BHARAT INSTITUTE OF ENGINEERING & TECHNOLOGY

PREPAID AND POSTPAID EV CHARGING STATION

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Abstract

Electric vehicles (EVs) are becoming more common, and there is a growing need for an easy and flexible charging system. This project presents a dual-mode EV charging setup that works with both prepaid and postpaid payment options. Users can start charging by scanning an RFID card. In prepaid mode, the system deducts money from the user's balance based on the amount of electricity used. In postpaid mode, users are charged after the charging session. This makes the system suitable for different types of users and helps manage billing more effectively. To ensure accurate tracking of electricity use, the system uses voltage and current sensors. A microcontroller like Arduino or ESP32 controls the process by reading sensor data, managing the relay that starts or stops charging, and checking user balance or billing status. The system also displays important information like energy usage, balance, and charging time on an LCD screen or web interface. Overall, this project provides a reliable and user-friendly solution for EV charging stations, making them more efficient and convenient

Introduction

The shift to electric vehicles (EVs) demands smarter charging infrastructure. Traditional systems lack personalized authentication and accurate energy tracking. This project introduces a smart EV charging system using RFID for user authentication and supports both prepaid and postpaid billing. It includes real-time monitoring with current and voltage sensors, and a relay for automated control. Key features include:

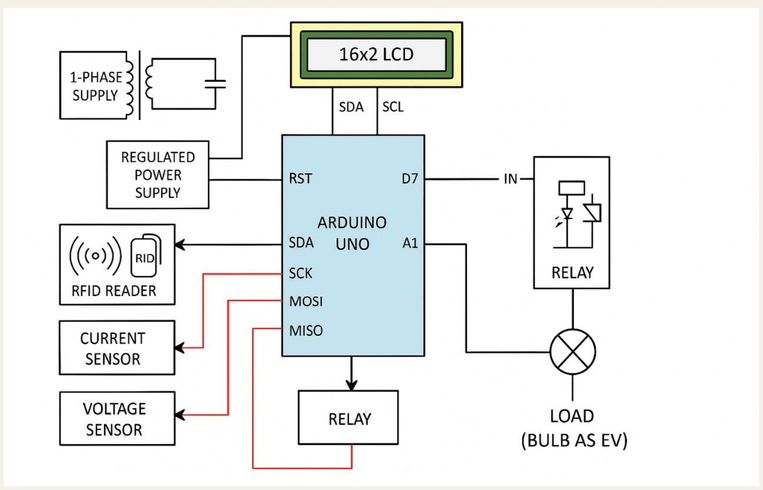
Prepaid billing: Charging halts when balance is exhausted

Postpaid billing: Usage is tracked and billed later

Real-time monitoring: Tracks energy, voltage, and current

Automated control: Relay switches charging based on user status

Schematic Structure



Materials

HARDWARE REQUIREMENTS:

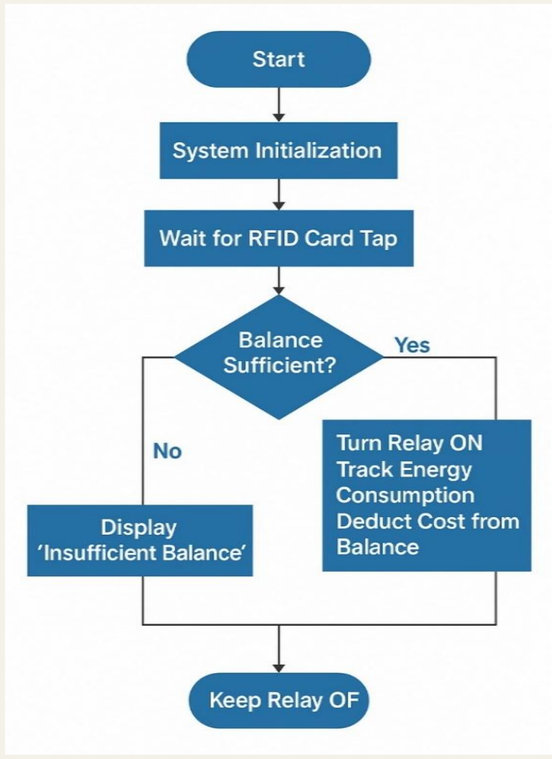
1) RPS
2) Arduino uno micro controller
3) Relay
4) Current Sensor
5) Voltage sensor
6) 16*2 lcd
7) RFID Reader with two tags

