School of Computing
Final Year Engineering Project

Project Initiation Document

Jake Bailey

Long Distance Cycling Route Planner

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1. Basic details

Student name:	Jake Bailey
Draft project title:	Long Distance Cycling Route Planner
Course and year:	BSc (Hons) Software Engineering Year 3
Project supervisor:	Dr Rich Boakes
Client organisation:	
Client contact name:	

2. Degree suitability

The artefact relates to my Software Engineering degree because it will utilise various technologies learned in this course and during my placement year thus far. The challenge of developing this application is greater as I will demonstrate my skills in building a web application to calculate and plot routes on OpenStreetMap based on a set of conditions determined by user input and publicly available databases of hazard data and weather predictions in real-time.

3. Outline of the project environment and problem to be solved

I'm going to build a prototype web application targeted at cyclists who wish to plan their route before their ride. The route planner will focus on customisability of the routing algorithm and safety of the cyclist. The prototype may not only consider user input into the routing algorithm, but other conditions such as, weather, road, elevation, traffic and many more.

Most of this functionality in pre-existing route planners either doesn't exist and/or is locked behind a paid service. The aim is to provide cyclists with as much flexibility as possible when planning a route whilst considering the safety of the cyclist, whether on a short or long ride.

The application will be developed as a modular system to ensure this planned flexibility. This means users can tailor the functionality according to their needs, allowing different components of the system to seamlessly interact when planning different types of routes. Furthermore, the system should ensure efficient route calculation even when utilising these distinct modules.

4. Project aim and objectives

Overall aim:
To build a prototype route planning application to be further expanded beyond the scope of this project. The prototype will allow cyclists to customise a range of datasets to plot a route custom-fit to the user's needs.

Objectives:

- Research open-source routing algorithms to understand how different options function.
- Research into mapping options, for example:
    - OSM (Open Street Map).
    - Google Maps.
- Discover what data is available and how I can access it.
- Understand how to utilise the available data in the different routing algorithms.
- Build an intuitive and accessible UI (User Interface).

5. Project constraints

- Fixed deadline for project completion.
- Only one team member.
- Limited funds to pay for API access.
- Limited funds to test routing algorithms on high-end machines.

6. Facilities and resources

I will use my home PC, Laptop, and university devices to conduct secondary research and to develop and test the proposed artefact. Mobile phones and activity trackers may also test certain functionality, such as importing the generated GPX file into a mapping application.

A potential constraint could arise where I cannot test using activity trackers like Garmin devices due to the cost of such devices. As I do not own an activity tracker other than a mobile phone, I could request permission from students who own such devices to conduct primary research and test the exported file generated by the artefact. Using other students' devices, however, would develop a time constraint for the project, whereby I am required to return the device after some time.

