

# **Data Structure and Algorithm**

## **Project 2**

### **Path Adviser Based on Shortest Path Algorithm**

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## **1. Introduction**

Similar to tree data structure, graph is another widely used abstract data type in computer science, so this project designed for you is aiming at let you be more familiar with graph algorithm learned in this course. You are required to design travel route in Shanghai using the data from Shanghai subways under the condition of satisfying different requirements such as using the shortest time, walking least and so on.

## **2. Requirements**

### **2.1 Basic Function**

#### **2.1.1 Initialization**

Given the subway data, you are required to initial the graph data structure. You have better consider carefully the storage method in order to make your following work more convenient.

The format of data provided to you is like(subway line 1):

站名	纬度	经度	末班车时间
莘庄	121.3918	31.11655	22:32
外环路	121.3997	31.12691	22:34
莲花路	121.4093	31.13674	22:36
锦江乐园	121.4206	31.14845	22:39
上海南站	121.4363	31.16123	22:42
漕宝路	121.4417	31.17445	22:45
上海体育馆	121.4428	31.18839	22:48
徐家汇	121.4447	31.19917	22:50
衡山路	121.4531	31.21143	22:52
常熟路	121.4577	31.21994	22:54
陕西南路	121.4667	31.22353	22:56
黄陂南路	121.4798	31.22869	22:58
人民广场	121.4817	31.23897	23:01
新闻路	121.4747	31.24476	23:03
汉中路	121.4651	31.24799	23:05
上海火车站	121.4623	31.25359	23:08
中山北路	121.4656	31.26532	23:10
延长路	121.4619	31.27812	23:13
上海马戏城	121.4585	31.28583	23:15
汶水路	121.4566	31.29887	23:17
彭浦新村	121.4551	31.31291	23:20
共康路	121.4535	31.32539	23:23
通河新村	121.4478	31.33782	23:25
呼兰路	121.4442	31.33782	23:27
共富新村	121.4404	31.36164	23:30
宝安公路	121.4373	31.37624	23:33
友谊西路	121.4343	31.38769	23:35
富锦路	121.431	31.39871	23:37

The final column is the time of last subway at night, you can regard the difference between two neighbor station as the running time of these two stations, and this difference can also be the weight of two nodes if you want to calculate the shortest time path.

### 2.1.2 Recommended Path

#### a) shortest time path

Given a start place and an end place, calculate the shortest time path and give travel route as well as the total time including the time you walk to the subway station and the time you spent on subways.

In order to calculate the distance between start place and subway station, we have given the longitude and latitude of all stations. And you can get the longitude and latitude of start place and end place using baidu map api. For convenience, we only consider the straight line distance ignoring the real road conditions (If you can consider, it's better). Hint: you can calculate the distance between two points if you have known the longitude and latitude using baidu map api.

Suppose the walking speed is 5 km/s. 

#### b) walking least path

Given start place and end place, calculate the walking least path. The distance we consider here is like a) and give the travel route as well as travel time.

#### c) least transfer path

Given start place and end place, calculate the least transfer route using subway and give the travel route as well as travel time.

**Note:** you should show the used time of each query.

## 2.2 Document

Document is very important, and you need to:

1. Show that which algorithm is used and explain why you choose that.
2. Analyze your implementation's performance with collected data.

## 2.3 User Interface



You can choose the start place and end place from the map, and after

you have calculate the route, you can display it. There is a demo provided for you. And you're very welcome to show us a more user-friendly interface.

### 3. Grading

Item	Cost	Description
General	50%	Correct implementation of basic function
Interview	25%	Correct answer face-to-face question
Documents	10%	Full and detail. Reasonable analysis
UI	10%	User-friendly and easy to use
Coding Style	5%	Proper comment
Bonus	10%	Creative thought.

### 4. Submissions

#### 4.1 Documents

- a) all the codes
- b) a document

#### 4.2 Deadline

2018.12.19 23:59:59

Please submit to:

<ftp://10.132.141.33/classes/17/181> 数据结构与算法设计(郑骁庆)

/WORK\_UPLOAD/Project2

Naming: 学号\_姓名.rar or .zip and so on.

### **4.3 Interview Time**

2018.12.19 18:30 软件楼机房

## **5. Suggestions**

- a) Start early.
- b) You can start your program and test the correctness of your program with a start subway station and an end subway station randomly. After you have make sure your program is correct, you start to consider the walking route and other thing.
- c) If you have any questions, you can contact us with Wechat or in any other way.
- d) **Don't try to make everything perfect!** Good luck to you!