IT 427, Design and Analysis of Algorithms

Programming Assignment 2: Dijkstra's Algorithm

Due date: Sep. 22, 2024, Sunday, 11:55 PM 30 points (25 on programs, 5 on report)

For this assignment, you are asked to write a java program that can read in a text file that contains multiple weighted-directed graphs and find the shortest path using Dijkstra's algorithm for each graph.

Input: The input file is formatted as follows:

```
20 graphs in wdGraphs.txt.

** G1:  |V|=5, V={0,1,...4}
(u, v, weight) E = {
     ( 0, 2, 10.869)
     ( 1, 4, 25.297)
     ( 2, 0,  8.403)
     ( 2, 1, 12.700)
     ( 3, 0, 89.156)
     ( 4, 3, 38.522)}
------------------------
......
......
** G20:  |V|=455, V={0,1,...454}
(u, v, weight) E = {
     ......  }
------------------------
```

The first line indicates the number of graphs in the file. There are 20 graphs in `wdGraphs.txt`. For each graph, `V` is the index set of vertices, i.e., `V = {0,1,...n-1}` where $|V| = n$ is given. Each edge from v to u with weight w is presented as (v, u, w).

Output: The output shows the shortest path from v_0 to v_{n-1} with incremental weight from v_0 to each vertex on the path for each graph. The results should be shown on the screen formatted as follows.

```
Shortest Paths from vertex 0 to vertex n-1 in wdGraphs.txt, |V|=n

G1's shortest path from 0 to 4:
     ( 0, 2, 10.869) --> 10.869
     ( 2, 1, 12.700) --> 23.569
     ( 1, 4, 25.297) --> 48.866

G2's shortest 0 to 4:
     ( 0, 3, 46.188) --> 46.188
     ( 3, 4, 26.595) --> 72.783

G3's shortest path from 0 to 54:
     *** There is no path.
```

```
G20's shortest path from 0 to 454:
     (  0, 146,  0.019) -->  0.019
     (146, 117, 10.144) --> 10.163
     (117, 169,  2.618) --> 12.781
     (169, 454, 43.630) --> 56.411
```

Program requirement: The name of the Python program should be `dijkstra.py` and I will compile and run your program on our Linux server as follows.

```
python3 dijkstra.py wdGraphs.txt
```

where `wdGraphs.txt` is the name of the input file. If your program fails to compile, you will get 0 point. I may test your program on a different graph file.

Prepare your programs on Linux Server: This is similar to the previous assignment.

- Make a directory `asg2` under your `IT427`, i.e., `~/IT427/asg2/`. All of your programs and needed files for this assignment should be saved under your `~/IT427/asg2` before run `submit427.sh`.
- Check the contents of my `/home/ad.ilstu.edu/cli2/Public/IT427/asg2` and copy `wdGraphs.txt` to your own `~/IT427/asg2`.

There are two parts of submission:

All are the same as the previous assignment except when you try to run the submission scripts you have to change the submission number to 2 as follow:

```
bash /home/ad.ilstu.edu/cli2/Public/IT427/submit427.sh peekapoo 2
```

You can use the same secret name. Since I will keep updating `submit427.sh` for different assignment, you have to run the updated version from my `/home/ad.ilstu.edu/cli2/Public/IT427/` directly, i.e., don't copy it to your own directory.

Important!! You will lose significant points if you fail to follow the rules.