Caleb Walter Bowden

U2166829

Project Proposal

The University Of Huddersfield

PlugMap UK

Problem Identification

Electric cars are becoming increasingly popular as people look for more eco-friendly transportation options. However, one big problem is that finding places to charge these electric vehicles can be a real headache. Imagine being on a road trip with your electric car and worrying about running out of battery because you can't find a charging station. This anxiety, often called "range anxiety," is a big obstacle to people adopting electric cars. It's not just about long trips either; sometimes, it's just hard to find a charging station when you need one, even in your own city.

Adding to the problem is that information about charging stations is all over the place. Different charging networks have their own apps and websites, and they don't always share information with each other. This means you might have to use multiple apps or websites to find a charging station, and even then, you might not get the information you need, like whether your car is compatible with the station. My project is all about understanding these problems better. I want to figure out what exactly is making it so hard for people to find and use charging stations for their electric cars. Once I understand the issues, I can work on solutions to make it easier for everyone to charge their electric vehicles hassle-free.

Here are a few aims for the project:

1) **Route Optimization** - Develop an intelligent route planning algorithm that takes into account the user's EV specifications, current battery status and desired destination. The algorithm should prioritise routes that maximise convenience by minimising charging stops and ensuring compatibility with the user's vehicle.

2) **Literature review:** Conduct a thorough investigation into the challenges and obstacles EV owners face when trying to locate and access charging stations. This includes assessing the extent of range anxiety, understanding the diversity of charging networks, and identifying common user frustrations.

3) **Collecting Data and Mapping:** Identify the most reliable source of information regarding EV charging stations, including details on their compatibility with users' EVs. Develop an intuitive and user-friendly application that effectively presents this information and integrates it seamlessly into a map interface.

4) **Real-time updates through API Integration:** By using API's I can connect directly to charging network information. By using this technology I can make sure that users have

access to the most up to date information. For example if the charging point is "available to use", "Under maintenance" or "incompatible with current vehicle".

Product Definition and Target Audience

Product Definition

By the end of this project, I aim to create a working demo of my application. This application will be designed with a user-friendly interface. It will offer several important features to make EV ownership more convenient. One of the key features will be a smart route planning algorithm. This algorithm will do more than just find the shortest path; it will consider where you can charge your EV along the way. This should help reduce the anxiety some EV owners feel about running out of battery on longer trips.

Additionally, the app will provide a wealth of information about charging stations. You'll be able to see what kind of charging socket each station has to ensure compatibility with your vehicle. Plus, you'll get real-time updates on whether a station is available for use, undergoing maintenance or temporarily out of service.

In summary, the app aims to simplify the EV charging experience and make it more user-friendly, helping EV owners navigate the charging landscape with confidence.

Target Audience

The application helps both new and experienced EV owners by making it easier for them to charge their EVs. It gives new EV owners access to charging stations, helping them feel more confident about travelling longer distances. For experienced EV owners, it offers advanced route planning and the change to find new places to charge. Most importantly, it provides up to the minute information about charging stations availability, ensuring that all EV owners can travel without worry and enjoy the transition to eco-friendly eclectic transportation.

Looking ahead, this application could prove incredibly beneficial for truck drivers who are shifting to electric vehicles. Truck drivers rely on efficiency and dependability as they navigate their routes, with the twin goals of reaching their destination promptly and ensuring they don't run out of charge along the way. As the trucking industry increasingly adopts electric vehicles, this application emerges as a valuable asset, helping drivers fine-tune their journeys to maximise both time and energy management. In doing so, it enhances overall efficiency and ensures they arrive at their destinations with plenty of charge to spare.

Problem-Solving Activities & Resources

To successfully complete the project I will need to do the following activities:

1) **Resources needed:** To successfully execute this project, I will utilise essential tools and resources, including Android Development Studio and the java programming language for application development. Additionally, the integration of crucial APIs such as OpenCharge Map and Google Maps Library will provide accurate EV charging station data and enhance the user experience.

2) **Testing phase:** The testing phase will be a crucial component of this project making sure that everything runs smoothly and correctly, I will be opting for the prototype methodology which makes the testing phase even more important as many variations of the application will be made. The goal is to ensure a reliable user-friendly application for electric vehicle owners.

3) **Design phase:** In the design phase, I'll create detailed wireframes that act as visual blueprints for the application. These wireframes will not only outline the app's layout but the navigational flow and user interface elements. This ensures that the design aligns with user requirements for the project goal and optimises user experience.

4) **Development phase:** During this phase, I'll start turning my research findings from the literature review and the design concepts into an actual product, using the prototype methodology which means the development phase will also be the testing phase.

5) **Questionnaire:** I'll put together a questionnaire using google forms. It will include both multiple choice questions and open ended questions to gain a better understanding of "range anxiety" and what users are looking for in the app. By doing this I can gain a deeper understanding of the users needs and preferences.

6) **Competition:** To make the application unique, it's crucial to conduct research on what other companies are offering. This research will help me not only improve existing features but also introduce fresh ideas and features that have not been created yet.

7) **Literature review:** The literature review serves as a valuable resource, offering the essential information required to successfully undertake the project. It involves a thorough analysis of research papers, books, and prior work by competitors. This comprehensive review will provide me with a deep understanding of all aspects related to the project.

8) **Evaluation:** I'll assess my project to identify areas where improvements could have been made and explore what I could have done differently to create a superior product. This evaluation aims to pinpoint lessons learned and opportunities that could have improved the project's development and outcomes.

Project Plan

Week 1 - 2: Project Initiation
- Research and brainstorm project ideas.
- Develop and complete a project proposal.

Week 3 - 4: Planning and Preliminary work
- Create and distribute a questionnaire to gather initial insight.
- Develop wireframes for the applications user interface.
- Begin outlining the Literature review and PLESI.

Week 5 - 7: In-Depth research and literature review
- Conduct thorough research on all aspects related to the project.
- Initiate the literature review and incorporate the PLESI within it.

Week 8 - 20: Report and Project Development

- Finalise the literature review.
- Begin work on the final report while starting to develop the application

Week 21 - 25: Report Finalisation and testing

- Finalise the project report, ensuring it comprehensively covers all aspects.
- Complete the main components of the application.
- Initiate testing and gather user feedback for improvements .

Week 26 - 27: Poster Presentation preparation

- Concentrate on creating an information and visually appealing project poster.

Week 28 - 30: Presentation preparation and application Finalisation

- Begin crafting the presentation and script for the application presentation.
- Ensure the application is fully functional and polished for the presentation.

References

(08/10/2023) *Google forms: Online form creator | google workspace*. Available at: https://www.google.com/forms/about/ (Accessed: 08 October 2023).

Openchargemap.org (08/10/2023) *Open charge map - the global public registry of electric vehicle charging locations*, *Open Charge Map - The global public registry of electric vehicle charging locations*. Available at: https://openchargemap.org/ (Accessed: 08 October 2023).

(08/10/2023) *Google maps*. Available at: https://www.google.com/maps (Accessed: 08 October 2023).

(08/10/2023) *Java.com*. Available at: https://www.java.com/en/ (Accessed: 08 October 2023).

Android mobile App Developer tools (08/10/2023) *Android Developers*. Available at: https://developer.android.com/?gclid=Cj0KCQjwpompBhDZARIsAFD_Fp8A2XaLee6ER_i2a b3BwK0EzQ8KOz-BRlH8oxSviPKY5ZrYmaAJ_qgaAtEjEALw_wcB&gclsrc=aw.ds (Accessed: 08 October 2023).