An Android Application for Electric Vehicle Utilities

Madhusudan G [1], Manas Adiki[2], Saikiran K[3], Syed Affan Hameed[4], Isaaq Shariff[5]

[1] *Assistant professor, Dept. of Computer Science Engineering, JSS Science & Technology University, Mysore, India - 570006*

[2,3,4,5] B.E Student, Dept. of Computer Science Engineering, JSS Science & Technology University, Mysore, India - 570006

Abstract: *The transition to electric mobility is a promising global strategy for decarbonizing the transport sector. India is among a handful of countries that support the global EV30@30 campaign, which targets to have at least 30% new vehicle sales be electric by 2030. An accessible and robust network of electric vehicle (EV) charging infrastructure is an essential pre-requisite to achieving this ambitious transition. A charging station is usually in the form of a fixture connected directly to an electrical distribution panel, or sometimes to an electrical outlet. It has one or more charging cables equipped with a connector that is similar to a gas-pump nozzle and is used in the same way: it simply connects to the EV's charging socket to charge the battery. The station has lights that indicate that the EV is connected and charging. It can also have a button for starting or stopping the charging operation. Some have additional features: energy meter, electronic payment system, card controlled access system, Internet access, etc. As prices of fossil fuels are increasing, electric vehicles are becoming so popular day by day. The short driving range of electric vehicles is the main motivation for efficient navigation system which shows the nearest charging stations. The electric vehicle charging navigation system considers both power system and travelling system.*

Key Words: electric vehicle, charging, infrastructure, navigation system, android, application, EV, user, owner, station.

1.INTRODUCTION

The world is facing pressure on fossil fuels, so many countries are moving towards sustainable, reliable, efficient, economic, and green energy resources. Fossil fuels are one of the main threats to the earth's climate as they contribute to the emission of Carbon Dioxide. Transportation is one of the significant emission sectors, contributing to 22 percent of the total carbon dioxide emission in 2020. Most public and personal vehicles run on internal combustion engines which is one of the main causes for the climate change. Because of all these reasons, EV market is increasing in fast pace and number of EV charging stations are also increasing. The navigation system implemented in the paper will filter out the charging station based on user's location, remaining charge of the electric vehicle and configuration of electric vehicle.

1.1 Problem statement

To build an application that implements a navigation system which shows the sorted sorted electric charging stations and directs the user towards the nearest charging station.

1.2 Objectives

The main objectives of our project are to display the relevant and active charging stations of various electric vehicle companies currently active in the market. To provide a single platform for the EV owners to find the right charging station for them across the city regardless of the company and charging port type. To reduce the complexity of the users by filtering the charging stations by various components and factors like cost per unit charge, charging port type and charging mode. To suggest the best possible routes using the real time updates from Google Maps API.

2. LITERATURE SURVEY

The paper titled "HANDBOOK of ELECTRIC VEHICLE CHARGING INFRASTRUCTURE IMPLEMENTATION" by Ministry of Power, Government of India depicts the implementation of electric vehicle charging infrastructure. An accessible and robust network of electric vehicle (EV) charging infrastructure is an essential pre-requisite to achieving the ambitious transition to electric vehicles[1]. The Government of India has instituted various enabling policies to promote the development of the charging infrastructure network.

The paper "An Overview on Electric Vehicle Charging Infrastructure" by Manoz Kumar M Tirupati, TATA ELXSI importance of charging station infrastructure[2]. More than just a power outlet, the charging terminal allows for charging electric vehicles safely with maximum efficiency. Unlike a household outlet, which does not include any specific function, the charging terminal is designed specifically for this operation and that any model of an electric vehicle is connected to the terminal.

The paper titled "Plug-In Electric Vehicle Handbook" by U.S. Department of Energy tells about the plug-in electric vehicles[3]. The reasons drivers choose PEVs range from a desire to improve the world to a desire to save money. The following list of PEV benefits illustrates why the demand for PEVs — and thus for charging stations — has been growing rapidly. Compared with conventional vehicles, PEVs offer additional fueling options, including charging at home, work, commercial charging stations, other public locations, private fleet facilities, or a combination of these sites.