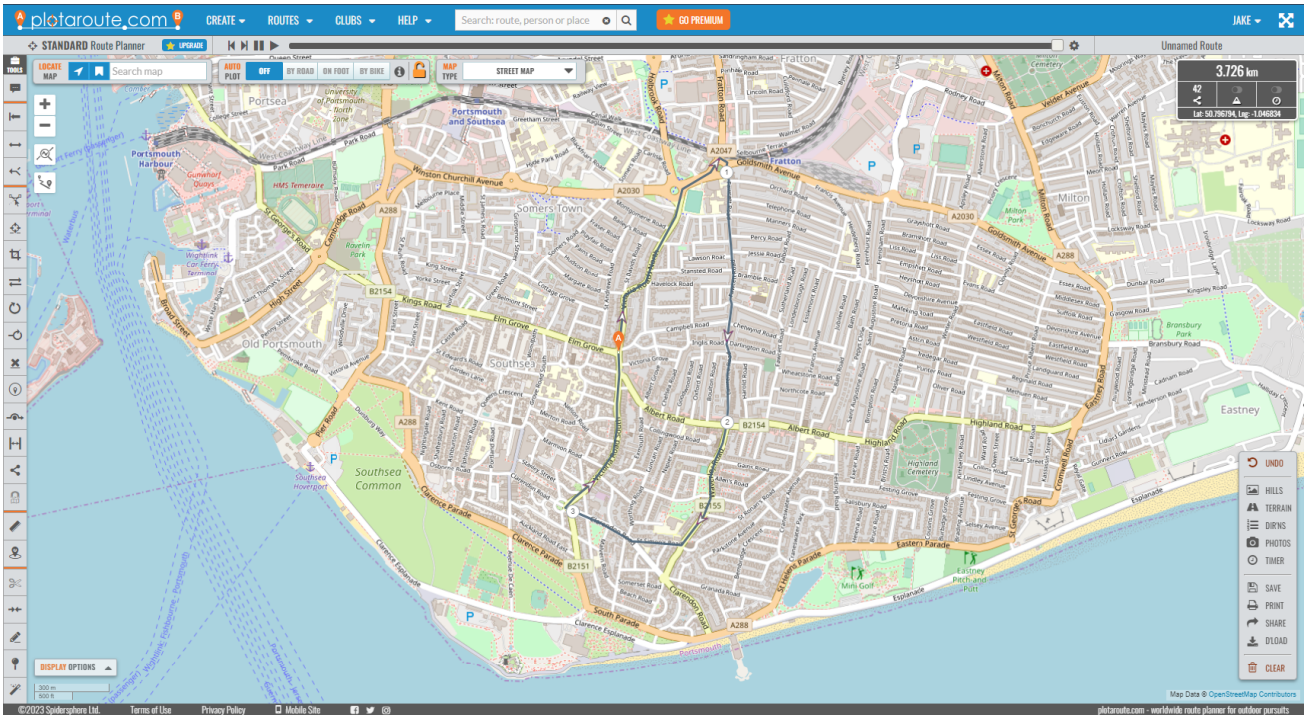
7. Log of risks

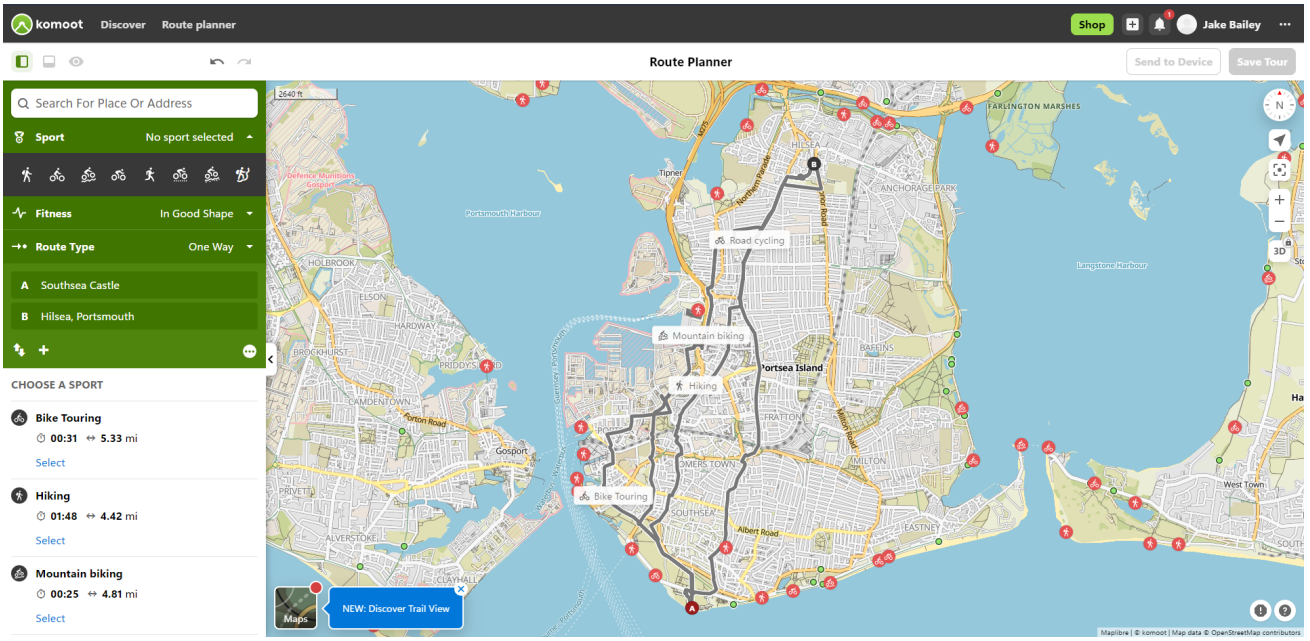
Description	Impact	Mitigation/Avoidance
Supervisor becomes unwell	Cause delays in the project due to lack of insight and guidance.	If possible, conduct online meetings and plan time in preparation for the potential delay.
I become unwell	Impact on the scope of the project, delaying the timeline.	Visit a doctor if unwell and allocate time for rest around university work.
Change in requirements.	Impact on the scope of the project, delaying the timeline.	Regular communication with the supervisor to discuss the feasibility of the current requirements to prevent any future changes.
Time availability	Decreases the feasibility of	Plan tasks ahead of time to consider potential future setbacks.

