CSC3003S Capstone Project 2022

PTJP: Public Transportation Journey Planner

Proposer: Dr. Jan Buys (jbuys@cs.uct.ac.za)
Tutor: Linamandla Pikisa (PKSLIN002@myuct.ac.za)

Summary

A large portion of the South African population relies on public transport, but most transportation agencies do not provide a website or app for easily accessing route information or for planning a trip between two stations or stops, and often up to date timetables are not even available. In this project you will develop a web application in which a user can search for a route to travel between two train stations (or bus stops) and specify their arrival or departure time to find the exact train or bus to take. The application should work for travelling between train stations in the Cape Town region, with the option to extend it to other regions or other modes of transportation. The program should be able to find the best route between two stations (which may include changing trains) and possible departure times, given maps and timetables. Admin users should also be able to update the schedule if some trains are out of service.

Functionality

Basic functionality:

- Read in and construct internal representation of Cape Town train timetables (see below)
- A web interface (preferred) or otherwise a GUI to search for journeys between any 2 train stations (not just stops on the same line)
- Enable search by time: The user can specify the departure or arrival time.
- Display the information of the route that was found, including the departure and arrival time, and any transfers between lines.
- User login to save search and search results.
- The implementation should use an algorithm to find the shortest route between the start and end stations, and then consult the timetable to find the first available journey following that route after the specified departure time.

Extended functionality (you are not expected to implement all of these, but you will get marks based on the number and quality of implemented features):

- Extend the route finding algorithm to find the journey with the earliest possible arrival time (if the departure time is specified) or the latest possible departure time (if the arrival time is specified). This won't always have the same result as the basic approach where the route finding is independent of the arrival/departure time and only depends on the actual length of the journey.

- Add an admin login, where the admin can specify that some routes or stations are currently closed. The search algorithm should then take this information into consideration.
- Autocomplete functionality for typing the name of a station or stop.
- Add timetables from another region or another mode of transportation (e.g. busses). This could also include walking or taking a taxi.
- Choose and/or display start/end locations and routes on a map. You may use an existing maps API if you implement this.
- You may consult with the project proposer about other possible extensions.

Implementation

You may use Java or Python (or other languages with the permission of the Tutor).

You may use existing web development frameworks for development (e.g. React, Django). A database is not required. If you have a web-based application it should be possible to host it locally (this will be required for the tutor to mark the project).

You may not use an existing journey planning or route finding API – you need to implement this yourself. If you have questions about which frameworks or existing tools may be used please consult with the tutor or the project proposer.

Resources: Cape Town Train timetables

The route map and timetables (for South, North and Central areas) are available on Vula under "Per Project Resources". They were downloaded from http://www.metrorail.co.za but the website does not seem to be available currently.

The first step will be to convert the data to a machine-readable format and to parse the data into the data structures that your program uses. You may optionally use the General Transit Feed Specification (GTFS) to represent the data, but you will need to write the code do convert the data into this format.

If you find alternative data sources you may contact the project proposer to advise whether you may use that.

Examples of existing journey planners

https://cttrains.co.za/index.php This website has train schedules but one can only search or display information for one line at a time.

https://www.myciti.org.za/en/routes-stops/plan-your-journey/ For MyCity busses.

https://moovitapp.com/cape_town-1883/poi/en-gb

https://tfl.gov.uk/plan-a-journey/