Spring 2022

GPS Least Costly Path

100 pts

For this final project you are to create a program similar to a GPS system. Your code will read in a pre-defined file with all the information you will need to calculate the least costly path from one point to another on the graph. The user will have the ability to choose if they want one cost over another (distance cost or time cost), as well as ask for the location symbol (A – T) or the street address associated with the symbol.

1. Use your own Generic heap PriorityQueue to be used with your Dijkstra' s Shortest algorithm.
2. Read in a set of data from a text file which will contain vertices with both a symbol and an address to represent locations on a map. The file will also contain a set of connections between vertices with both a distance and time cost between them.
3. Create a user interface (**console** for a max grade of 90% or a **GUI** for a max grade of 100%). Users should be able to select a from and a to address and be give the least costly path based on user selection (see below)
4. Create at least the following classes:
    a. Vertex
    b. Edge
    c. Path
    d. Graph that contains the following:
        i. Two public static booleans called:
            1. useDistCost
            2. returnAddress
        ii. A constructor that accepts a filename as a string.
        iii. The toString() method that returns all vertices and costs (both dependent on the two static Booleans above
    e. Dijkstra that contains the following:
        i. A static method called shortestPath that returns a Path
        ii. A static int called totalCost
    f. Tester class for testing

The format of the map file is as follows with tabs separating fields:

```
<Nodes>
Symbol      Address
A     1121 N Bend Rd.
B     1521 Grassland Ave.
...
</Nodes>
<Edges>
Source      Destination TimeCost    DistanceCost
A     C     4     8
A     Q     3     6
A     T     5     10
...
</Edges>
```

NOTE: A max of 10 extra credit points can be obtained by adding additional path criteria but you must add that to the existing file and turn it in.

The "best" 3 projects in each section will be selected and awarded with an exemption from the Final. "Best" is determined by a number of factors listed on Canvas.