CS 150: Project III: Optimizing A Fuel Network

Due: 11:55pm, Saturday December 6, 2014

Version as of: 19:47 Monday 10th November, 2014

Introduction

The third project is to build a simulation of a fuel distribution network. Your program should simulate the generation of a delivery path for each fuel depot so that each gas station can receive fuel. In this project, you will need to explain/justify why your solution is a good solution.

Project Description

The problem can described as follows.

Given:

- There are n_{depots} fuel depots at various locations.
- There are $n_{station}$ gas stations at various locations.
- Each gas station $station_i$ has a need for fuel and must be serviced by a fuel depot $dept_j$.

Your task in this project is to determine which gas stations should be serviced by each fuel depot. The goal is to minimize

1. the total number of miles travelled,
2. the longest distance from any gas station ($station_i$) to the fuel depot ($depot_j$) that services it

subject to the following constraints

- Each gas station can only be serviced by one fuel depot.
- Every gas station must receive service from a fuel depot.

Project Data

Your program will read in data from the following files:

1. connectivity (graph information) from a file *connectivity.txt*. The format of the file is:

   ```
   <node name> - <node name> <edge weight>
   ```

2. specification of fuel depots and gas stations from a file *locations.txt*. The format of the file is:

   ```
   <keyword> <node name>
   ```

   where <keyword> is one of (depot, station).

The program will write out the mapping of gas stations and fuel depots to a file *mapping.txt*. The format of the file is as follows:

1. name of a node (fuel depot) - all on one line
2. space separated list of triples (¡node name¿ (¡path from depot to gas station¿) ¡distance¿) - all on one line
3. blank line - separator from next entry

Project Analysis and Report

Your report should include:

- a description of the algorithm(s) that you used,
- assumptions made,
- the quality of the solution, i.e., how good is the solution based in your opinion?
- analysis of the program's performance on the provided set of data
- a **complete** list of the people with whom you have discussed the project.

Project Constraints

The following constraints apply to the project:

1. The project is to be completed individually. The only person you can consult about code issues is the instructor.

Grading

Your project will be graded on the following criteria (assuming the program compiles and runs):

1. correctness of the program
2. documentation (methods and classes) including javadoc
3. unit testing
4. object oriented design
5. quality of the evaluation and analysis

Errata

For the ECE students, this problem is analogous to the routing problem in circuits. Think of the depots as synchronized clocks, the gas stations as the chips/gates that need clock signals and the weighted edges as the constrained channels that the signals must use. This problem assumes that the chips/gates have been placed in a 2-dimensional rectilinear grid. The more general or full problem is that of *placement and route* where the placement of the chips and the signal routes must both be determined.