

Access Aber - Pathfinding

Report Name	Outline Project Specification
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1 Project description

The project will focus on creating a framework for route-planning or pathfinding-applications in Java, aimed at persons with reduced mobility (PRM) at Aberystwyth University; non-PRMs should be able to use the applications as well, but they are not my target-users.

The applications should be able to help PRMs with various disabilities find the best accessible route from one point on the Aberystwyth University campuses to another, with respect to each user's physical limitations (if any). Not all users will be limited in the same ways, so the framework will have to account for this.

The routes will be planned by one or more pathfinding-algorithms in real-time via a set of nodes: making it possible to dynamically generate the best route-suggestions for the user wherever they are on campus. The pathfinding-algorithm(s) to be implemented have not been decided upon yet, but A* (A Star) and D* (D Star / Dynamic A Star) are strong contenders at the time of writing this. In addition to implementing one or more algorithms in the framework, I will need to investigate several others and document their functionality and advantages and disadvantages in my dissertation; 8 search-algorithms was the number suggested by my supervisor.

The nodes to be used for route-planning have already been mapped in *OpenStreetMap* (OSM) [4] by various members of the public. OSM's database of nodes on the Aberystwyth University campuses is quite extensive, and can be further expanded upon to increase the accuracy of my framework, as the database is open to the public. In addition to this, the framework should be made in such a way that it possible to update the nodes used for pathfinding over time - for example by importing a more recent version of the OSM database - thus ensuring that the framework can stay useful over time.

2 Proposed tasks

- Investigate how to store, represent, and index the OSM database containing all the nodes to be used for pathfinding.
- Extract current information about disabled access on the campuses from the university's records, and investigate whether information is available on other points of interest as well.
- decide upon a pathfinding algorithm to use for the project, or combination of algorithms if this has an impact on effectiveness.
- Investigate what constitutes an obstacle for people with different disabilities.

Create different categories for the various disabilities / modes of transportation based on this information. The route-planning algorithm(s) should avoid any obstacles flagged in each category.

Possibly hold a conversation with the university about this, and find the nodes that are hard to travel between for people with various disabilities.

- Investigate localisation on various platforms. How is it done, where can it be used, and how do I incorporate it in my framework?

The framework should make it possible to use the users' coordinates for route-planning, but as there are many ways of finding and interpreting said coordinates, my framework should focus on standardising them to a single coordinate system like WGS84, OSGB36, or ED50 [2,3,5].

3 Project deliverables

3.1 Software:

- Working iterations of the system, with various functionality added over time.

The first iteration has to provide some simple route-planning using a subset of the OSM database, without considering specific disabilities.

Then some functionality has to be added in order to make it possible to distinguish between different modes of transportation and disabilities when planning routes.

Then some localisation has to be added to the system so that the user knows where it is, and the pathfinding can be made more dynamic.

After this, I can start experimenting with different search-algorithms, and document their advantages and disadvantages when applied to the OSM database and my framework.

- All of these steps will work as a potential demo of the system, with each iteration improving upon previous functionality and/or adding something new.

3.2 Documents:

- Final hand-in of the dissertation:

30.September.2016

- Any other deliverables (Like design and testing plans) to be decided upon by the supervisor (As far as I have understood this).

Annotated Bibliography

- [1] Google, "Google maps development kit," <https://developers.google.com/maps/>, Feb. 2015, accessed February 2015.

This website can provide me with valuable insight into how pathfinding can be done. My project will have comparable functionality to Google Maps and other route-planning software, so this is a good place to get ideas from.

- [2] National Geospatial-Intelligence Agency. Wgs84. [Online]. Available: <http://earth-info.nga.mil/GandG/wgs84/>
- [3] OpenStreetMap Foundation. Wgs84 conversion in openstreetmap. [Online]. Available: wiki.openstreetmap.org/wiki/Converting_to_WGS84
- [4] —, "OpenStreetMap Homepage," http://wiki.osmfoundation.org/wiki/Main_Page, 2004.
- [5] Ordnance Survey. A guide to coordinate systems in great britain. [Online]. Available: <http://www.ordnancesurvey.co.uk/docs/support/guide-coordinate-systems-great-britain.pdf>
- [6] Route4Me, "Route4Me Route Planning SDK," <http://route-planning-blog.route4me.com/2014/08/route4me-releases-c-sdk-for-route-planning-api-2/>, Aug. 2014, accessed February 2015.

A SDK for creating route-planning software. I am unsure of how it is licensed and which(if any) parts I am allowed to use in my own project. But it is worth a look.

- [7] P. Sanders and D. Schultes, "Sanders/Schultes: Route Planning," <http://algo2.iti.uka.de/schultes/hwy/>, Feb. 2008, accessed February 2015.

A website containing lots of links to other works related to route planning. Made for a PhD thesis, which is also available on the site. This might provide me with more ideas for how to structure my system, as the thesis is aimed at pathfinding in larger areas than my project is aimed at, such as cities or countries.