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Charging Station Locator and Booking Solution for EV and CNG VehicleUsing Flutter

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ABSTRACT: Electric vehicles (EVs) are becoming a popular mode of transportation. However, one of the main concerns for EV and CNGowners is the availability and accessibility of charging stations. In this work, we present the development and implementation of an EV and CNG charging station finder application using the Flutter framework. The app uses the Google Maps API to display the location of nearby pay stations and provide details such as connection type, availability and price. The app also allows users to filter chargingand CNG stations according to their preferences and report charging stations as false or unserviceable.User testing is done to evaluate the usability and performance of the application. The results show that the app is easy to use and provides accurate and up-to-date information on payment facilities.

KEYWORDS: FlutterFramework, Google Maps API, CNG, EV Charging Station
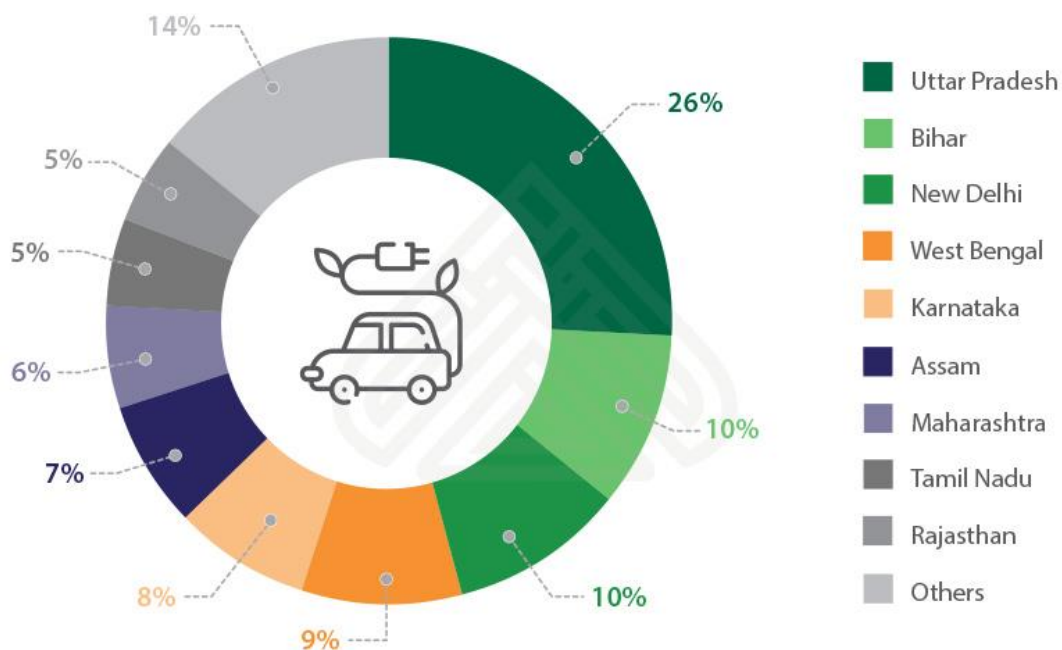
I. INTRODUCTION

The Indian car industry is the fifth largest in the world, and it is anticipated to be the third largest by 2030. India possesses the world's largest untapped market, notably in the two-wheeler category. This sector is open to 100 percent foreign direct investment under the automatic method. The infographic below provides an overview of the country's EV ecosystem. As of now there are very few payment centers in India and people cannot find suitable payment centers, this will save people time and money. The problem is not only to find the charging station, but also to fast-charge it because it takes hours for an electric car to charge. This makes it difficult for people to drive the electric car because it takes a lot of time, so it is necessary to hold the hole to charge the electric car. As the electric car market continues to grow in India, there are fewer and fewer charging stations available in India and the number of new charging stations is increasing, so the growth of charging stations is not on the virtual map. This puts users in the trouble of finding a place to pay. Electric vehicle (EV) charging station APP is a mobile application designed for EV owners to find and manage their charging stations. App provides information about the availability and location of toll booths, payment speed and cost of , and helps users navigate to the nearest toll booths. The also allows users to pay for their service directly from the app, eliminating the need to pay with cash or card at stations. In addition, theapplication allows them to follow the payment history of automobile users and track their usage and expenditures. The main purpose of the EV Charging Station app is to make charging as easy and convenient as for EV owners.

