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NBA Accredited

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UNIVERSITY OF MUMBAI

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A Project Report on

ChargePlug- A Comprehensive Cross-Platform Application for Locating Electric Charging Stations

INFORMATION TECHNOLOGY

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1.Project Conception and Initiation

1.1 Abstract

Living in the 21st century, people are well acquainted with the technology. Technology has proved its importance by showing its benefits to the human race. The use of technology has become an integrated part of life. Technology has lent a helping hand to automobile developers to develop cars that can run on batteries and be charged using electricity. In the market, the scale of sales of such electric vehicles is booming. The latest strong performance of EV sales is due to the consumers' concerns regarding the hike in prices of petrol and gases. These EV cars thus require charging in locations along the road so that people can charge their cars as they use to fuel them. Being the initial stage of the rise of electric vehicles people are not aware of the locations of charging stations. Hence, through this project, we tend to build a comprehensive cross-platform application for locating charging stations of EVs in near in real-time. The mobile application have maps that helps the users quickly find the charging location. The application being in a form of a mobile application provides a lot of convenience, reliability and allows users to easily communicate. As per the constraint of the electric power distribution network, electric vehicle charging stations are restricted and it is difficult for new EV owners to discover the stations. So as to give information to users concerning the charging stations and to help them navigate, it developed a need for mobile applications to assist electric vehicle owners in these processes. This proposed EV Charging Station finder Application that helps EV owners to find a charging station close to them and set up a journey with several options.

1.2 Objectives

- To develop a login page for the user in application using Flutter.
- To get directions for navigating to nearby electric charging stations using Geolocation API.
- To setup booking slots for recharging electric vehicles using Flutter.
- To deploy the application on cloud server using AWS.
- To allow the owner/vendors to add the station details.

1.3 Literature Review

In this section, gists of ideas are covered from the various technologies used by authors. A few of them are summarized below.

• In paper[1], the tracking of the location of the user is useful in most applications, as it can provide valuable information about where the user is located at any given moment. This information can be used to tailor the user's experience to their location, providing them with relevant information or services that are specific to their location. There won't be a need for any purchase of a GPS device if the Geo-location API is used, the API can provide the same information as a GPS device. This is beneficial for many reasons, such as reducing the cost of the application, making it more accessible to users who may not have a GPS device, and making it easier to integrate the location tracking feature into the application. The tracking of location is done on the basis of the hosting device. Also without the GPS device, the location is obtained by Google's Online Service. This is achieved by using a combination of Wi-Fi networks, cell towers, and IP addresses to triangulate the user's location. This is useful in situations where a GPS device is not available or when the user's GPS signal is weak or unreliable.

1.3 Literature Review

• In paper[2], it summarizes the Electric Charging Station infrastructure locator as a project that aims to provide a tool for locating electric charging stations using a genetic algorithm. This algorithm is a computational method that mimics the process of natural selection and helps to optimize the location of charging stations based on a variety of factors, such as population density, traffic patterns, and existing infrastructure. This tool is open source, which means that interested users can access and modify the source code to meet their specific needs. It is also freely available, which means that users do not have to pay to use the tool. This makes it accessible to a wider range of users, including local authorities and governments, who may not have the resources to develop their own charging station infrastructure locator. The use of a genetic algorithm is particularly useful for assigning charging stations at a higher level, as it can consider a large number of variables and provide a more optimal solution than traditional methods. Additionally, the authors of the project encourage its use by local authorities of other cities, as it can help to promote the adoption of electric vehicles and reduce carbon emissions.

