

## CS 3610/5610N Project 6

**Due date: Monday, Nov. 28, 11:59 pm**

**4 final points**

Whenever I make a trip to a new city, I use Google maps to find the shortest path to my destination. All I have to do is enter the name of the city I currently reside in followed by my destination city. In seconds, I am given a route with estimated arrival time. This is much quicker than tracing a path with my finger on a map found at the gas station because they utilize advanced shortest path algorithms.

It is now your turn to compete with Google maps and write your own shortest path program. Given a source city, you need to print the shortest path to the destination city followed by the length of the path. This problem is formally known as the single source shortest path problem. There are greedy algorithms that solve this problem in polynomial time, so I expect your program to be just as efficient.

### 1 Input Format

```
t
n
City-1
City-2
.
.
.
City-n
w11 w12 ... w1n
w21 w22 ... w2n
.
.
.
wn1 wn2 ... wnn
.
.
.
```

**t**: Number of test cases.

**n**: Number of cities in map.

**City-x**: Name of city in map. City-1 is the the source city and City-n is the destination.

**wij**: Matrix of weights between City-i and City-j for all n cities.

## 2 Example

```
1
4
Chatham
Athens
Columbus
Cleveland
0 1 2 0
1 0 5 6
2 5 0 7
0 6 7 0
```

Here we have 1 test case. In this test case we have 4 cities to read in followed by a 4x4 matrix of weights. Chatham is city 0, Athens is city 1, Columbus is city 2, and Cleveland is city 3. Using these as indices into the matrix, we can find the weights between each city. For example there is a distance of 7 between Columbus and Cleveland. We now want to find the path between Chatham and Cleveland.

## 3 Output

```
City-1 ... City-x ... City-n d
```

You should output the shortest path taken to get from city 1 to city n followed by the distance. So the output for the example above should be:

```
Chatham Athens Cleveland 7
```

In order to get to Cleveland from Chatham, we must first travel through Athens. The total trip has a distance of 7.

## 4 Turn in

Email your source code to pg219709@ohio.edu with the subject "CS3610 Project 6". If you have multiple files, package them into a compressed tar file (.tar.gz).

As an example, if I had my source files in a directory named "project6/", I could package the files inside with the following command

```
$ tar -zcvf cs3610_project6.tar.gz project6/
```

Now my files reside in cs3610 project6.tar.gz, which you will email to me. To verify that the files were packaged correctly, you can unpackage the .tar.gz file with the following command.

```
$ tar -xvf cs3610_project6.tar.gz
```