	completing the project by the submission date.	
Data loss	The application will no longer work. The development would have to start from scratch.	Back up all project files regularly. Use git and GitHub to back up and manage the codebase.
Hardware failure	Delays the project timeline; new devices would need setting up.	Use multiple devices to ensure progress continues while the other device is in repair.

8. Project deliverables

The artefact that will be developed will be a prototype web application with an accessible and user-friendly UI design; it will display a map and a menu allowing the user to customise a route they want to plan. The artefact will also display information about the route with data to be useful to the user in deciding which route to pick. The UI will share similarities to plotaroute.com (*Route Planner for Walking, Running, Cycling - Plotaroute.Com*, n.d.) and Komoot (*The Best Route Planner for Cycling, Walking, Hiking and Running*, n.d.):





The primary documentation piece to be produced will be the final project report. All other documentation may include:

- Design Specification
  - User Interface Wireframes
  - User Interface Designs
- Unified Modelling Language
  - Use Case Diagrams
  - Sequence Diagrams
- System requirements
  - Functional requirements
  - Non-functional requirements
- User Guide
- Code documentation (inline)
- Installation and setup instructions
  - In a README.md file
  - In the User Guide
- Testing documentation – Jest will be used.
  - Test instructions
  - Test plan
  - Test cases
  - Test logs

9. Project approach

I will plan the project using elements of the Agile Software Development Lifecycle methodology, enabling development to adapt to an unplanned requirements change. I will use the GitHub Kanban board to manage and track the project's progress. Using GitHub's Kanban board will enable the code repository to be closely linked to the board and ensure tasks are completed within their expected timeframes. GitHub also allows pull requests to be linked to open issues and labels to be applied to those issues, which gives more context as to what the specific task is.

Secondary research will be completed before development begins; I will research the current systems in use to gain a greater understanding of how they function and the data they use. Different websites and online documentation for APIs, such as Open Street Map, will be useful in determining how I can utilise existing services and integrate them into the artefact.

Primary research will be necessary for the project. Utilising the preferences available for the routing algorithm, I will research how different datasets affect the quality of the final route when subjectively assessed by the users. This will determine which preferences are vital to the route planning algorithm and which will be optional.

10. Project plan

The key stages of the project will comprise:

- Secondary Research & Literature Review
- Create UI Wireframes for Artefact
- Create UI Designs for Artefact
- Establish requirements
    - Functional
    - Non-Functional
- Develop the artefact prototype
    - Conduct primary research (during development)
    - Develop tests (during development)
    - Write artefact documentation
- Conduct primary research (after development)
- Conduct tests (after development)
- Write the final report

I will conduct secondary research whilst writing the literature review during the initial stage of the project. The wireframe will be designed as a first UI design draft before the final, detailed UI design is developed. An initial set of requirements will be set before development begins, and these requirements will be converted to issues on GitHub's Kanban board; the requirements may likely change during the development of the artefact.

Accessing and manipulating the data from a range of APIs will be challenging to translate to a format accepted by the routing algorithm. I will be utilising my current knowledge of software engineering, web development and RESTful APIs whilst developing my knowledge further through research, other students, and my supervisor.

