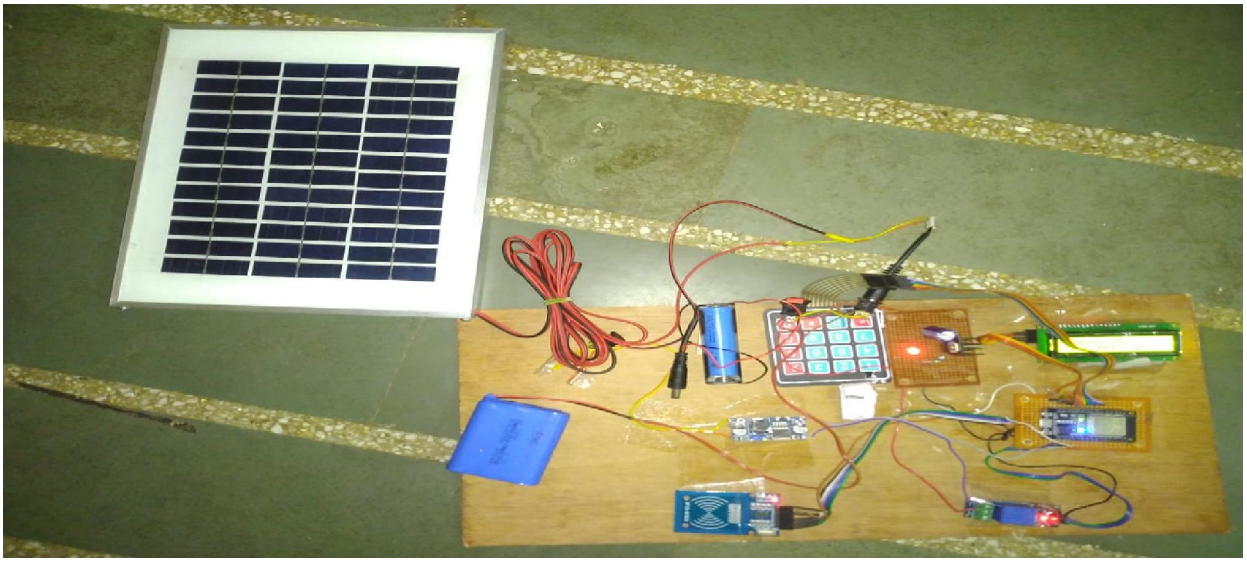


Fig 1.1

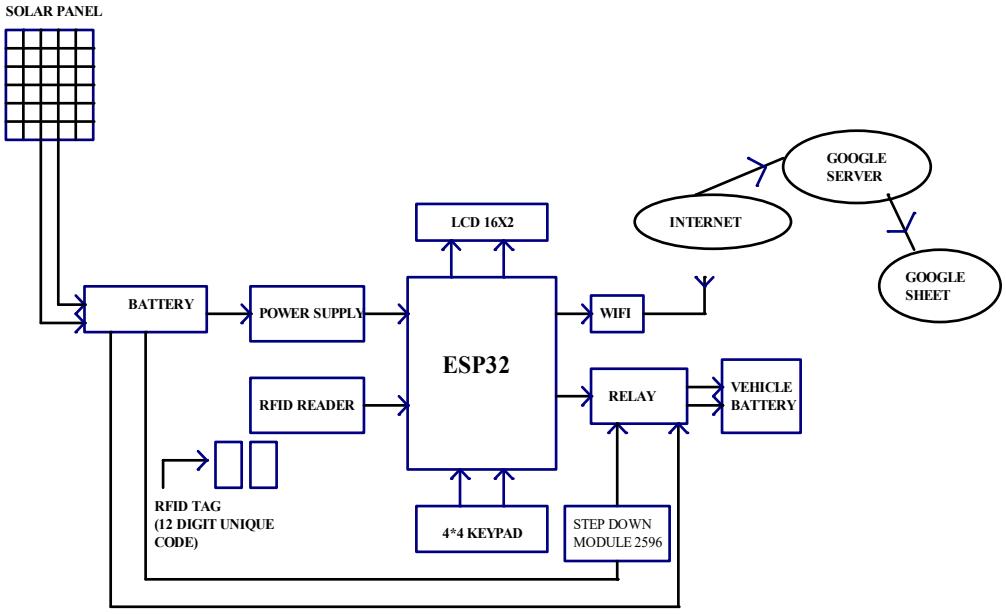
V. WORKING

Radio-frequency identification (RFID) technology is used in an RFID-based EV (Electric Vehicle) charging station to allow a user to confirm their identity and access the charging services.

