ISSN (Online): 2456-0448
International Journal Of Innovative Research In Management, Engineering And Technology
Vol. 9, Issue 10, October 2024

Next-Generation Online EV Charging Slot Management Framework

[1] R.Kalaiyarasi , [2] S.Janakiraman
[1] Student: Department Of Mca, Er Perumal Manimekalai College Of Engineering(Autonomous) ,Hosur, Tamil Nadu, India
[2] Assistant Professor, Department Of Mca, Er Perumal Manimekalai College Of Engineering(Autonomous),Hosur, Tamil Nadu, India

Abstract: ***With the rapid adoption of Electric Vehicles (EVs), the need for an efficient and robust charging infrastructure has become essential to support the growing demand for E-Mobility services. However, the current EV charging stations face several challenges, including long waiting times, charging delays, uneven charge scheduling, and an unequal distribution of charging stations. These issues are particularly prevalent during peak hours, leading to increased queues and extended waiting times for EVs. To address these challenges, this project aims to design a comprehensive framework for an advanced online EV charging slot booking system. The proposed system leverages a stochastic queuing model to optimize the charging process at stations. By formulating an objective function that considers charging time, cost, queuing delay, and distance, the system aims to minimize these inefficiencies while maximizing the overall user experience. Additionally, the project introduces a cloud-based Charging Station Management platform that will network and manage multiple charging stations, facilitating real-time charging forecasts and efficient scheduling. This server-based approach will reduce waiting times, improve resource allocation, and help prevent EVs from running out of battery on the road. Ultimately, the proposed system aims to provide a cost-effective, scalable, and user-friendly solution for optimizing EV charging infrastructure.***

I. INTRODUCTION

An electric vehicle (EV) is a vehicle that runs on an electric motor powered by rechargeable batteries instead of using internal combustion engines that run on fossil fuels. EVs are becoming increasingly popular due to their low environmental impact, improved performance, and reduced operational costs. The batteries that power EVs can be recharged by plugging the vehicle into an electric power source, such as a charging station, or by regenerative braking, which captures the kinetic energy of the vehicle during braking and converts it into electrical energy to recharge the batteries. EVs are available in a range of types, including all-electric vehicles, plug-in hybrid electric vehicles, and hybrid electric vehicles.

II.SOFTWARE ANALYSIS

Software analysis tools help analyze, evaluate, and understand software systems to improve their quality, maintainability, and performance. They assist in identifying bugs, vulnerabilities, code smells, performance bottlenecks, and other issues in the software development lifecycle. Here are some categories of software analysis tools and popular examples:

1.Dynamic Analysis Tools: These tools analyze software during runtime to evaluate performance, memory usage, and dynamic behaviour.
2.Performance Analysis Tools: Focus on assessing and optimizing software performance.3. Reverse Engineering and DecompilationTools Analyse binaries or compiled code to understand software behaviour.

lII. EXISTING SYSTEM

First Come First Serve (FCFS) priority for charging.
In “Recharging Phase”, each CS performs scheduling for EVs already parking herein based on the FCFS order, or even with smart method by knowing the anticipated EVs arrival information (as included in EVs reservation information).

Admission Control Algorithm

The admission control mechanism can be viewed as a virtual scheduling procedure. Whenever a new task i arrives, it will be put into an active scheduling task set I together with the existing admitted tasks. Then, all the tasks in I will be scheduled by the corresponding scheduling algorithm. Since each admitted task must achieve the requested SOC while departure, if any existing admitted task or the newly arrived task itself cannot be charged to its requested battery SOC at the departure, the new task should be declined of service; otherwise, it should be admitted.

State on Charge

The proposed real-time EV charge scheduling depends upon the battery dynamics and availability of charging slots. Based on the scheduling management facility, the system will deliver the information to the user regarding the nearest charging station, best cost function and booking slots with respect to estimated vehicle battery SOC.

Electric Vehicles Recharge Scheduling with Time Windows (EVRSTW)

It is closely related to the resource allocation and resource constrained scheduling problems. EVRSTW, in its special case, belongs to the class of Complete problems, meaning that exact methods are usually unable to cope with large problem instances in reasonable time, and display unpredictable runtimes. In order to build a real-world dynamic system based on user requests and almost immediate system responses, we need to find methods which can operate within a short, bounded execution time.

