CSI 2110

Programming Assignment - 3 (Part B)

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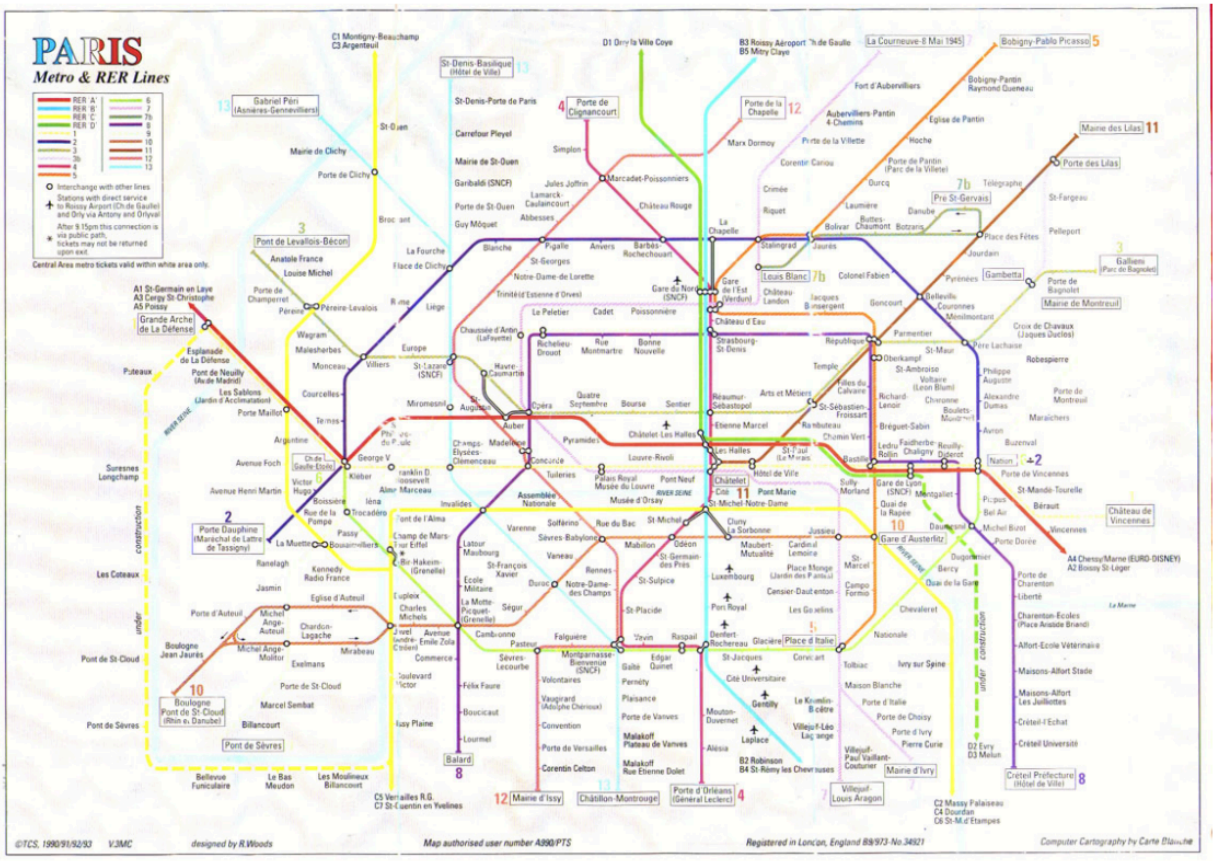

Introduction

This assignment consists of two parts, both of which utilize the concepts of a minimum spanning tree (MST) and graph algorithms:

- The “Expensive Subway” problem is resolved in Part A (Main.java), which calculates the lowest cost to connect all the stations, alongside reporting the feasibility.
- The Paris metro network (ParisMetro.java) identifies “hub stations,” creates a reduced graph on those hubs, and determines the cost-efficient set of segments connecting all hubs.

Part 2 - Analysis

In this part, metro.txt is read into various arrays of the IDs and the station names, with a HashMap<Integer, Integer>. All edges with weight -1 are considered as transfers. The positive weights are treated as travel times and are stored in an ArrayList (ArrayList<NewVert>[] trainInfo).

The Arrays → transmission[], connect[], and fairSys[] helped to calculate hub indices and the list of vertices per hub. The Dijkstra algorithm was utilized using a Priority Queue of nodes only through the positive edges to calculate the cheapest path to every other hub, thus, storing minimum costs in a matrix choose[][]. Later, I successfully managed to build a hub graph (NewStation edges) and then applied Kruskal's algorithm to determine an MST over the hub.

Test Outputs:

Test File Names	Output
metro.txt	Total vertices: 376, Total Edges: 933 Number of Hub Stations = 58 (total Hub Vertices = 138) Number of Possible Segments = 108 Total Cost = $4464

References

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