MINI PROJECT:

EV-NAVASSIST

SUBMITTED BY:

PRANEETH DEVADIGA (01JST20CS117)

HARDIK MODI (01JST20CS062)

PUNITH A C (01JST21CS407)

SRIRAKSHA B S (01JST21CS411)

Under the Guidance of

Prof. Shwethashree G C

Assistant Professor,

Dept.of CS & E,

SJCE, JSS STU Mysuru

Background

The rising popularity and adoption of electric vehicles (EVs) have brought about the need for effective navigation and route planning. As more individuals embrace sustainable transportation options, ensuring convenient access to charging infrastructure and optimizing travel routes becomes increasingly essential. The project aims to develop a comprehensive platform that empowers EV owners to navigate their vehicles efficiently. The project seeks to enhance the overall experience of EV owners, promoting the widespread adoption of electric cars and contributing to the sustainable transportation revolution.

Key points

- **Rapid growth of electric vehicles**
- **Charging infrastructure expansion**
- **Range anxiety and route planning challenges**
- **Integration of supportive services**
- **Advancements in technology**

Challenges

01

Limited Driving Range

02

Charging Infrastructure

03

Charging Time

04

Battery Breakdowns

05

Inefficient Route Planning

Literature Review

Review papers

- [1] Optimal Route Planning for Electric Vehicles Considering Dynamic Charging Infrastructure" by Zhang et al. (2019)
- [2] Electric Vehicle Routing Problem Using A* Algorithm with Charging Time Consideration" by Wang et al. (2018)
- [3] "A Neural Network Approach to EV Route Planning" by H. Wang, Y. Zhang, and Z. Li (2021)

A number of recent studies have proposed new approaches for solving the EV route planning problem. Here are few of them that were interesting

- In [1], the authors in this paper proposed an optimal route planning algorithm for electric vehicles that considers charging station availability, charging time, and vehicle energy consumption to determine the most efficient route and charging strategy.

- In [2], A* algorithm-based approach incorporates charging time into route planning, evaluates potential charging station locations, and identifies the most efficient route minimizing travel time and charging time.

- In [3], the authors propose a new algorithm that uses a **neural network** to learn the optimal route. This proposed algorithm can use neural networks to quickly learn and find the optimal route, even for unseen networks.

Introduction

Key features

Smart Navigation for EVs

Create a mobile app that integrates real-time charging station data with navigation capabilities.

Hassle free charging

Enable EV users to reserve and pay for charging slots in advance through a secure online platform.

On-Demand Roadside Assistance

Provide real-time assistance for EV users in the event of a breakdown or other issue through a mobile app.

Technologies Used

- **Database:** MongoDB a NoSQL database is used to store charging station data.
- **Mapping libraries:** Google Maps API is used to display charging station locations and the route on a map.
- **Routing algorithm:** A* algorithm to determine the best route with charging stops.
- **Frontend technologies:** HTML, CSS, and JavaScript are used for building the user interface, React is being used for more complex interfaces
- **Web frameworks:** Django is used to build the web application backend.

Design

User Requirements

- **Battery level:**

Users should know the current battery level of their electric vehicle, which they will input into the website.

