Finding Nearby Charging Stations and Slot Booking for EV Vehicles

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Abstract— The application of EVs is becoming more widespread, establishing themselves as a sustainable means of transportation. But one of the main obstacles faced by EV owners is the accessibility and availability of charging points. In this research, we present the development and implementation of EV charging point finding app using the Flutter framework. The app leverages the Google Maps API to showcase the locations of nearby charging stations while providing comprehensive information, including details on type of connector, availability, and pricing. Furthermore, the app enables users to filter outlets to be charged in line with their preferences and report any inaccuracies or out-of-service stations. There was user testing to assess the app's effectiveness and usability, and the results indicated that the app was user-friendly and furnished accurate, up-to-date information on charging points. The utilization of this app possesses the ability to alleviate the issue of charging point's availability and enhance the overall experience of owning an EV.

Keywords— Android Studio, Google Maps API, EV Charging points, Flutter Framework.

I. INTRODUCTION

There are presently a very few charging ports located in India, which presents a challenge for individuals seeking affordable and practical charging options. This problem is not limited to finding a charging station; it also includes the time-consuming process of recharging electric vehicles (EVs). Due to user inconveniences caused by the longer charging times for EVs, slot reservations are now required in order to control charging schedules. The quantity of recharging locations is rising in India Because of the, country's growing electric vehicle industry. Increasing the difficulty for users attempting to find a suitable charging station online, these recently registered charging stations frequently fail to show on virtual maps. To solve this matter, an app for EV charging points has been developed. The objective of this mobile application is to help EV owners to find and control charging station services. The app provides vital details regarding the availability and precise locations of the charging points along with the information of their charging speeds and related expenses. Additionally, it helps users find the closest charging station via navigation. Furthermore, users can pay directly through the app for charging services, doing away with the need to use cash or credit cards at the station. Additionally, the app might maintain a history of the user's car charging sessions, allowing them to track their consumption and costs. For EV owners, the primary purpose of an EV charging location app is to expedite and simplify the procedure for charging.

II. METHODOLOGIES

The advancement of EVs and charging technology has advanced significantly in the last ten years. Since they can use regenerative braking to recharge their batteries while in motion, electric vehicles not only offer superior power delivery but also prove to be notably more potent than alternative kinds of transportation. Even with all of their benefits, electric cars are still lacking in certain areas, like accessibility to charging stations. Thus, we had the notion to create an app that directs users to electric vehicle charging points and, thanks to its special features, makes the process enjoyable. With this approach, the user may search for or reserve a time slot in advance at the point of charging and to manage all of their EVs within the app

A. Modules and Their Description
The system is made up of two main modules and their submodules as follows:
1. Admin:
- Log in
- Oversee stations/ Find stations
- View reservations

2. Entity/User:
- Sign up.
- Log in.
- Oversee EV automobiles.
- Locate stations view reservations.

B. TECHNOLOGY STACK
Flutter: Google developed a cost-free and open-source framework in order to create mobile applications called Flutter. It utilizes a single codebase to develop high-fidelity, high-performance apps for desktop, web, Android and iOS platforms using the Dart programming language.

Android Studio: Android Studio is the name of the official Android app development environment. It offers a comprehensive environment with features like

code editing, debugging, and testing, making it an essential tool for developers.

Android Studio is compatible with two primary programming languages i.e., Java and Kotlin. Java is a widely-used and adaptable language which has been used traditionally for Android development. JetBrains introduced Kotlin, which has become the preferred language due to its safety features, conciseness, and interoperability with Java. This allows developers to switch between Java and Kotlin seamlessly inside the same project, which increases flexibility.

Google Maps API: An effective tool for incorporating dynamic maps and geolocation services into applications is the Google Maps API. With its help, developers can improve location-based features in their projects and make personalized, interactive maps.

Google Play Services: Google Play Services equips Android developers with a diverse range of SDKs, enabling app creation, bolstering user privacy and security, fostering engagement, and promoting app expansion. These distinctive SDKs necessitate the integration of a lightweight client library into our apps. During runtime, this client library communicates with the SDKs implementation packages within Google Play Services, minimizing footprint

III. LITERATURE SURVEY.

We highlighted a few of the articles and went through surveys that are accessible right now on Finding Nearby Charging Stations and Slot Booking for EV.

Er. Ashwini Deokate et el. [1] Easily find, reserve, and pay for charging slots using our app to experience seamless electric vehicle charging. In the EV market, it's the ideal choice for customer ease and loyalty thanks to its improved AI assistance and emergency features.Vinod Kumar et el.[2] This study presents a user-friendly, Flutter-based EV charging station finding app that makes use of the Google Maps API and provides comprehensive station information. Its simplicity of use and accuracy in delivering current information on charging stations were validated by user testing. Sumit S. Muddalkar et el.[3] The lack of electric charging stations makes it difficult for EV users to locate easy and accessible charging choices, especially in private settings like residential parking lots and business areas. This scarcity presents difficulties, affecting customers' ability to save time and money when looking for nearby charging stations. Dwi Styoko et el.[4] The impact of technology on the transportation

sector is seen by the creation of effective systems. One example is the online ticket purchasing system offered by Bus Hiba Utama, which makes use of Location Based Service (LBS). By using user location data, this method improves accuracy and customisation. Binal Vansola et el.[5] The study looks at the best locations for EV charging points in the National Capital Territory (NCT) of Delhi, taking investment expenses and charging demand into account. With varying expected EV penetration rates, it seeks to optimum coverage for mixed traffic flow using a set cover problem technique and GIS analysis. Ashwani Kumar et el.[6] The method for solving an optimization problem presented in this paper makes use of heuristic algorithms. The system's components include EV routing, communication, and EV/charging station modeling. It does, however, lack specific information regarding the algorithms applied in the given situation. Daqing Gong et el.[7] The study aims to improve accessibility and sharing by strategically placing charging points to address the mismatch between supply and demand in PUEVs. By effectively placing stations at the right places, the infrastructure for charging can be enhanced overall. Dr. Omar A. Ibrahim et el.[8] The article presents an Android location services application that integrates Google Maps and enables users to engage with the map and utilize navigation functionalities. It is implemented using the JSON, MySQL Database, Maps API by Google, Google Direction API, PHP, and Android as the client and PHP/MySQL as the server in a client/server architecture. Monika Sharmaet el.[9] The paper describes a method of tracking a location that uses GPS, GSM, and the API for Google Maps. It also includes information on methods such as calculating geographic coordinates and using reverse geocoding to retrieve addresses.It features a block diagram that illustrates the design of the proposed system, along with an overview of relevant works. Kai Yuan et el.[10] A framework for charging guiding strategies that makes use of road topology, geographic data, and the charging point's capacity is provided in this document. To ensure that guide EV users based on charging costs, it uses the Monte Carlo technique for EV characteristics, OD analysis for charging demand distribution, and the introduction of a stack queue model for dynamic charging station queues.

IV. CONCLUSION

The project's principal aim is to provide EV users, with a useful and incredibly convenient product. Along with offering the user a service, This application will serve as an interactive system by the administrator. It is useful to locate in addition to proceed to the stations and to book their slot for charging their EV. Additionally, this app will be expanded in the as a commercial product with additional features in the future that will additionally make use of subscription packages and features like charge additionally, which will increase sales and profits.

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