1.3 Literature Review

• In paper[3], the concept and methodologies that will be implemented are designed in a way that they will directly interact with the application. This means that they will 2 be integrated into the application's code and functionality, making them an integral part of the user experience. The implementation of these concepts and methodologies is also intended to create an application that is reliable, interactive, and easy to use for both users and vendors of electric charging stations. Reliability is crucial to ensure that the application functions correctly and provides accurate information to users and vendors. Interactivity is important to provide an engaging and user-friendly experience that encourages users to continue using the application. Ease of use is critical to ensure that the application is accessible to a wide range of users, regardless of their technical expertise or familiarity with electric vehicles. The architecture of the application will be adopted to develop and enjoy many services. This means that the underlying design of the application will be flexible and scalable, allowing for the addition of new features and services in the future. This is important to ensure that the application remains relevant and useful as the landscape of electric vehicle charging infrastructure evolves over time. In summary, the concept and methodologies that will be implemented in the application are designed to directly interact with the app, providing a reliable, interactive, and easy-to-use experience for users and vendors of electric charging stations. The architecture of the application will be flexible and scalable, allowing for the addition of new services as the electric vehicle charging infrastructure evolves.

1.4 Problem Definition

This study aims to minimize the car moving distances, and car can get charging stations directly. All EVs move in a linear route. The location sharing problem for the EV charging station says that with in a given time, a given number of EV charging stations are randomly assigned in certain areas. It must be determined how to minimize the moving distance for these EVs get charging based on the capacity of the battery, the position of the charging station and, position of the driver, demand (driver wanted position) and its priority, etc. Limited by mileage, EVs must visit charging stations before the battery runs out. One criterion for being a reasonable shared location is that there is insignificant variance in the access frequencies to different charging stations. The variables that are required for creating an application for finding electric-charging stations are : number of charging stations in nearby area , demand quantity in one time period, distance between the user and station.

1.5 Scope

As the number of EVs on the road increases, more people will require easy access to EV charging stations. As a result of this, applications that help users locate and navigate to nearby charging stations are likely to see an increase in user adoption. Also, Artificial intelligence (AI) can be used to predict charging station usage patterns, helping to optimize charging station placement and improve user convenience. Future applications could use AI to provide real-time data on charging station availability and predict future demand. As the number of charging stations grows, payment systems for EV charging will become more important. Applications that can integrate with payment systems and provide realtime data on payment options could become essential for EV drivers. Overall, the future of applications that locates nearby EV charging stations is bright, with opportunities for integration with other technologies and expansion into new markets. As more people adopt EVs, the demand for such applications is likely to increase, making them a valuable tool for drivers.

1.6 Technology stack

- Google Maps API
- Flutter
- Google Cloud Firebase
- Android Studio
- Dataset of E-charging Stations

1.7 Benefits for environment & Society

- Reduced carbon emissions: Electric vehicles (EVs) emit fewer greenhouse gases compared to gasoline-powered vehicles. By providing electrical charging stations, we can encourage the use of electric vehicles, thereby reducing carbon emissions and air pollution.
- Improved air quality: EVs produce zero tailpipe emissions, which means they do not release harmful pollutants into the air. This can help to improve air quality in urban areas, reducing the risk of respiratory problems and other health issues.
- Reduced dependence on fossil fuels: By encouraging the use of EVs, we can reduce our dependence on fossil fuels and move towards a more sustainable energy system.
- Increased energy efficiency: EVs are more energy-efficient than traditional vehicles, which means they require less energy to travel the same distance. This can help to reduce overall energy consumption and lower energy costs.
- Economic benefits: The deployment of electric charging infrastructure can create new jobs and boost the economy. Moreover, electric vehicles are cheaper to maintain than traditional gasoline-powered vehicles, which can help to reduce the cost of ownership.
- Increased accessibility: Providing electrical charging stations in public places and on highways can make EVs more accessible to a wider range of people, including those who do not have access to home charging facilities.
- Increased energy security: By reducing our dependence on imported oil, we can increase our energy security and reduce the risk of supply disruptions.