SOFTWARE REQUIREMENTS:

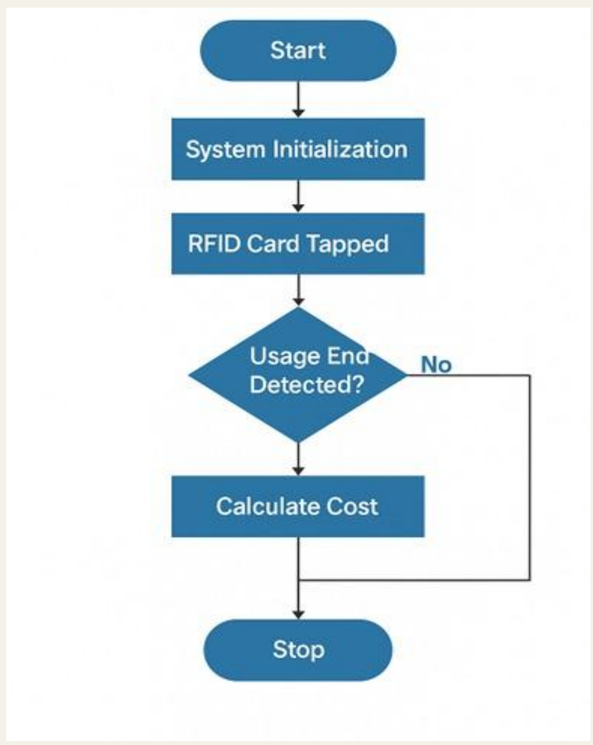
1) Arduino IDE

Methodology

PREPAID SYSTEM



POSTPAID SYSTEM



Result & Discussion

This project presents a smart and secure electric vehicle (EV) charging system using RFID technology. It allows only authorized users to access the charging station by scanning an RFID card. The system includes a voltage sensor and an LCD display to show real-time charging status. A relay module is used to safely control the power supply. This setup makes EV charging more convenient, automated, and efficient.

Fig.27(a) when the system is in off condition

Fig.28(b) when system is on

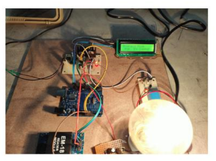


Fig.27(c) when we tap prepaid card it display details of prepaid mode

Fig.27(d) it displays the deducted amount and available balance

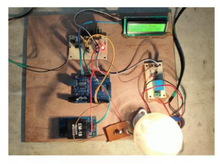


Fig.27(e) when we tap postpaid card it display details of postpaid mode

Conclusion

The RFID-based prepaid and postpaid billing system significantly improves the efficiency, security, and convenience of electric vehicle (EV) charging stations. This system allows users to authenticate themselves using RFID cards, enabling secure and personalized access to charging services. With the dual billing option, users can choose between prepaid—paying in advance by deducting from their balance—or postpaid—where energy usage is tracked and billed later. This flexibility caters to various user preferences and usage scenarios. The system ensures precise energy monitoring and billing through automated tracking, eliminating the need for manual intervention. It also helps prevent unauthorized usage and reduces the risk of fraud or misuse. By automating the charging and billing process, it lowers human effort, improves operational efficiency, and enhances the overall user experience. The integration of RFID technology with smart billing makes EV charging stations more reliable, scalable, and aligned with the growing demand for intelligent transportation solutions in the electric mobility sector.

References

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[2] 2024, Major Project Report – Vyankatesh Chavan, Aniket Kahandal, Sujal Sonavane, Ankur Saxena "Department of Electronics and Telecommunication Engineering, Sandip Institute of Technology and Research Centre, Nashik, Maharashtra, India" titled as PREPAID & POSTPAID BILLING FOR EV CHARGING STATION.

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