



A Smart EV Charging Slot Booking System

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ABSTRACT—

We all know very well that due to the use of conventional vehicles that run on petrol or diesel fuel, the fuel is made up of crude oil or fossil fuels, but the fact is that the resources of these fuels are decreasing, so the world is moving towards electric vehicles. The electric vehicles are pollution-free, as well, as they do not require fossil fuels.

Due to that, the electric vehicles are becoming more popular in all domains. Also, the government promotes the EV vehicles. As the electric vehicle becomes more popular, the rate of the EV components and the price of the electric vehicles are reducing day by day, so people take a much greater interest in the electric vehicles, and electric vehicles become the future of the automobile industry.

Electric vehicles run on lithium-ion batteries, which require an electric charge to store energy, but the problem these days is that the batteries take much longer to charge. Currently, most EV vehicle owners charge their vehicles overnight, but charging stations will be required in the future. So there is an issue with the charging time if someone is charging their vehicle at the station; it takes time to charge, so it is not possible to wait, so we created an application that provides a platform for the users as well as the station owners to generate slots and book those slots. This makes the process much easier; it helps us to book your charging slot by searching for the station or a nearby station.

Keywords: EV Charging, Slot Booking

I. INTRODUCTION

The EV charging slot booking system is a convenient and efficient way to manage the limited resources of charging stations. It allows electric vehicle owners to reserve a charging slot in advance, reducing congestion and waiting times at the stations. This system is a great way to promote the widespread adoption of electric vehicles by making it easier and more convenient to charge them. It has the potential to revolutionize the way we charge our electric vehicles. The EV charging slot booking system is a digital platform that allows EV owners to reserve a charging slot in advance, reducing congestion and waiting times at charging stations.

It works by allowing users to log in to the platform, select the charging station they wish to use, and book a time slot that suits their schedule. The system also provides real-time updates on the availability of charging stations, allowing users to plan their charging needs accordingly. The system has the potential to revolutionize the way we charge our electric vehicles and the impact of the system on the electric vehicle industry and the environment.

The EV charging slot booking system is a technological solution to the challenges of electric vehicle charging, such as the limited number of charging stations and congestion. It is environmentally friendly and contributes to reducing air pollution and mitigating climate change, but there are drawbacks such as cyber attacks and misused charging slots.

A. Motivation

[2] Electrical Vehicles (EVs) have several advantages over the traditional gasoline powered vehicles. Realizing the above, regulators (e.g. Federal Energy Regulators Commission) are providing incentives to the customers to switch to electric vehicles. Manufacturers (e.g. Tesla, Nissan) are increasingly developing EVs equipped with superior technologies. [3] Batteries have become the popular form of electrical energy storage in EVs. The evolution in city transportation has boosted over the last few decades which in turn increased the growth of societies and industry. Since battery is a commonly used device for storage of energy calculation of Status of Charge plays a vital role in the future

II. LITERATURE SURVEY

Today we see that the price of everything is increasing day by day as we know the prices of the fuels in every type also increasing there for everyone in India who are not so rich facing the financial problems because of the spending of more money on everything due to the inflation. As a part of inflation it is difficult to use the petrol or diesel vehicles. Also the world is facing the lack of fossil fuels due to that the world is shifting towards the electric vehicles the main reason in that is electric vehicles are pollution free as well as they do not need the fossil fuels like petrol or diesel

The electric vehicles runs on the electric batteries .Now a days the electric vehicles becomes more popular that the conventional vehicles so the popularity makes the component of the electric vehicles are cheaper day by day for the more production of the electrical vehicles and make it budget friendly. Electric vehicles need the battery charging from the electricity and current time it is time consuming process the peoples who uses the electric vehicles use the overnight charging option at home but the Indian road network is so vast it is up to 57 lakes kilometer so it is not possible to travel more than 500 kilometers with in the one full charge of the battery then there is need of the electric charging stations for recharging the electric vehicles. Electric car charging stations are public charging stations for electric cars. With the spread of electric cars, electric car charging stations are becoming the focus of development in the automotive industry and the energy industry. Electric car charging stations can better solve the problem of fast charging, energy saving and emission reduction as per the companies provide charging time of vehicles is as follows in the table