Electric Vehicle (EV) Pay Station is a mobile application designed for EV owners to use to find and manage their payment stations. The app provides information about the availability and location, charging speed and cost of charging station and helps users to direct to the nearest charging station. It also allows users to pay for services directly from the app, eliminating the 's need to pay with cash or credit card at the station. In addition, the application allows the user to track their usage and spending by tracking the payment history of their car. The main purpose of the EV Charging Station App is to make charging easier and more efficient for EV owners. In this article, we will focus on the main idea of the project that we will create. We have divided this article into chapters to show you the main idea of our study; The second part describes the research materials containing many documents, guidelines and analysis data related to our

plan, and the third part describes the process we will follow as the implementation of the project. The fourth section is the technology group and focuses on the technology that we will use in the project. The fifth part is a discussion where will talk about how we will use the project. Finally, we should focus on future work and conclude with an explanation of how we will make project available to the public. In this project, we will design and build an application that finds payment centers near the user's location. The app displays all nearby EV charging stations. Users can go directly to these payment centers. This app will provide a payment place for user Electric Vehicle by payment type and method.

Regional Registered EV Sales Jan-Dec 2020

Uttar Pradesh 26%, Bihar 10%, New Delhi 10%, West Bengal 9%, Karnataka 8%, Assam 7%, Maharashtra 6%, Tamil Nadu 5%, Rajasthan 5%, Others 14%

Source: Vahan Dashboard, JMK Research

Graphic© Asia Briefing Ltd.

II. LITRATURE REVIEW

The authors of [1] presented a charging management method for heterogeneous EVs that minimises the charging waiting duration (through preemption charging service). Based on the knowledge of EVs parked locally at CS's as well as those who make reservations for distant charging. This information aids in the planning of charging schedules for EVs that will occur early with waiting time.Flexibility in V2V coordination (with DTN (Delay Tolerant Network) nature) to send EV charging reservations. Our study addresses this issue over a longer time frame and employs low-cost V2V contact to satisfy the traffic requirements of dense networks that limit the breadth and service capabilities of RSUs.

The authors of proposed a model to evaluate the throughput performance of multiple vehicles sharing the wireless resources of an 802.11-based AP in a given mobility scenario, in order to capture the impact of road capacity, vehicle density, and vehicle relative speed differences on V2I communications throughput performance. As the scenario is one of transformation to a wholly grid-run EV network, the model integrates this design strategy to allow vehicle density network.

The authors of [3] expand on the use of V2I contact to collectively analyse ideal EV speeds and other essential steps to be conducted with minimal delays while mitigating hazards to power grid components caused by change in Spatio-temporal EV demand patterns.

The authors of [4] presented a set of requirements for the EV and charging stations to be shared through the contact network. This method investigated the impact of standardised and competitive pricing models on EV customers' chosen

range of charging sites, which was further influenced by charging distance from the CS. In this literature, a study was conducted to measure the distance between charging stations that can be scaled up depending on population density and economic circumstances that meet various accessibility scenarios. Such frameworks can then be capitalised on by the state government to utilise peak time payment prices in order to boost finances.

The authors of [5] explore the relevance of the likelihood that the adoption of EVs will pose threats to the current power system in the absence of two-way communications, and they propose a complete collection of tools and procedures that should be incorporated. A survey is used to establish a predicted market for EVs. The conclusions derived in the survey may be used to predict power grid instabilities and patterns of load demand profile, and a subsequent action plan can be formed based on them.

The authors of [6] propose a theoretical approach for reducing charging wait times by intelligently grouping geographically and temporally charging operations. It focuses on a theoretical study to articulate the problem of reduced waiting time in charge scheduling and to derive an upper bound efficiency. Our study focuses on slot booking scheduling, which simplifies this procedure by lowering charge time and collision scheduling.

