

## CS 361 – Homework #5 – Dijkstra’s Shortest Path – due December 3, 2018

In this assignment, you will implement Dijkstra’s shortest path algorithm into Java. For a weighted graph, the algorithm determines the shortest path between two given vertices. I’ve decided to practice finding shortest paths on a real-world graph: the London Underground, which is a subway network consisting of over 300 stations. In the Dijkstra folder on the class Web site, you will find some useful files to help with your implementation:

- Graph.java – implements a graph data structure
- Vertex.java – defines a vertex
- stations.txt – this will be the input for your program (For each station in the system, you will see the time in minutes it takes to get to all its immediate neighbors.)
- output.txt – shows example I/O for your program

In addition I’ve provided some images that show pictorially how the London Underground system is arranged. This may be helpful when looking for interactive input data to test.

You will need to write a Driver.java file that encapsulates the basic logic of the program, including the I/O. You may also find it helpful to add functionality to the Vertex and Graph classes to assist in finding shortest paths.

Your program will first need to read in the text file stations.txt. This file contains all the information necessary to build the graph. Next, ask the user to enter the names of two stations. If a station does not exist, your program should gracefully handle this situation and ask the user to re-enter the missing information. If the first station entered is incorrect, resolve that mistake before going on to the second station.

Once you have the two stations, compute the shortest path according to Dijkstra’s algorithm, and then list all of the stations along that path. The implementation should be computationally efficient – returning the final answer within a few seconds. The output should be formatted as in the example below, with the numbers in the time column right justified. Allow for up to 25 characters in the station name and 3 digits in the time.

Example I/O:

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Enter the name of two stations to find the shortest path between them:
Station 1: Seven Sisters
Station 2: Oxford Circus
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The quickest route from Seven Sisters to Oxford Circus is 14 minutes.  
The stations along the route (with times indicated) are:

STATION	TIME IN MINUTES
Seven Sisters	
Finsbury Park	4
Highbury and Islington	6
Kings Cross	9
Euston	11
Warren Street	13
Oxford Circus	14