Sr. No.	EV Automotives	Capacity	Charging Timing
1	Tata Nexon EV	30.2 kWh	8.5 hours @ 230V
2	Tata Tigor EV	26 kWh	8.45 hours @ 230V
3	MG ZS EV	50.3 kWh	11 hours @ 230V
4	Kia EV6	77.4 kWh	9 hours

As we seen above the average time of every automotive is near by 9-10 hours but as the use of electrical vehicle increasing the time of the charging becomes decreasing because of the advance technologies are including in the vehicles so it is possible that in future that time becomes very less for charging. There is also charging stations for electric cars are stations where electric cars are charged, similar to petrol stations today. Charging stations can be divided into four sub modules according to their functions: Distribution System, Charging System, Battery Scheduling System and Charging Station Monitoring System. In charging stations, there are generally three ways to charge cars: normal charging, fast charging and battery replacement. Normal charging is AC charging with 220V or 380V voltage. Fast charging is usually DC. The main equipment of the charging station includes chargers, charging posts, active filtering devices and current monitoring systems. Public charging stations for electric cars and charging columns for electric cars are two concepts. Charging columns for electric cars are placed on the ground and provide AC electrical energy for electric cars with built-in chargers by using a special charging interface and line mode. They have appropriate communication, charging and safety protection functions.

[1] The city fast charging station is large and complex in order to enhance the user experience, the intelligent billing and settlement system needs vehicle guidance and also consider other related functions, for example, the system should have charge status reminder function, promptly remind the user to take timely removal of the vehicle, reduce other users waiting time. Inbound and outbound require vehicle identification.

III. SYSTEM DESCRIPTION

The EV charging slot booking system is a digital platform that allows electric vehicle owners to reserve a charging slot at a charging station in advance. The system works by enabling users to log in to the platform, select the charging station they wish to use, and book a time slot that suits their schedule. The system also provides real-time updates on the availability of charging stations, allowing users to plan their charging needs accordingly.

Once a user books a charging slot, the system sends a confirmation message to their registered email or phone number. The system also sends reminders to users prior to the booking time to ensure that they do not forget to charge their electric vehicle.

The EV charging slot booking system is designed to manage the limited resources of charging stations, reduce congestion, and reduce waiting times at charging stations. The system ensures that users have access to a charging slot when they need it, making it easier and more convenient to charge their electric vehicles. The system is environmentally friendly, reducing air pollution and mitigating climate change.

The EV charging slot booking system is a technological solution to the challenges of electric vehicle charging, such as the limited number of charging stations and congestion. While there are some concerns regarding the system, the potential benefits outweigh the drawbacks. As technology advances, the EV charging slot booking system could become even more efficient and effective, making it an indispensable tool for electric vehicle owners.

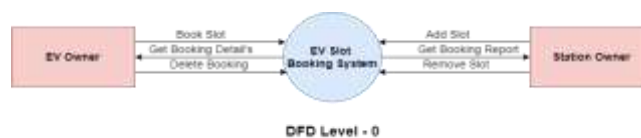


Fig. 1. DFD Level - 0

A. USER INTERFACE WEBSITE

The user interface of an EV charging slot booking system is a crucial aspect of its functionality. It plays a significant role in attracting and retaining users, ensuring the system's accessibility, and facilitating the booking process. In this section, we will examine the key features and components of the user interface of an EV charging slot booking system.



Fig. 2. Flowchart

Homepage: The homepage of the EV charging slot booking system is the first point of contact between the user and the system. It should be visually appealing, informative, and easy to navigate. The homepage should display the system's logo, a brief description of the system's functionality, and a call-to-action button that prompts users to sign up or log in.

Registration and Login: The registration and login process should be straightforward and secure. The system should prompt users to enter their personal information, such as their name, email address, and phone number, and create a password. The login process should be secure and require users to enter their credentials.