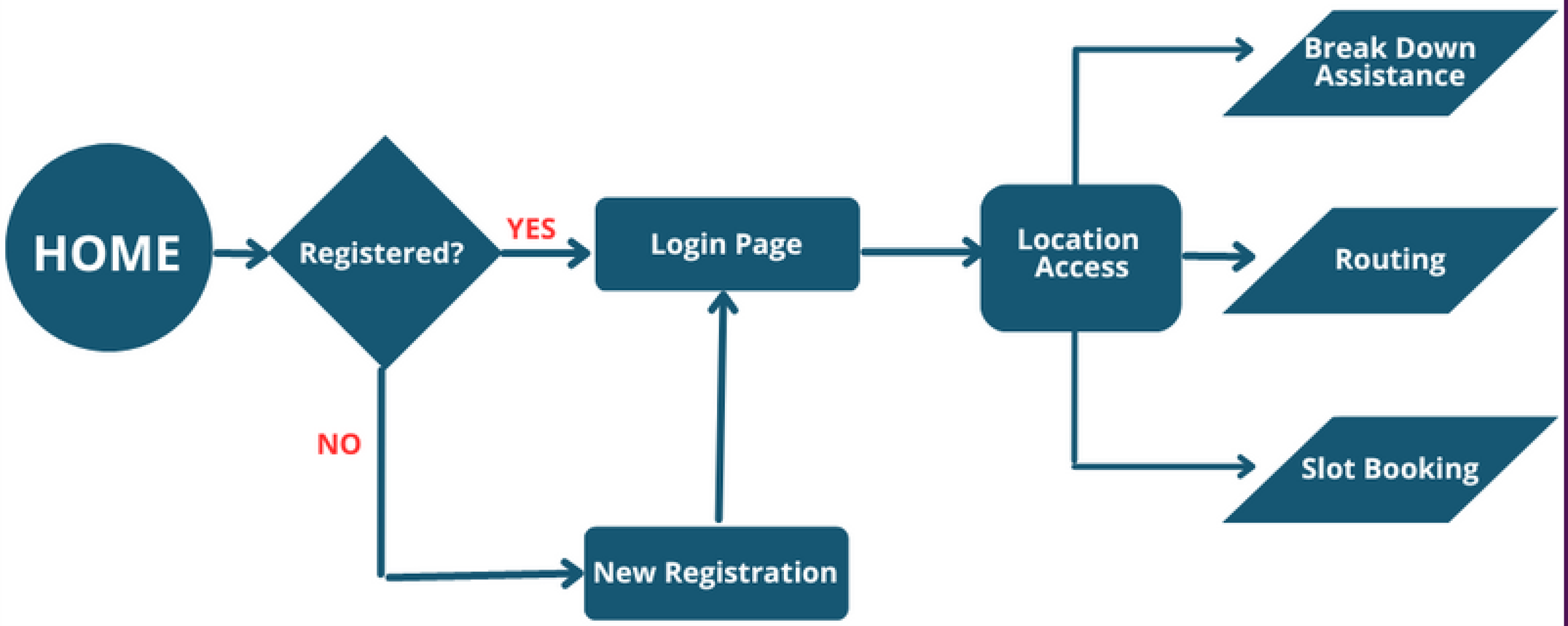
- **Payment method:**

Users should have a valid payment method, such as a credit card or mobile payment app, to pay for charging at the charging stations.

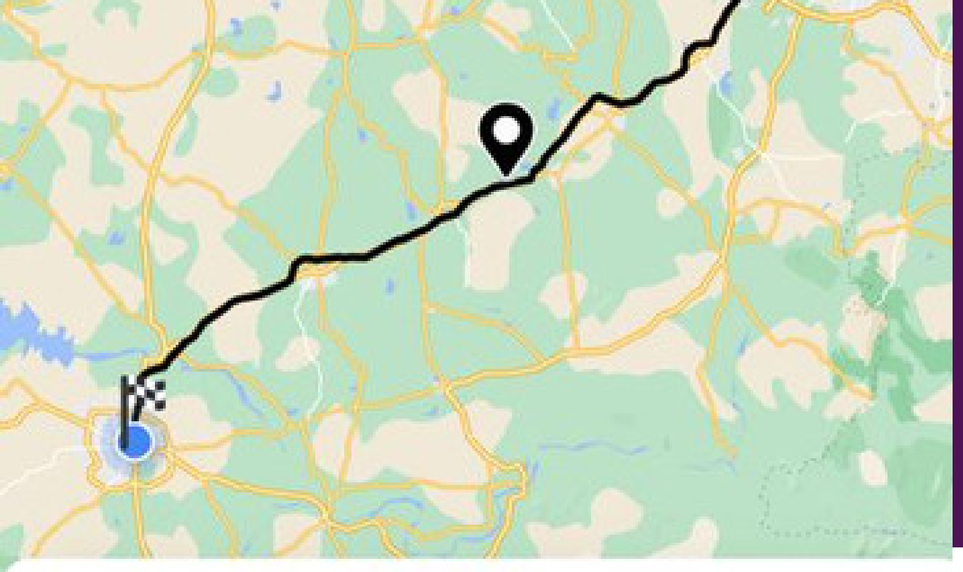
- **Location Access:**

The user needs to allow the website to access their location so that the website can determine their starting point and suggest charging stops along the route.