In today's environment, every customer wants to design cross-platform mobile applications. Engineers are required to create the same system for several operating systems (OS). Google offers a solution in the form of Flutter. It is an open-source SDK for developing high-performance and dependable mobile apps for platforms such as iOS, Android, Linux, web, and Windows. [7]

Flutter has a variety of frameworks and widgets that make it simple to use and create code. In this research paper, we will look into flutter and its widgets. Electric car research and development have been encouraged as emerging technologies in Indonesia in recent years. To ensure flexibility, charging station (CS) infrastructure for electric vehicles (EV) must be provided. The communication of multiple brands into the central system makes managing the EV Charging Station difficult. The charging station management system (CSMS) was created successfully. Application development is utilised to create a tool in the form of a CSMS application called SONIK (electric vehicle charging operation system) to monitor and operate CS. [8]

The overall tendency is for a growth in the number of electric vehicles, but it is also important to extend the charging infrastructure. Certain issues develop in the electrical networks as a result of the building of additional charging stations, particularly in metropolitan areas. This study presents a taxonomy of charging station types as well as a Matlab model of a charging station supplied by a DC power source. [9]

III. METHODOLOGY

In this system, the user may manage all of his EVs within the app, as well as search for/book a charging station space in advance. The user may also look for an EV and CNG charging station by location, city, or kilometers. If you specify a source and destination, the system will generate a road map with charging stations along the way based on the km entered. All of the stations and slots will be managed by the administrator.

We have seen tremendous developments in electric cars and charging technologies over the last decade. Along with lowering pollution, electric cars offer superior power delivery and are significantly more efficient since they can use regenerative braking to recharge their batteries while driving.

Despite their numerous advantages, electric vehicles fall behind in areas such as charging station availability. Unlike traditional automobile owners, EV owners cannot recharge their vehicles at any petrol station. Drivers of electric vehicles must maintain their vehicles charged well in ahead of departure.

The necessity for infrastructure development, including as charging stations, is apparent.

This EV and CNG Charging Station app was created with Flutter to assist EV drivers in locating available charging stations around them. After identifying a charging station, users may reserve a charging slot at the station.