2. Project Design

2.1 Proposed System

Sharing charging stations with other users to charge their vehicles can be a good solution for routine usage of electric vehicles charging, In spite of there being a high demand for charging stations in cities they are not mostly vacant, while in the nearby rural areas, the stations are idle. Thus there was an urge to create an interface that can combine all this information and bring up a better solution. Hence, we came up with the idea of making a proper application. To create an application for finding EV charging stations on Google Maps the developer first need to integrate the app with Google Maps API into the application that will allow displaying maps and location information within the app. Gather data on EV charging stations, including teir locations, availability, type of charger, and other relevant information. This data can be sourced from existing charging station networks or obtained through 5 scraping websites and databases. Store the data collected in a database that can be easily queried and updated. Design a user-friendly interface for your application that allows users to search for charging stations by location, view their availability and type of charger, and get directions to the station. Implement a search functionality that allows users to search for charging stations by location and filter their results by availability, type of charger, and other criteria. Incorporate real-time updates into the application, so that users can see if a charging station is occupied or not. This can be achieved by integrating with existing charging station networks or by using real-time data from users.

2.2 Design(Flow Of Modules)

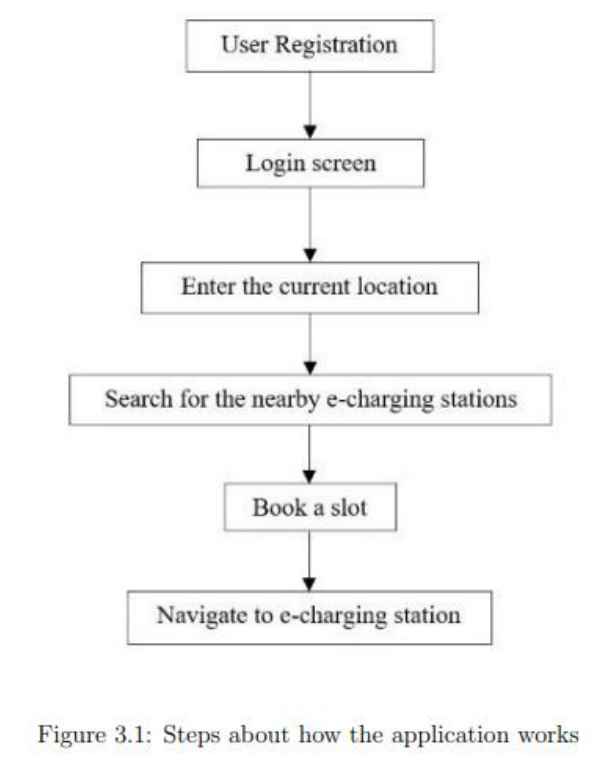
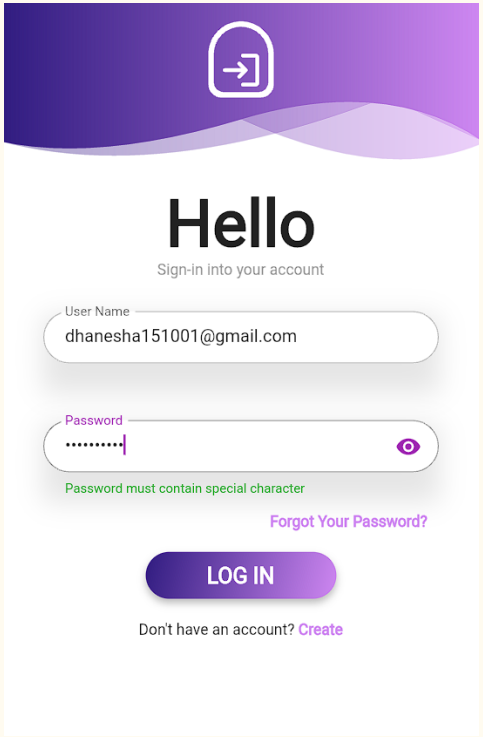
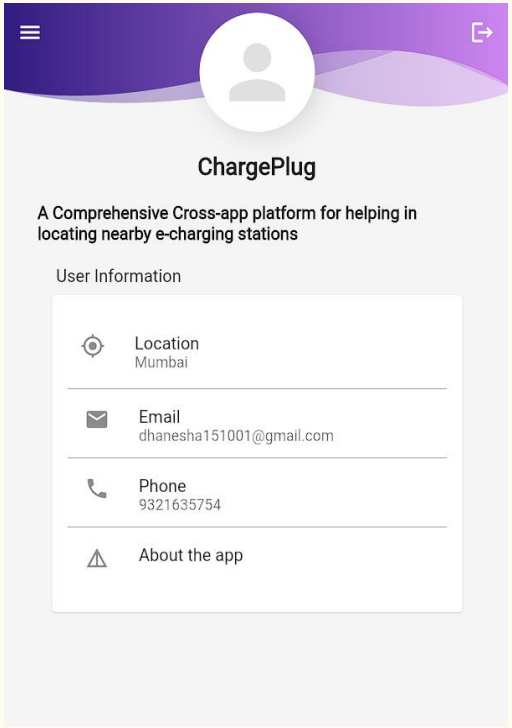
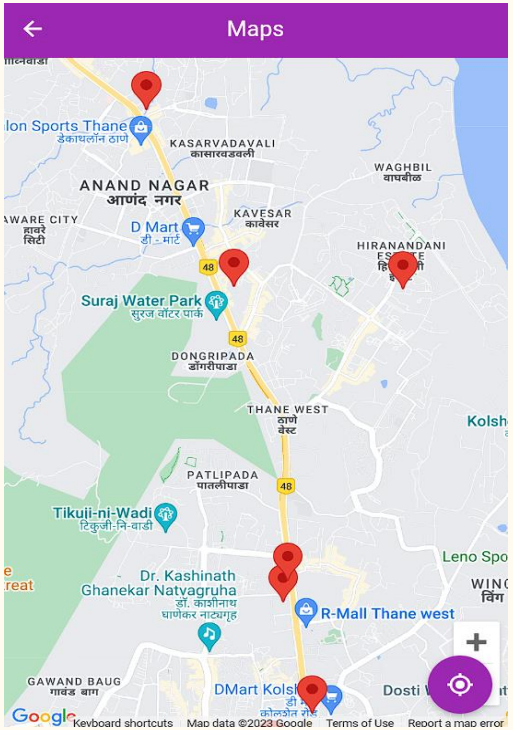


