Using Mapping APIs and Public Transport Data to Optimise Meetup Destinations in Greater London

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1 Problem Statement

Greater London is the biggest city in the UK, both in terms of land size and population[1]. As such, it comes with a wide variety of transport options, many places to meet up, and people travelling from significant distances apart. The aim of this project is to produce a web-application which takes into consideration the modes of transport being used by a group of people, and the type of place they want to meet at, to find a location which takes the same length of time for everyone to travel to.

2 Background Research

Currently, one of the most popular navigation tools is Google Maps[2], and more specifically, Citymapper is one of the most popular tools specifically for Londoners[3]. Looking further at these will be useful to establish intuitive and popular layouts for the user interface, especially when making the web-app responsive for smaller screens.

There are already websites which attempt to optimise meetup destinations, but none of then incorporate all the features in Table 1.

Statistics also show us that it is common for people to use the internet to plan their transport.[4] The aim for this project, therefore, is to produce a web application which implements all the features listed in Table 1.

In order to achieve this, there are many resources available. For example, the websites listed in Table 1 all use Google Maps APIs, with the exception of Roudle and wheretomeetup which use Leaflet and MapBox respectively, both of which rely on OpenStreetMap data. Furthermore, there are many different Google Maps APIs which all serve different purposes and are relevant for different features. For example, the Google Maps Distance Matrix API calculates the travel distance and travel time for multiple origins and destinations and the Google Maps Directions API gets directions data. Some of these features are also available in the Google Maps Javascript API. On top of this, there is the Transport for London unified API, so a big part of the project will be researching these in detail to find the most appropriate choices to achieve the objectives of the project which are listed below.

Table 1: Features in different websites

	www.roudle.com	www.whatshalfway.com	www.meetways.com	a.placebetween.us	www.wheretomeetup.com	www.shallwemeetinthemiddle.com	www.geomidpoint.com/meet/
aesthetically pleasing	x	x	xx		xx	xx	
different modes of transport	x		x			x	
equal travel time		xx					
equal travel distance	x	xx	xx			xx	xx
meetup time							
destination ratings	x	xx	xx		xx		xx
includes directions		x	xx	x		x	x
can be used in London		xx	xx	xx	x	xx	xx
works for more than 2 people	xx	xx		xx			xx
display responsive	x		xx	x	x	xx	
destination type	x	xx	xx	xx	xx		xx
passed my algorithm test*		xx			x		x

*a test to determine how well the algorithm performs in an unusual situation - to find an optimal cinema for two people where the optimal cinema is not directly between their two addresses

Table key:
x - feature implemented
xx - feature implemented very well

3   Objectives

Ideally, the system should be able to include all the features listed in the table above. However, not all of these are inherently required to meet the overall aim of the project. Therefore I have split them into primary objectives - those which are required - and secondary objectives - those which improve the user experience.

3.1   Primary Objectives

1. Create a basic but intuitive User Interface

    (a) Allow two starting addresses to be inputted
    (b) Allow mode of transport to be selected
    (c) Allow type of destination to be chosen

2. Produce an algorithm to optimise meetup destination for two users considering

    (a) Geographical midpoint
    (b) Travelling midpoint
    (c) Timed midpoint

3. Show the suggested destinations in relation to the starting addresses on a map to visualise the journey for each user

3.2   Secondary Objectives

1. Extend the algorithm to work for larger groups of people

2. Improve the UI to make it aesthetically pleasing and responsive to different screen resolutions

3. Include ratings of the suggested meetup locations

4. Extend the UI to show directions for each person travelling

5. Provide a save feature for midpoints and starting addresses to be saved for later use

3.3   Possible Extensions

1. Consider prices

    (a) Display the price of each journey using petrol prices in the UK and TFL data
    (b) Extend the algorithm to work for finding a destination that costs the same to travel to for each user

2. Include the choice to reduce overall length, distance, or price travelled by the users together

4 Project Management

4.1 Methodology

The most appropriate methodology for this project is an agile approach as it will help to prioritise a functioning system and can adapt to changes that need to be made as the project progresses.