This approach can also help EV owners plan their travels more effectively. Users must only provide the source and destination. This technology generates a roadmap with all available charging stations along the route based on these two characteristics.
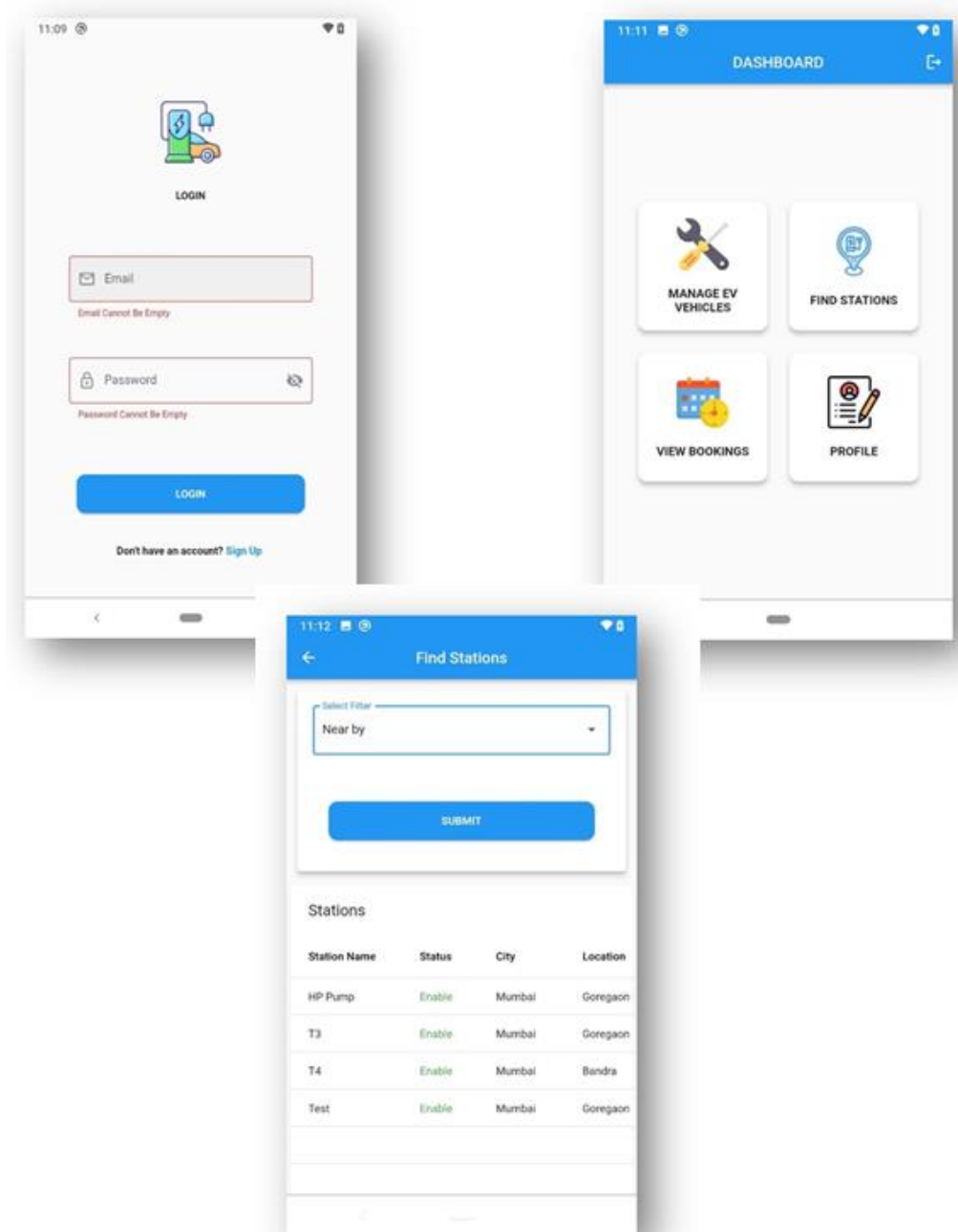
Fig.2. UI Designing

These features will make your app easy and reliable to use.

Registration: This is one of the most important EV and CNG charging station finder app. Every time a new user installs your app, they should be able to sign up for the app using their phone number or email id. They can register with their social media ID.

User Profiles: Users should be given the ability to fine-tune or change information at any time. Parking spaces, cars, etc. can upload their photos. Users must have all the settings provided in their profile.

Geolocation: It is a function where the user can get directions to the desired location. They also get feedback from the parking lot. They can learn the nearest parking lot or stop on the way.

Site Details: This feature helps users to know some information about the site they are visiting. They know the station's features, ratings, photos, and more. They also know the price of the best equipment, the location of the station and the name of the station.

Filter: This feature helps users get what they want by matching requirements. These filters have many different interests and can be easily selected.

Slot Reservation: This is the most important. Users should be allowed to reserve their slots to charge their cars without going anywhere. It helps them avoid long delays and save time.

User Ratings and Reviews: This feature helps users rate their experience with the stations they visit. It can help newcomers to understand the real situation of that station. The concept also gives garage owners an idea of what they need to improve to best serve their customers.

Multiple payment methods: This function helps users to get multiple payment methods. They can pay by any method they want. They can also pay through the app itself.

Push Notifications: This is also one of the most important. Users are notified about notifications, app offers, pre-orders and more.

Invoice History: This feature helps users to keep track of the bills they have paid. It helps them keep track of their energy use and how much they pay for their car. They can understand usage patterns and cycles.

$$eq.(3)$$

IV. CONCLUSION

The major goal of the project is to provide a helpful product for EV and CNG customers that will be extremely valuable to them. This app will not only serve the user but will also be utilized by the administrator as an interactive system. It can also create more data about users who own electric and CNG vehicles and charging station owners. It may be used to locate and navigate to stations. This software will be enhanced as a commercial product in the future with new features that will also employ subscription packs, as well as functions like charge and cool that will produce more cash

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