IV. PROPOSED SYSTEM

Proposed the Framework and Architecture of the Next-Generation Communication based Online EVs Charging Slot Booking at Charging Station Find the nearest charging station.Deep Q- Learning Model to find the nearest charging location with user defined constraints Reserve charging time, Navigation to the location, Charging limit setup (amount of energy, amount, time), Flexible payment system (payment gateway, Cash);Live monitoring of charging during other activities Additionally, a geo-dashboard shows geographically distributed EV charging stations and identifies the nearest EV charging station for a driver.

V. MODULES

1.EV Web App

This innovative solution encompasses a user-friendly interface allowing for efficient user registration, authentication, and real-time updates on charging space availability. The system facilitates easy reservation and booking, guiding users to their designated parking spots through integrated mapping and navigation services.Secure payment processing ensures a hassle-free transaction experience. Meanwhile, an intuitive admin dashboard empowers administrators to monitor and manage parking spaces effectively.

2. Access Control

2.1. Registration

In this module describe the user registration process. User/Admin register the information like a user name, mobile number, mail id, etc.

2.2. Login

User/Admin was registered into this website after that they are receive the notification via SMS/email id.The user/admin can login in this page. It checks whether the username and password are correct, if correct allows the user/administrator to update or view the details.

3. Charging Station Management

EV Service Provider Register the charging station with this module.Charging station management module is designed to manage and optimize the operation of EV stations. The module can be integrated into a larger EV network

4.. Tariff management

In the context of a EV web app, tariff management would involve establishing and overseeing the pricing structure for charging services. This could include hourly rates, daily rates, special event pricing, and any other factors influencing the cost of charging. Additionally, integrating a transparent and user-friendly tariff display within the application is crucial for providing customers with clear information on charging cost.

5. Charging Slot Finder

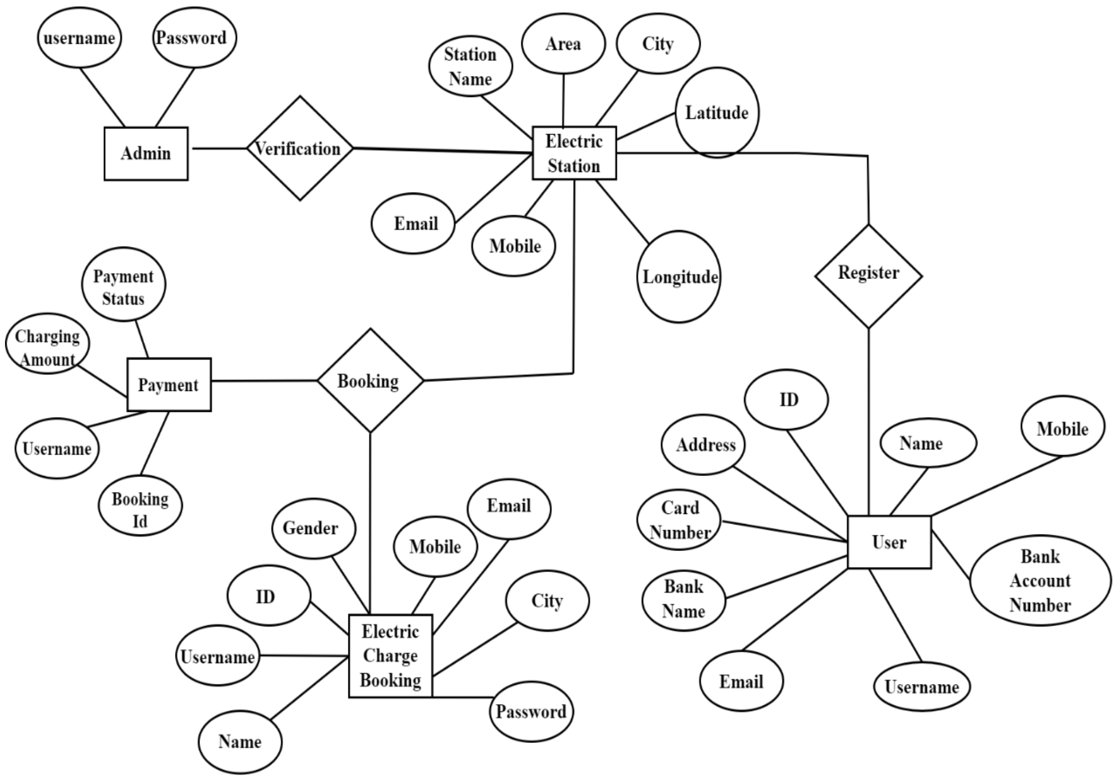
5.1. Location-based search: Users can search for parking slots near their current location or a specific address.