The paper "Real-time charging navigation of electric vehicles for fast charging stations: A hierarchical Game approach" by IEEE proposes the framework for navigation system for charging stations[4]. The proposed framework links the power system with transportation system through the charging navigation of massive EVs. It benefits the two systems by attracting EVs to charge at off-peak hours and saving the time of EV owners with real-time navigation. At the upper level of the hierarchical game, a non-cooperative game is proposed to model the competition between EVCSs. Based on the pricing strategies obtained from the non-cooperative game, multiple evolutionary games are formulated at the lower level to evolve EVs' strategies in choosing EVCSs.

3. EXISTING METHODS

3.1 Chargemap
Chargemap is an application which takes the electric vehicle's port type, power rating, filters out the charging stations and shows them in the navigation system. This is applicable only in Europe.

3.2 Chargepoint
This app shows the address of the charging stations in a list along with their power rating and cost per unit charge. When the user reaches the destination, he/she has to hold the phone near the card reader and start charging the vehicle.

3.3 PlugShare
Plugshare is an app which takes the electric vehicle's name as input and shows the nearest charging station along with the reviews given by the customers.

The existing methods show either only the address of the charging stations or they provide navigation system without providing much filtering options. After knowing these limitations of the existing methods, we decided to build this system to improve the user experience.

4. PROPOSED WORK

To use the application, the user has to have an account and password through which he/she logins to the application. The application will show the electric vehicle companies and based on the user's choice; the model of the vehicle will be asked. The user will be able to view the nearby charging stations and will be able to classify them based on the colour codings which denotes the companies to which the charging stations belong to. When the user clicks on a particular charging station, the information about that particular station will be displayed. Based on the information entered by the user, the charging stations will be selected and showed to the user by which the user will be able to reach the nearest charging station. The reviews given by the customers who have visited the stations before will also be displayed and the user can set a minimum rating by which the stations should be listed.
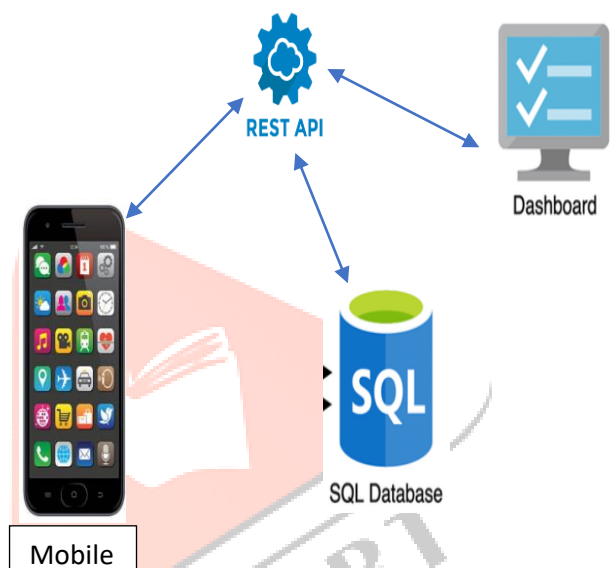
4.1 System Architecture

Fig.1 System Architecture

4.2 Methodology

4.2.1 Home page
At first time, when we launch the web app using the command" ng serve –open", the server will start running on localhost in port number 3306.The very first page displayed is the homepage.

4.2.2 Login page
For authentication, the user has to login using his/her username and password.

4.2.3 Dashboard
After logging in the user will be prompted to a dashboard, where he can see the different options available for adding a company, adding a vehicle_type, advisory, etc.

4.2.4 Add company
On clicking the add Company button, we can see a list of existing EV charging Companies, if we want to add a new company, then we have to enter the new company name in the Add Company layout and click on submit. The new company will be added to the list in the Company details.

4.2.5 Add charging station

On clicking the add charging type button, on the right side we can see the various charging types. For adding a new charging type the new charging type in the Add charging type layout on the left side and click on submit. The new charging type will be added to the list present to the right side. There is an option available to update or delete the charging types.

4.2.6 Adding charging station

On clicking the add station button, at the bottom of the page we can see the list of current charging stations active along with the attributes like cost, latitude, longitude, stationID, etc. For adding a new charging station, we have to select the company from the drop down, enter the description, cost along with its co-ordinates. On submit the new station will be added to list of Station Details. There an option available to update or delete the charging station.