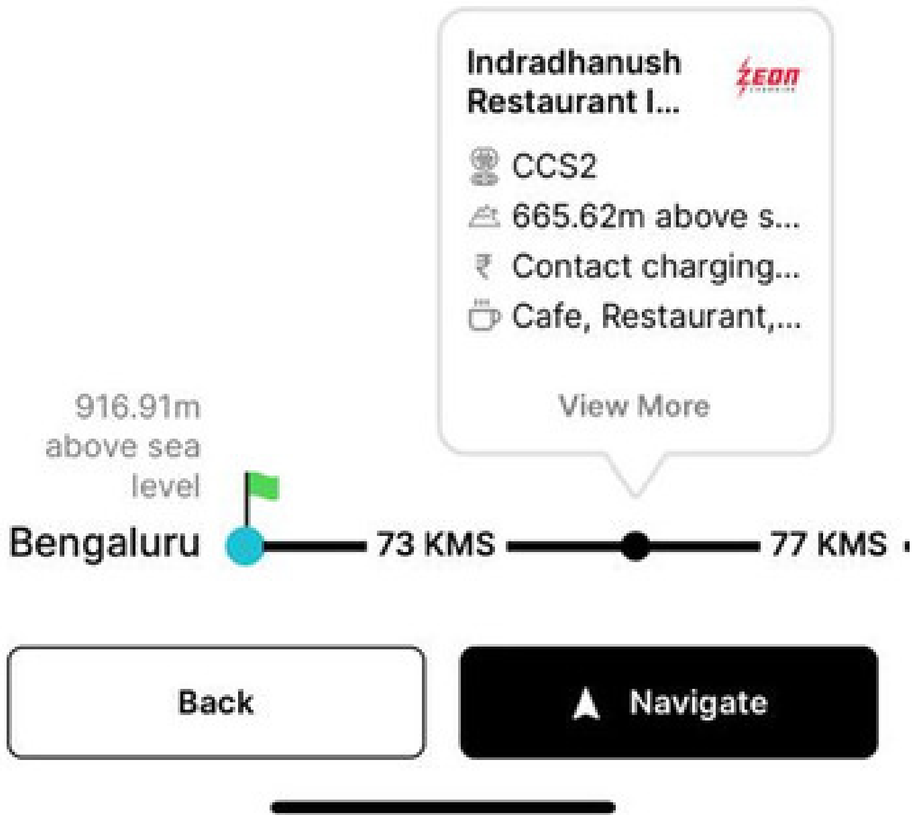
Process Flow Chart



Implementation



Smart Routing



Our Smart routing algorithms is used to plan the most efficient route for electric vehicles (EVs) by taking into account factors such as the vehicle's battery range, available charging stations, and real-time traffic data. It is implemented as follows

1. **Select source and destination**
2. **Mapping of source and destination to its corresponding latitude and longitude co-ordinates.**
3. **Map Creation**
4. **Selection of Charging Stations along the route.**
5. **Heuristic Calculation**
6. **Marking of charging stations in the navigation map**