An RFID reader included into the charging station connects to any RFID tag or card the user may have. The charging procedure can be started by scanning the user's RFID tag or card as they approach the charging station. The user is then identified and their authorization to use the charging station is confirmed by the RFID reader.

The charging station starts the charging process once the user's identity has been confirmed. To start charging the battery, it establishes a wired or wireless connection with the electric car. Additionally, the charging station has the ability to track the progress of the charging procedure and notify the user when it is finished.

Electric vehicle charging is simple and safe using RFID-based charging stations. They can ensure that only authorised users may access the charging services by employing RFID technology, and they can give users real-time updates on the status of their charge. The use of their charging infrastructure can be managed and monitored by operators of RFID-based EV charging stations, allowing them to maximise the efficiency of their EV station.



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VI. CONCLUSION

The future looks more decisive in the direction of development of an electric car. What could we predict for the development of electricity, the future may hold vehicle. In any case, factors such as installation costs are different. The proposed system is more flexible in many way, more possibilities replace the entire conventional system with the proposed system. When deploying the proposal system to the business model. If properly supported, this field will grow significantly Government and financial support from industry. Rear you can expect a lot of network expansion in terms of time during the trial period. Direct investment Electric vehicle manufacturer for proposed business Planning helps you reach your sustainability goals Earth's environment in a very short time. Through use this way, the availability of electric charging stations.. Here we use a pricing design. The world will become simpler, and the use of electricity will also become simpler. Vehicles become more common than other commercial vehicle. And it also encourages buyers to buy electricity Vehicles in future transportation. It is also decreasing promote pollution and shipping. Innovative technology further improving the proposed system by improving efficiency, Reduced energy consumption costs and portable. Although the future of the proposed system looks very promising, Put it into a business model and create something huge Demand for electric vehicles. The project demonstrates how we can use Google Sheets to create an accounting system for EV charging stations. The accounting process runs more smoothly with the aid of a microcontroller and RFID module. Programming for microcontrollers, designing power supplies, and designing PCBs are the project's main takeaways. This procedure makes it simple to understand how the coupler functions when there is a high and low voltage separation. Consequently, this project implements the prototype of an EV charging station utilizing standard components.

VII.RESULT

	A	B	C	D
1	December 5, 2022 at 12:04PM	rfid		
2	December 5, 2022 at 12:04PM	rfid		4995
3	December 5, 2022 at 12:05PM	rfid	ID2	
4	December 5, 2022 at 12:05PM	rfid		4995
5	December 5, 2022 at 12:05PM	rfid		
6	December 5, 2022 at 12:23PM	rfid	ID1	
7	December 5, 2022 at 12:23PM	rfid		4995
8	December 5, 2022 at 12:23PM	rfid		
9	December 5, 2022 at 12:25PM	rfid	ID1	
10	December 5, 2022 at 12:25PM	rfid		4993
11	December 5, 2022 at 12:25PM	rfid		
12	December 5, 2022 at 12:25PM	rfid	ID2	
13	December 5, 2022 at 12:25PM	rfid		4994
14	December 5, 2022 at 12:26PM	rfid		
15	December 5, 2022 at 03:20PM	rfid	ID1	
16	December 5, 2022 at 03:20PM	rfid		4995
17	December 5, 2022 at 03:20PM	rfid		
18	December 5, 2022 at 03:22PM	rfid	ID1	
19	December 5, 2022 at 03:22PM	rfid		4995
20	December 5, 2022 at 03:22PM	rfid		

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