5.2. Station availability: Real-time information on the availability and status of charging space, including whether a space is in use or out of order.

6. Charging Slot Simulator

A charging slot simulator is a GUI that shows Slot Usage of Car. To simulate the charging process for their vehicle at a EV station.Through this the space.

ARCHITECTURE DIAGRAM



VI. RESULT

An Electric Vehicle (EV) Slot Management Framework typically refers to a system or methodology designed to optimize the allocation of charging slots, parking spaces, or other EV-related resources in public or private spaces. It often involves a combination of software tools, real-time data, and algorithms to ensure efficient usage of limited resources while minimizing user inconvenience.

VII. CONCLUSION

In conclusion, the Electric Vehicle Charging Slot Scheduling System is poised to revolutionize the landscape of Electric Vehicle Charging Stations (EVCS). By incorporating cutting-edge technologies such as stochastic queuing algorithms, the system brings forth a new era of efficiency, reliability, and user-centric charging experiences. For Web Administrators, the system provides a robust platform for seamless station management, from approval processes to real-time slot optimization. The ability to generate comprehensive reports enhances decision-making, contributing to the overall operational intelligence of the charging infrastructure. Charging Station Owners benefit from a user-friendly interface to manage their stations dynamically. The integration of Stochastic Queuing algorithms ensures optimal slot prediction, preventing unnecessary waiting times and optimizing resource usage. The system's cloud-based architecture allows for scalability, accommodating a growing network of charging stations. For EV Users, the system offers an intuitive and convenient experience. From locating suitable charging stations to transparent tariff information and real-time slot booking, the system prioritizes user satisfaction. Timely notifications and feedback mechanisms enhance the overall user journey. This project stands as a testament to the convergence of technological innovation and sustainable mobility. By addressing challenges associated with EV charging infrastructure, the system plays a pivotal role in fostering the widespread adoption of electric vehicles. Its forward-thinking approach, coupled with a user-centric design, positions it as a cornerstone in the ongoing evolution data.

REFERENCES

J. Liu, G. Lin, S. Huang, Y. Zhou, C. Rehtanz, and Y. Li, ``Collaborative EV routing and charging scheduling with power distribution and trafc net- 991 works interaction," IEEE Trans. Power Syst., vol. 37, no. 5, pp. 3923 3936, 992 Sep. 2022.

M. Rezaeimozafar, M. Eskandari, and A. Savkin, ``A self-optimizing scheduling model for large-scale EV fleets in microgrids," IEEE Trans. 984 Ind. Informat., vol. 17, no. 12, pp. 8177 8188, Dec. 2021.

J. Liu, H. Guo, J. Xiong, N. Kato, J. Zhang, and Y. Zhang, “Smart and resilient EV charging in SDN-enhanced vehicular edge computing networks,” IEEE Journal on Selected Areas in Communications, vol. 38, no. 1, pp. 217–228, 2020.

B. Hashemi, M. Shahabi, and P. Teimourzadeh-Baboli, “Stochasticbased optimal charging strategy for plug-in electric vehicles aggregator under incentive and regulatory policies of dso,” IEEE Transactions on Vehicular Technology, vol. 68, no. 4, pp. 3234–3245, 2019.

Y. Cao, T. Wang, O. Kaiwartya, G. Min, N. Ahmad, and A. H. Abdullah, “An ev charging management system concerning drivers trip duration and mobility uncertainty,” IEEE Transactions on Systems, Man, and Cybernetics: Systems, vol. 48, no. 4, pp. 596–607, 2018.

D. A. Chekired and L. Khoukhi, “Smart grid solution for charging and discharging services based on cloud computing scheduling,” IEEE Trans.on Industrial Inform., vol. 13, no. 6, pp. 3312–3321, Dec. 2017.