Figure 3.1: Steps about how the application works

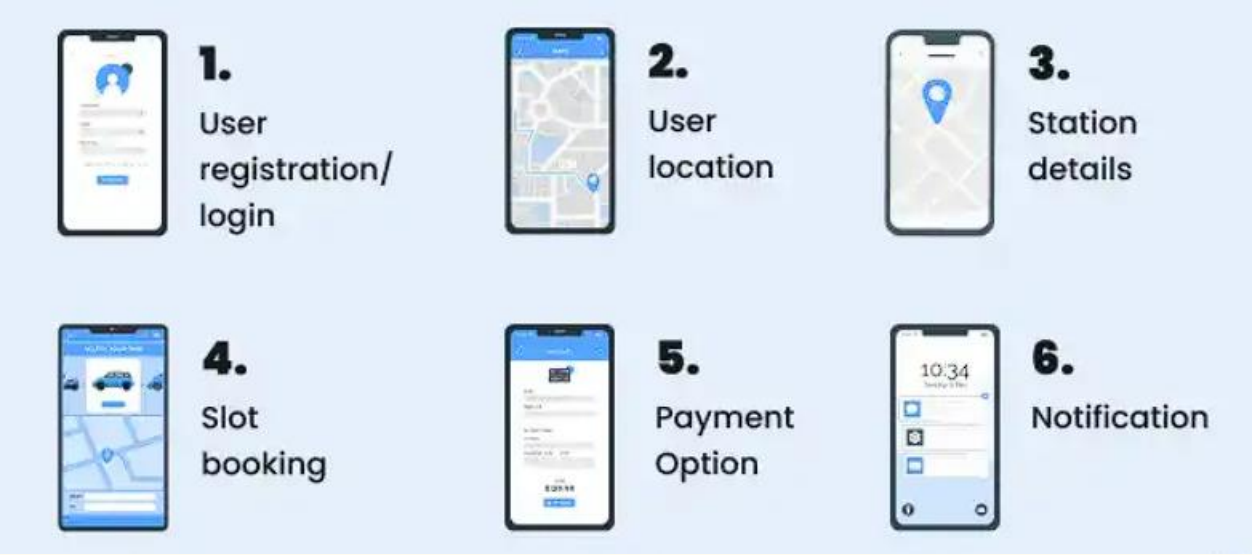
2.3 Description Of Use Case





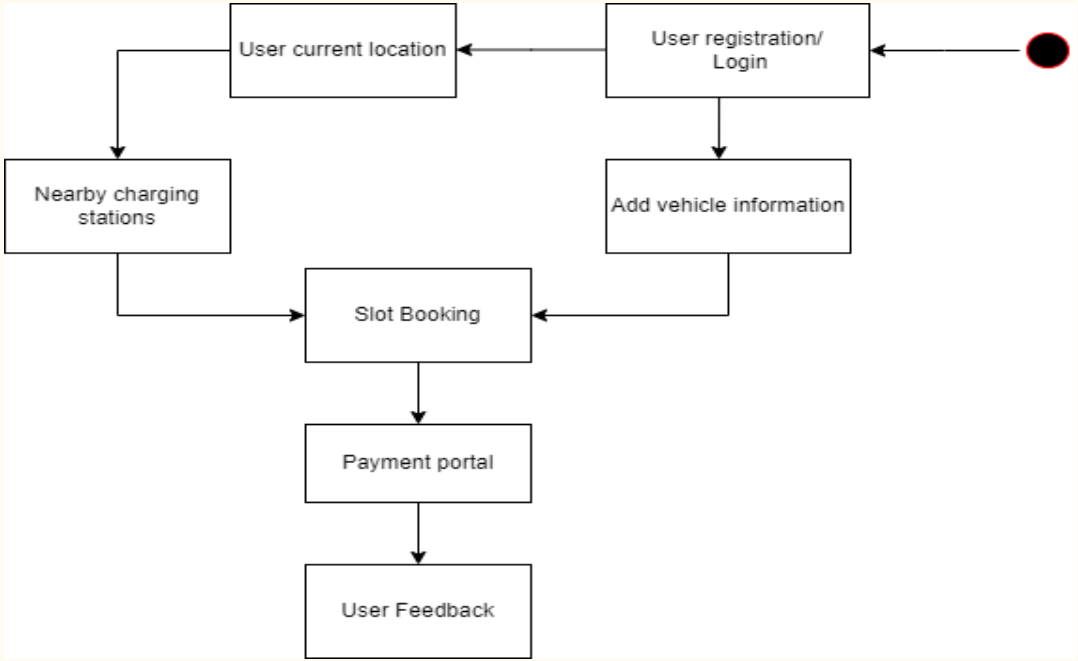


2.4 Activity diagram

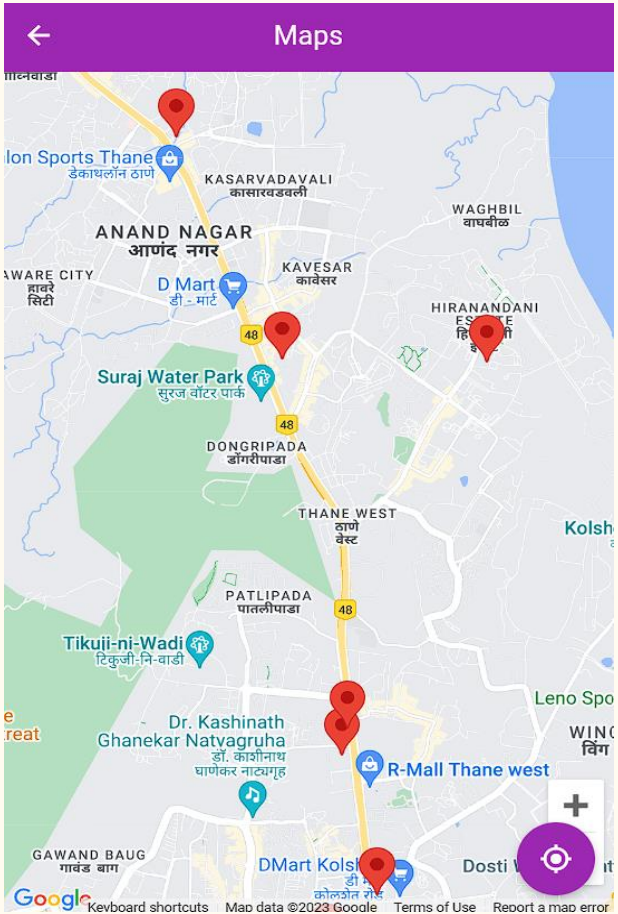


3. Implementation

3. Work Flow Activity



5. Result


Maps
KASARVADAVALI
कासारवडवली
ANAND NAGAR
आणंद नगर
WAGHBIL
वाघबील
KAVESAR
कावेसर
D Mart
डी - मार्ट
HIRANANDANI
Suraj Water Park
सुरज वॉटर पार्क
48
DONGRIPADA
डोंगरीपाडा
THANE WEST
ठाणे
वेस्ट
PATLIPADA
पातलीपाडा
Tikuji-ni-Wadi
टिकुजी-नि-वाडी
Dr. Kashinath
Ghanekar Natyagruha
डॉ. काशीनाथ
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6. Conclusion and Future Scope

Conclusion

In conclusion, making an application for locating electric charging stations for vehicles is a beneficial and necessary project in today's world. With the increasing number of electric vehicles on the road, having an application that can easily and accurately locate charging stations is crucial for the adoption of electric vehicles. The application developed has a user friendly interface and provides reliable and accurate charging station data, and real-time updates. Additionally, it is providing relevant information about the charging station, such as the types of charging ports available, charging speeds, and availability. By incorporating these features, the application is a valuable tool for electric vehicle owners, helping them find the nearest and most convenient charging station, and ultimately supporting the growth of the e-vehicle market

Future Scope

As the number of EVs on the road increases, more people will require easy access to EV charging stations. As a result of this, applications that help users locate and navigate to nearby charging stations are likely to see an increase in user adoption. Also, Artificial intelligence (AI) can be