Charging Stations: The user interface should display the available charging stations in the location selected by the user. The system should provide information on the charging stations, such as the location, type of charging connector available, and pricing. Users should be able to filter the charging stations based on their preferences and needs.

Booking Process: The booking process should be simple and intuitive. Users should be able to select the charging station, date, and time slot that suit their schedule. The system should provide real-time updates on the availability of charging slots, allowing users to make informed decisions about their booking.

Payment Options: The user interface should provide users with various payment options. The system should support secure online payments, credit/debit card payments, and other payment options such as mobile wallets.

Confirmation and Reminders: The system should send confirmation messages to users' registered email or phone number, along with reminders before the booking time. The reminders should ensure that users do not forget to charge their electric vehicles and arrive at the charging station on time.

User Dashboard: The user dashboard should display the user's booking history, upcoming bookings, and payment history. The dashboard should also allow users to make changes to their bookings, cancel bookings, and request refunds if necessary.

Accessibility: The user interface should be accessible from any device, including desktops, laptops, tablets, and smartphones. The system should have a responsive design that adjusts to the screen size of the device used by the user.

Security: The user interface should be secure, protecting users' personal and financial information. The system should have robust security features such as SSL encryption, two-factor authentication, and regular security updates.

In conclusion, the user interface of an EV charging slot booking system is a critical component of its functionality. It should be user-friendly, informative, accessible, and secure. The system should provide real-time updates, easy navigation, a variety of payment options, and access to help and support. The user interface should be designed to enhance the user experience, making it convenient and efficient for users to book and manage the charging of their electric vehicles.

IV. RESULTS

We can search the station by using the state and city names, or if we know the pin code, we can search by using that, as shown in figures 13 and 14.



Fig. 3. Search by State and City



Fig. 4. Search by Pincode

When we search for a station in a specific city, all the stations available in that city will be listed with information like name, address, route, and booking.

When we select the route, it takes you to a map that already points out the station; we only need to access the current location, and then it gives a path from the current location to the destination, as shown in Figure 5.



Fig. 5. Path from Source to Destination

It shows the path from your current location to your destination, as well as the various paths that will get you to the station in the shortest amount of time.

As shown in Figure 6, we use a SQLite database for storing the user data as well as their booking. We use SQLite because the data is stored on disc rather than on a server. So it helps to fetch the data easily or quickly.



Fig. 6. SQLite Database

In this, we also store different information like station data and slot numbers. Users need to specify the slots in which they want to recharge their cards. Here, the user can only book the slot, and the admin has the power to delete or reserve the specific slot.

As shown in Figure 7, we use a Stripe payment gateway that provides a simple UI and an easy transaction gateway to the user. In this gateway, all the transactions of the user are recorded.

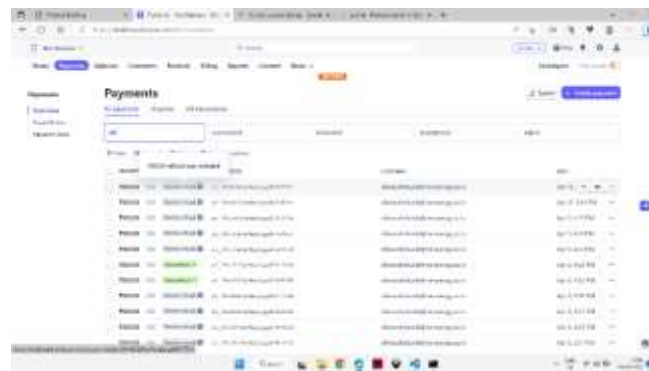


Fig. 7. Payment Gateway

So it is helpful to the user to know about the transaction, and from there we can refund the transaction if the user declines the booking.

V. CONCLUSION

The EV charging slot booking system is a convenient and efficient way to manage the limited resources of charging stations. The system allows electric vehicle owners to reserve a charging slot in advance, ensuring that they have access to the charging station when they need it. The system also helps to reduce congestion and waiting times at the charging stations, making the charging process faster and more convenient for everyone. Overall, the EV charging slot booking system is a great way to promote the widespread adoption of electric vehicles by making it easier and more convenient to charge them.

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