Slot Booking

01

Finding available charging stations

02

Selecting a time slot

03

Confirming the booking

04

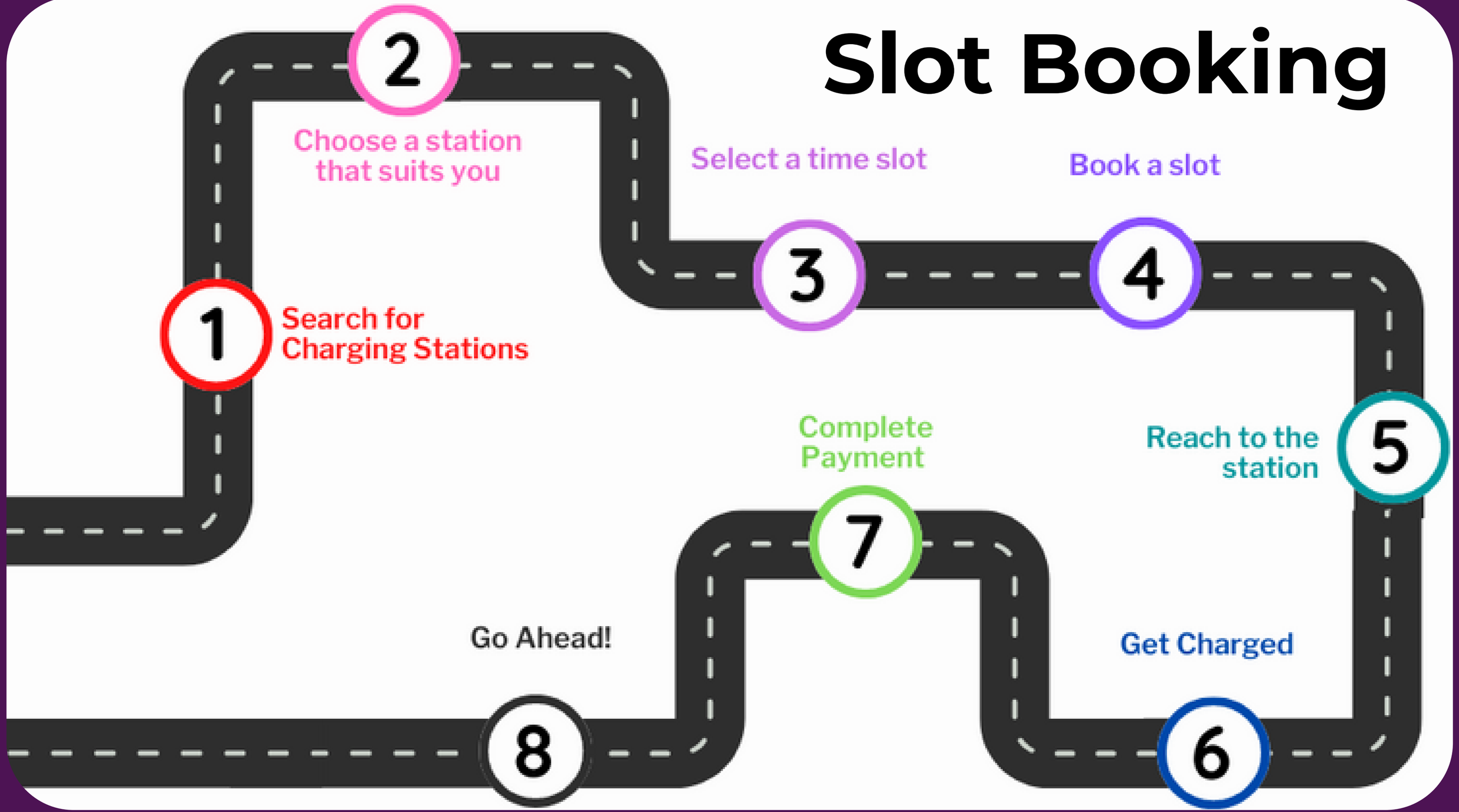
Arriving at the charging station

05

Completing the charging and payment process

How does it work?

Slot Booking



Breakdown assistance

Breakdown assistance for electric vehicles is a service that provides roadside assistance and repair services to electric vehicle drivers who experience a breakdown.

Process

- Go to breakdown assistance section.
- Enter location, vehicle info, and issue.
- Website shows list of services with contact info and pricing.
- Select service and make arrangements.

Advantages

Ensuring availability

Pre-booking an EV charging station ensures availability for long-distance travel and effective journey planning.

Planning your journey and saving time

Planning charging locations and times helps with route planning and stop scheduling.
Pre-booking a charging station saves time and avoids waiting in line.

Avoiding range anxiety

Alleviating range anxiety by knowing where and when to charge increases confidence in travel plans

Our Progress

TECHNOLOGIES

The team has finalized the user interface design and chosen the technologies to be used, including the frontend and backend frameworks

FRONTEND

The frontend of the website has been implemented using HTML, CSS, and JavaScript, with a mapping library (Google Maps) included

BACKEND

The backend needs integration with the Places API of Google, and the team has started working on it.

ROUTING ALGORITM

The team is yet to implement the routing algorithm.

Risks and Challenges

Risks

- Integration with the Places API of Google may be challenging, as it involves working with a third-party service that may have limitations and restrictions.
- The team may encounter difficulties in implementing the routing algorithm, as it requires complex algorithms and data structures.

Challenges

- Ensuring that the user interface is intuitive and easy to use, while also providing all the necessary functionality.
- Ensuring that the backend is scalable and efficient, and can handle a large amount of data and traffic.
- Ensuring that the website is secure and protected from malicious attack

Next Steps

Google Maps

Complete the integration with the Places API of Google to allow users to search for charging stations.

Deploy

Deploy the website to a production server and make it available to users.

Routing Algorithms

Implement the routing algorithm to calculate the best route with charging stops

Monitor

Monitor the website performance and user feedback, and make improvements as necessary.

Testing

Test the website thoroughly to ensure that it works as expected and is free from bugs and errors.

CONCLUSION

The integrated system combines navigation, charging station information, slot booking, and breakdown assistance to create a user-friendly and efficient experience for electric vehicle owners. It addresses critical concerns related to charging infrastructure availability, reduces range anxiety, and provides essential support in case of breakdowns, thereby encouraging the wider adoption of electric vehicles.