used to predict charging station usage patterns, helping to optimize charging station placement and improve user convenience. Future applications could use AI to provide real-time data on charging station availability and predict future demand. As the number of charging stations grows, payment systems for EV charging will become more important. Applications that can integrate with payment systems and provide realtime data on payment options could become essential for EV drivers. Overall, the future of applications that locates nearby EV charging stations is bright, with opportunities for integration with other technologies and expansion into new markets. As more people adopt EVs, the demand for such applications is likely to increase, making them a valuable tool for drivers.

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- GPS-Based Mobile Cross Platform Cargo Tracking System with Web-Based Application. A M Qadir, P.Cooper

Paper Publication

Paper entitled “**ChargePlug- A Comprehensive Cross-Platform Application for Locating Electric Charging Stations**” is presented in at “IEEE 8th International Conference for Convergence in Technology (I2CT) 2023” by “Pratham Nitin Dhanesha, Pavan Chopra, Shreya Desai and Prof. Manasi Choche and Dr. Kiran Deshpande”.

8th International Conference for Convergence in Technology (I2CT)

7th – 9th April 2023

Certificate

This is to certify that Dr./Prof./Mr./Ms. ***Pratham Nitin Dhanesha*** *has presented paper entitled* ***ChargePlug- A Comprehensive Cross-Platform Application for Locating Electric Charging Stations*** *in 8th International Conference for Convergence in Technology (I2CT) during 7th & 9th April 2023.*

Dr. Chanakya Kumar Jha
General Chair - I2CT

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Dr. Chanakya Kumar Jha
General Chair - I2CT

Thank You