Unit testing will be implemented at the end of each stage of development to ensure that the system works accurately and correctly. I will try to test specific cases with unusual answers to test the algorithm too.
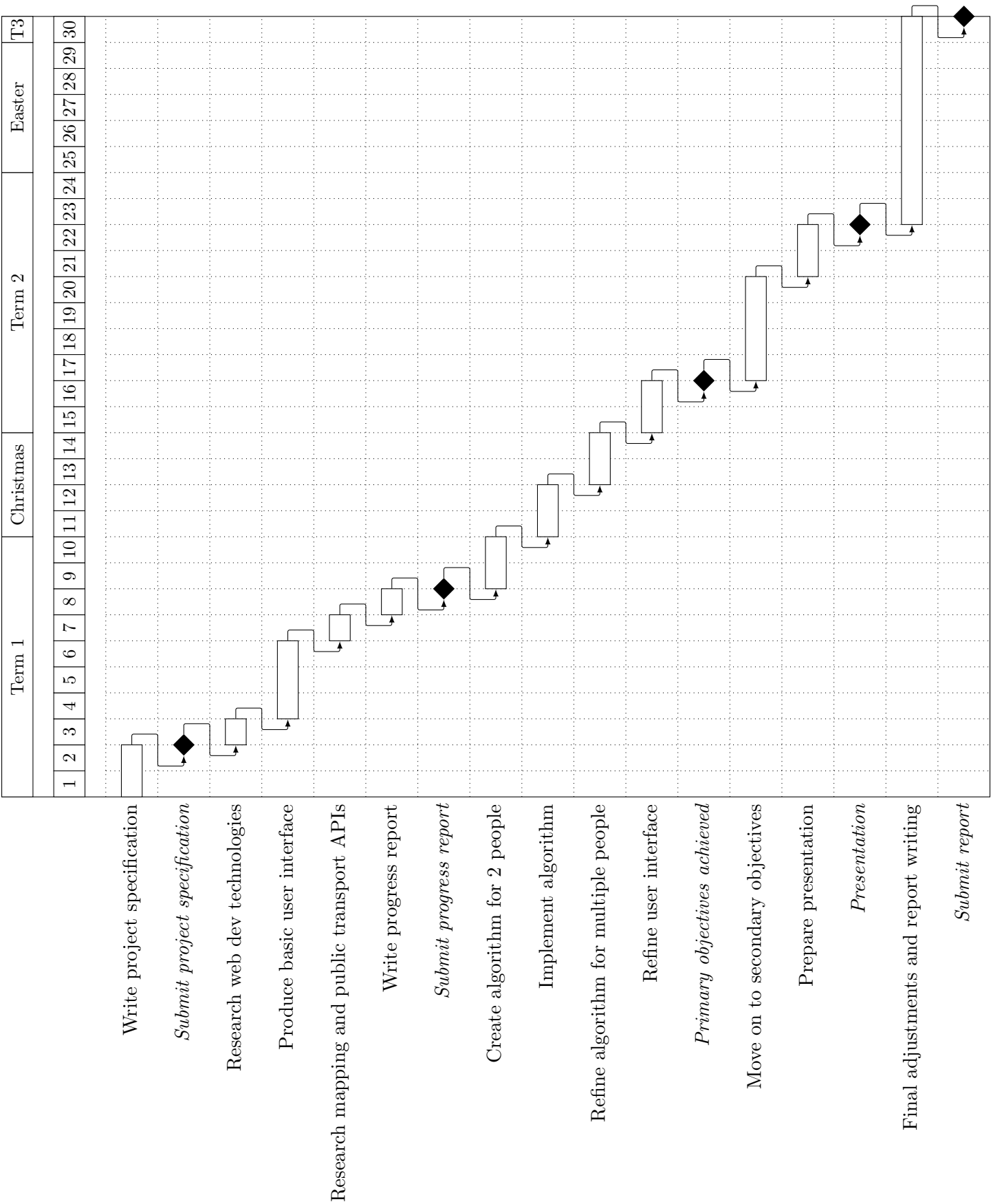
User acceptance testing will also take place to ensure the system is beneficial for the people who will be using it.

4.2 Timeline

In order to meet the 300 hours of work for this project, I plan to spend an average of 10 hours a week on the project. I will review my project weekly. I also intend to meet my supervisor every fortnight to review progress.

The timeline of the project can be seen in the Gantt Chart in Table 2.

Table 2: Gantt Chart

	Term 1		Christmas	Term 2		Easter	T3
	1 2 3 4 5 6 7 8 9 10		11 12 13 14	15 16 17 18 19 20 21 22 23 24		25 26 27 28 29	30

Write project specification
Submit project specification
Research web dev technologies
Produce basic user interface
Research mapping and public transport APIs
Write progress report
Submit progress report
Create algorithm for 2 people
Implement algorithm
Refine algorithm for multiple people
Refine user interface
Primary objectives achieved
Move on to secondary objectives
Prepare presentation
Presentation
Final adjustments and report writing
Submit report

4.3 Resources

- Git
  for version control

- GitHub
  for documenting and updating changes

- Trello
  for keeping track of tasks

- Javascript
  for the User Interface

- Mapping and public transport APIs
  to be researched, but for data essential to the system

4.4 Risks

1. One potential risk of this project is that I have not used almost all the technology before, which has the potential to slow down progress. To avoid this, I will endeavour to spend some extra hours a week using available resources to understand them, and will also choose the APIs easiest for beginners where appropriate.

2. Other risks which could slow down progress of the project include technical difficulties, illness, and other coursework. Where possible, I will take note of busy times in advance and ensure I am still reaching my average of 10 hours per week on the project.

4.5 Ethical considerations

- Whichever APIs end up being used for the project, it is important that the terms and conditions are read and understood carefully to ensure the project abides by them.

- Any user location information used and stored by the system will not be redistributed for the safety of the users.

- For the safety of users, it may be necessary to consider vet the locations suggested by the system. This can potentially be done by using Yelp, Google, or TripAdvisor reviews.

- When user acceptance testing takes place, the participants will be from my social circle, so formal consent will not be required.

References

[1] New Statesman. *City Metric*. URL: http://www.citymetric.com/skylines/where-are-largest-cities-britain-1404.

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[3] Growth Business. *Citymapper*. URL: http://www.growthbusiness.co.uk/navigation-app-citymapper-looks-to-new-cities-after-securing-balderton-capital-and-index-ventures-as-investors-2461427/.

[4] The Office for National Statistics. *Internet access – households and individuals: 2017*. URL: https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/bulletins/internetaccesshouseholdsandindividuals/2017.