

INFORMATION AND FILE FORMAT FOR NOTTINGHAM100 AND EDINBURGH200 INSTANCES

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There are two instances available, Nottingham100 and Edinburgh200, in which Nottingham100 consists of a network of 100 bus stops (i.e., vertices), and Edinburgh200 has 200 bus stops. The bus stops are selected at random from the National Public Transport Data Repository (NPTDR)¹ in the UK for Nottingham and Edinburgh, respectively, and consist of Latitude and Longitude coordinates. Once the vertices (bus stops) have been chosen, the driving distance and driving times between pairs of vertices are obtained by lookup from Google distance matrix API². Travel distance and travel time matrices are then constructed from this information, omitting the longer edges to avoid excessive lookup operations, and keep within the Google daily allocations that allow free usage of the API. Once the travel distance and time matrices have been constructed, an minimum spanning tree (MST) is formed from the shortest edges (driving times), and following this the remaining edges are added to match the number of edges required by the user. The shorter edges are chosen first to avoid excessive crossings of edges. Nottingham100 and Edinburgh200 are visually represented in below. (Please note that the edges joining the nodes on the maps have been constructed from linear components connecting "waypoints" obtained from Google Directions API³. Finally, demand matrices were computed by relating the number of passengers to the population density given by the Data Science Toolkit, Coordinates to Statistics API⁴, which gives the population for one km sq. surrounding each bus stop. Although this will not completely reflect real-world demand, we consider this to be a better option than the completely random choice for demand that was made when generating the Mumford instances.

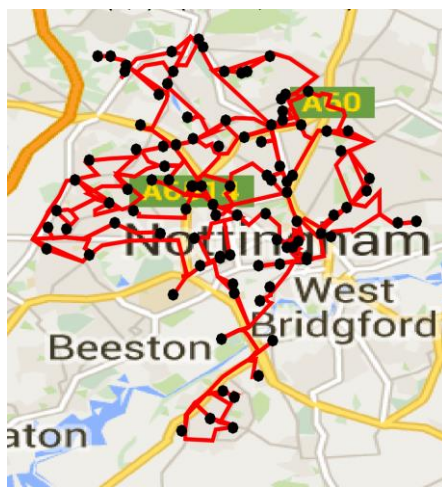


Figure 1: Nottingham100

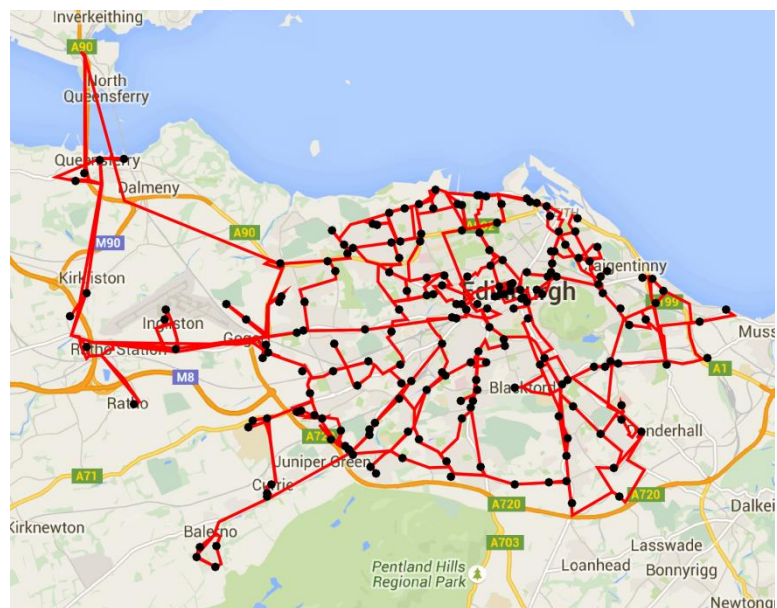


Figure 2: Edinburgh200

Files Available

To run our two test instances for each you will need the following files: the demand matrix file, the travel times matrix file. To plot the bus stops you will also need the files with the latitude and longitude of the bus stops. These input files are formatted as text files. The full list of files is given in the table below.

¹ <http://data.gov.uk/dataset/nptdr>

² <https://developers.google.com/maps/documentation/distancematrix/intro>

³ [google.com/maps/documentation/directions/intro](https://developers.google.com/maps/documentation/directions/intro)

⁴ <http://www.datasciencetoolkit.org/developerdocs#coordinates2statistics>

File Formats

File	Nottinham100	Edinburgh200
Coordinates file: latitude and longitude coordinates for bus stops	Nottingham100CoordsFile.txt	Edinburgh200CoordsFile.txt
Address file: Address of each bus stop	Nottingham200Stops.txt	Edinburgh200Stops.txt
Demand file: Daily demand for each bus stop (symmetrical)	Nottingham100Demand.txt	Edinburgh200DemandFile.txt
Travel Times file: Travel time matrix for	Nottingham100TravelTimes.txt	Edinburgh200.TravelTimes.txt
Distance matrix	Nottingham100DistFile.txt	Edinburgh200DistFile.txt
Visualization file: image file for city	Nottinham100.pdf	Edinburgh200.pdf

Formats

Coordinates File

Number of bus stops
longitude1 latitude1
longitude2 latitude2
longitude3 latitude3
etc.

Address File

Addresses to match the sequence of the longitude and latitude coordinates

Demand File

100 x 100 source to destination demand matrix(symmetrical).

Travel Times File

100 x 100 symmetrical travel times matrix between direct links, with “Inf” indicating that there is not direct link.

Distance Matrix File

100 x 100 symmetrical distance matrix between direct links, with “Inf” indicating that there is no direct link.

Visualization File

Images of Nottingham100 and Edinburgh200 on Google Maps, showing nodes (bus stops) and links.