4.2.7 Adding vehicle

A new vehicle can be added by selecting the company name, charging type and the model. The new details will be reflected on the right-side layout of vehicle details.

4.2.8. Advisories

It lists out the name of the user who owns an account in the app along with the feedback that he/she has given about the charging station.

4.2.9. Change password

The user also has an option of changing the password for his account, in case he wants it to be more secure.

4.2.10 Logout

The user can logout of his account, where he/she will be redirected back to the dashboard screen.

5. RESULTS

5.1 Station details page

Fig.2 Station list

5.2 Advisories page

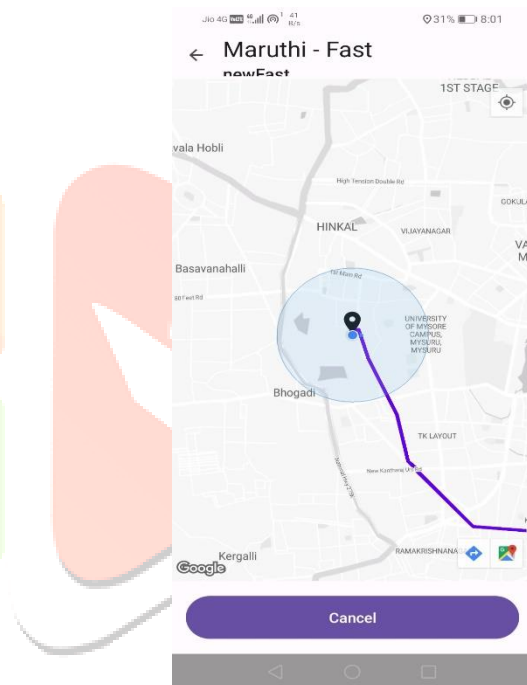Fig.3 Advisories

5.3 Navigation System

Fig.4 Navigation page

6. CONCLUSION

In our project, we have created a navigation system which helps the user to go to the nearest electric vehicle charging station. The user can search by applying various filters like manufacturer of the vehicle, model name of the vehicle etc. The application takes into consideration the remaining charge of the vehicle which is used to list the nearest charging station. When the charging stations of the company which the user has selected, he/she will be able to view the details of the station by clicking on the place in the map. The user can also view the reviews given by the customers who have visited the charging station before.

ACKNOWLEDGEMENT

It gives us immense pleasure to write an acknowledgement to this project, a contribution of all the people who helped to realize it. We extend our deep regards to Dr. S. B. Kivade, Honorable Principal of JSS Science and Technology University, for providing an excellent environment for our education and his encouragement throughout our stay in college. We would like to convey our heartfelt thanks to our HOD, Dr. S Srinath, for giving us the opportunity to embark upon this topic. We would like to thank our project guide, Dr. Madhusudhan.G for their invaluable guidance and enthusiastic assistance and for providing us support and constructive suggestions for the betterment of the project, without which this project would not have been possible. We appreciate the timely help and kind cooperation of our lecturers, other staff members of the department and our seniors, with whom we have come up all the way during our project work without whose support this project would not have been success. Finally, we would like to thank our friends for providing numerous insightful suggestions. We also convey our sincere thanks to all those who have contributed to this learning opportunity at every step of this project.

REFERENCES

[1] Handbook for Electrical Vehicle Charging Infrastructure Implementation Version 1 by Ministry of Power, Government of India, 2021

[2] An Overview on Electric Vehicle Charging Infrastructure by Manoz Kumar M Tirupati, TATA ELXSI, 2019

[3] Plug-In Electric Vehicle Handbook by U.S. Department of Energy, 2012

[4] Electric vehicle charging stations Technical Installation Guide 2nd edition by Hydro Quebec, 2015

[5] Review of Electric Vehicle Technologies, Charging Methods, Standards and Optimization Techniques by Syed Muhammad Arif, Tek Tjing Lie, Boon Chong Seet, Soumia Ayyadi and Kristian Jensen, 2021.

[6] Electric vehicle charging infrastructure a guide for DISCOM readiness by niti aayog, RMI India + Rocky mountain institute, 2020.