11. Supervisor Meetings

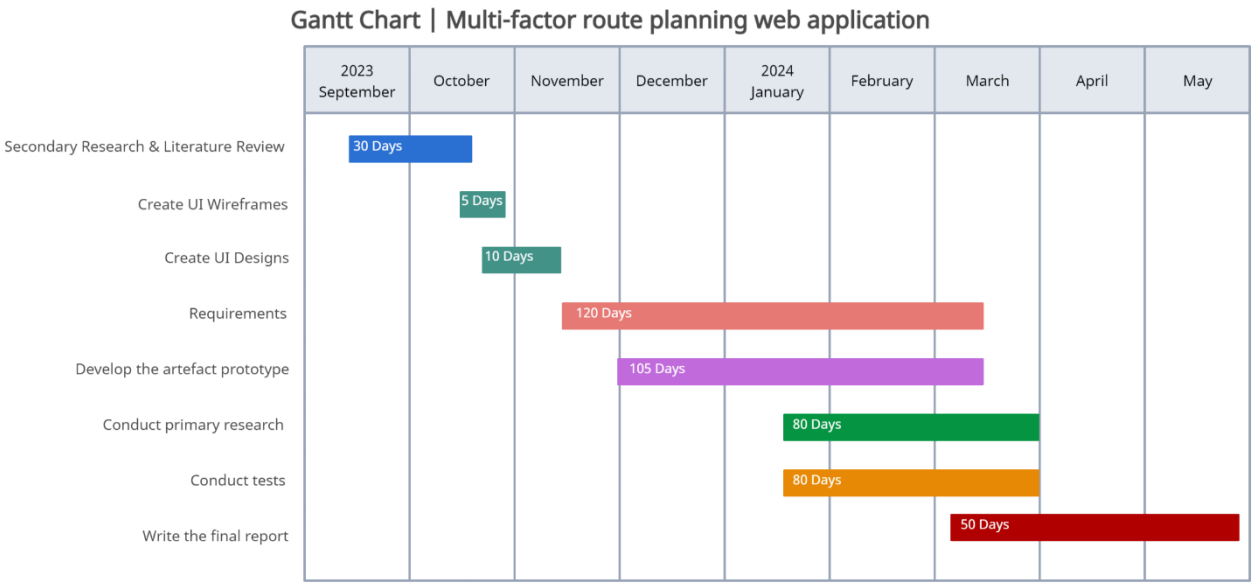
I will schedule meetings on a weekly or fortnightly basis; my supervisor allocates a range of slots each week where I can book a time which works for me. I aim to have all meetings face-to-face. However, if my supervisor or I become unwell, we will conduct a video conference where possible. If my supervisor has planned leave, or I will be away for some time, we will communicate ahead of time to devise a plan for the project while one or the other is away and unable to meet regularly. Doing so will further allow me to plan my workload ahead of time and effectively keep track of the progress throughout the project.

12. Legal, ethical, professional, social issues

The key legislation I must consider for this project is the Data Protection Act 2018 (DPA 2018). I am not planning on storing personal information. However, the user's current location will be requested upon the launch of the application; when the application no longer uses this data, it will be deleted and re-requested when the user enters the application again. Future iterations could implement accounts, storing a small amount of sensitive user information to include more features. However, the submitted artefact shouldn't contain this data; regardless of this fact, I will ensure the artefact abides by all principles of the DPA 2018 due to it handling the current location data of the user.

One social issue that could arise is that the artefact may entice more public members to start cycling more frequently; whilst this result will be a great incentive for protecting the environment, some road users are cautious, with many cyclists riding unsafely on the roads. The artefact will push users to ride safely and abide by all road safety laws, just as vehicles do; there will also be the option only to use cycle routes/lanes when plotting a route to ensure those cyclists who are less comfortable on roads still feel safe on the routes planned by the artefact.

Appendix B: Gantt chart



Bibliography

- *Route Planner for Walking, Running, Cycling—Plotaroute.com*. (n.d.). Retrieved 12 March 2023, from https://www.plotaroute.com/routeplanner
- *The Best Route Planner for Cycling, Walking, Hiking and Running*. (n.d.). Komoot. Retrieved 12 March 2023, from https://www.komoot.com/plan