PROJECT2

A Demo of Map Navigation System

November 29, 2023

I Purpose

To better understand the graph data structures learned in this course, for example, the shortest path algorithm and minimum spanning tree algorithm.

II Requirements

A. Implementation

1. Implement a map navigation system using GUI. You should use the specified map. The map is provided in folder ”data”. (**Building multiple other maps can serve as bonus points, but during the interview, it is necessary to use the provided test samples uniformly**)

2. Important locations are marked in ”tagged.png”. You can consider them as vertices of the graph. The distance information between each location is provided in the edge.txt file, and you can treat them as edges and corresponding weights.

3. Your system should contain four operations:
   (1) Given two locations, show the shortest path from one to the other on the map and its length.

   Floyd-Warshall vs Johnson

   (2) Given one location, show the shortest paths from all locations on the map to this one and their length.

   (3) You need to provide the path and distance for designing the subway routes based on the current road, which needs to meet these conditions:

   最小生成树
   Krustal vs Prim

   a. All locations are included in this route.
   b. The selected route has the shortest distance among all possible routes.

   (4) Given one location, such as A, you need to provide the path and distance for designing bus routes starting from A, and ensure that the bus route is the shortest. In addition:

   Dijkstra

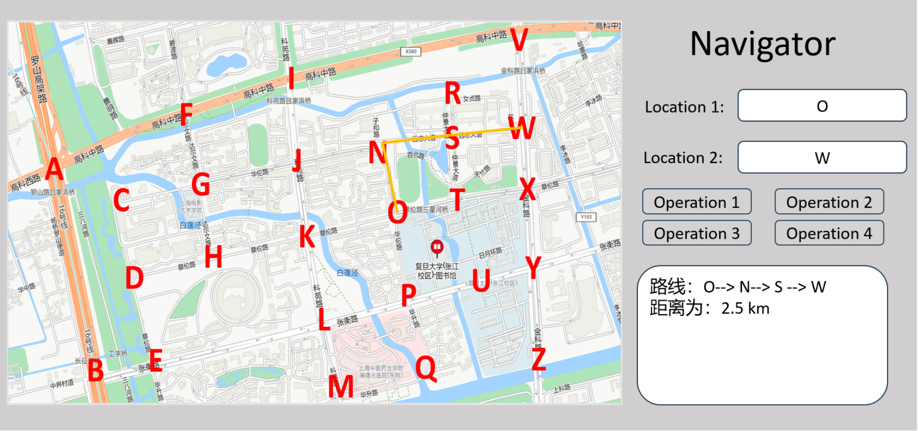
   a. The shortest path from all other points to A through this bus route remains the same length as before.
   b. Any two points can be reached through the designed bus route.

4. Use different algorithms to process the first three questions, and if the path is not unique, display all results. **Multiple solutions to the same problem can also be considered as a bonus.**

B. Document

1. Show that which algorithm is used in each function and why.
2. Describe how to use the system and display the operation results.
3. Analyzing the time complexity of algorithms.

III Demo



Location 1: O

Location 2: W

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路线：O--> N--> S --> W
距离为：2.5 km
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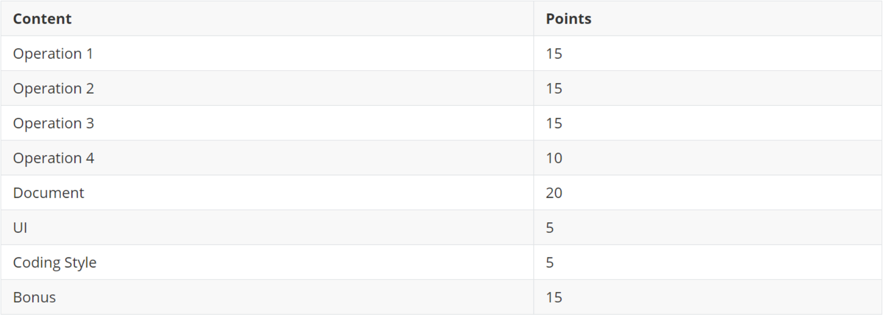
A GUI example is shown above. The GUI should contain two parts, one for the map and the other for operations. The important locations should be marked with red points on the map. The chosen path is highlighted in yellow and the corresponding information is output on the right side. **If you can choose a point by clicking the map, it will be considered in bonus.**

IV Grading

The scoring rules are as follows:



Content	Points
Operation 1	15
Operation 2	15
Operation 3	15
Operation 4	10
Document	20
UI	5
Coding Style	5
Bonus	15

V Submissions

1. For the implementation of these algorithms, you are free to select a programming language of your choice.

2. Your document should be submitted in electronic format whenever possible. If you have a handwritten document, please ensure that the writing is neat and the layout is well-organized. The document format should be either Word, PDF, or Markdown.

3. Interviews will be arranged for everyone after the deadline to showcase their work related to the project and UI.The interview will take place during the laboratory class on December 19th. We will conduct interviews in the order listed on the student roster.

4. Kindly upload the source code files along with their associated documentation in a compressed ZIP format to the elearning system for assessment.

5. The deadline of this lab is 23:59:59 on December 17th, 2023.

6. The naming format for the file should be ”proj2-StudentID-Name,” and make sure to compress all the files into a single compressed folder.

7. If you have any questions please feel free to contact teaching assistants.