CS241 Winter 2017 Project 3

Total points: 100

Due date: Friday, March 10th, 2017

Purpose:

Implement a graph data structure for a practical application.

Task Description:

Input: Two files - one contains city data and the other contains road data.

- **city.dat:** This file contains information about cities, where each line has 5 attributes: *City Number*, *City_Code (2 letters)*, *Full_City_Name*, *Population*, and *Elevation*.
- **road.dat**: This file contains information about roads, where each line has 3 attributes: *From_City*, *To_City*, and *Distance*. Note that all roads are assumed to be one-way.

Output: A menu driven system which has the following options.

- Read the original data files and store the data to appropriate data structures.
- Let the user of this program enter a *City Code* and your program should print out the city information (the whole record).
- Find the connection between two cities.
    - The user will be asked to enter two *City Codes*. The program finds the shortest distance between the two cities.
- Insert a road (edge) between two cities
    - The user will be asked to enter two *City Codes* and its *Distance*. Note that if a pair of *City Codes* already exists or if the *City Code* doesn't exist, print out a warning message.
- Delete a road (edge)
    - The user will be asked to enter two *City Codes* for a road. Note that if the road entered doesn't exist, print out a warning message.
- Exit.

Your program should resemble the following output (the user inputs are underlined):

% java Project3
Command? H
  Q Query the city information by entering the city code.

D Find the minimum distance between two cities.
I Insert a road by entering two city codes and distance.
R Remove an existing road by entering two city codes.
H Display this message.
E Exit.
Command? Q
City code: LV
12 LV LEE VINING 8390 5983
Command? D
City codes: CH PM
The minimum distance between CHINO HILLS and POMONA is 143 through the route: CH, xxx, ..., xxx, PM.
Command? I
City codes and distance: GG BO 100
You have inserted a road from GARDEN GRPVE to BOSSTOWN with a distance of 100.
Command? R
City codes: KV MP
The road from KERNVILLE and MOUNTAIN PASS doesn't exist.
Command? E

Programming Guides

Create a Java **Digraph** (directed graph) class to store the city and road information. Use Dijkstra's algorithm discussed in class for finding the shortest distances between cities. In your project report, please discuss the data structures you used for the graph and dijkstra's algorithm. You will also need to analyze the time complexity of your program with your selected data structures.

What to Submit?

1. Project report (please follow the standard guideline as shown in blackboard).
2. Java source code (Project3.java, which contains the main method and other supported java files).
3. Output.txt.
4. Please zip all documents as yourname_p3.zip and submit it in blackboard.

You will be graded based on the quality of your program, your project report and how well you follow the project description and our general project guideline.