

BLG336E – Analysis of Algorithms II

Homework 2 Report

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In this homework we are asked to implement shortest path algorithm with some restrictions. I used Dijkstra algorithm finding shortest paths.

You can compile the code and using commands:

```
- g++ hw.cpp  
- ./a.out test.txt
```

In this homework I used adjacency matrix. Then I found shortest paths using Dijkstra algorithm. Non-edge ones are set to INF value which is 999 in my code. When looking for alternative paths I set the edge causing intersection as INF temporarily.

You see Joseph and Lucy's paths and taken times.

```
(base) Kursat-MacBook-Pro:hw2 kursat$ ./hw test1.txt  
Joseph:  
Node: 0 Time: 0  
Node: 1 Time: 4  
Node: 4 Time: 7  
Node: 5 Time: 20  
Lucy:  
Node: 2 Time: 0  
Node: 3 Time: 10  
Node: 1 Time: 15  
Node: 4 Time: 18
```

Now they arrived destination points. They will start to come back their hotels.

```
-- returning --
Joseph:
Node: 5 Time: 50
Node: 6 Time: 56
Node: 2 Time: 58
Node: 3 Time: 68
Node: 1 Time: 73
Node: 0 Time: 79

-- returning --
Lucy:
Node: 4 Time: 48
Node: 3 Time: 49
Node: 6 Time: 56
Node: 2 Time: 58
There is intersection found at node:6
New path found for Lucy:

-- returning --
Lucy:
Node: 4 Time: 48
Node: 3 Time: 49
Node: 1 Time: 54
Node: 0 Time: 60
Node: 2 Time: 68
```

Joseph successfully came back. But there was intersection at node 6 as stated above. So, the program found new path for Lucy. The program will try to find alternate paths for both Lucy and Joseph. It worked for Lucy so no need to search for Joseph. This time she did not pass node 6 because I set edge between 3 and 6 as INF to not use this particular edge between 3 and 6 to avoid intersection.

Let's try for test2.

```
(base) Kursat-MacBook-Pro:hw2 kursat$ ./hw test2.txt
Joseph:
Node: 0 Time: 0
Node: 2 Time: 5
Node: 1 Time: 7
Node: 6 Time: 11
Node: 7 Time: 13
Node: 9 Time: 21
Lucy:
Node: 3 Time: 0
Node: 1 Time: 7
Node: 6 Time: 11
Node: 7 Time: 13
Node: 8 Time: 16
Node: 11 Time: 18
Node: 15 Time: 23
There is intersection found at node:1
New path found for Joseph:
Joseph:
Node: 0 Time: 0
Node: 2 Time: 5
Node: 3 Time: 8
Node: 1 Time: 15
Node: 6 Time: 19
Node: 7 Time: 21
Node: 9 Time: 29
```

This time intersection found while they were going their destinations. There is new path found for Joseph.

```
-- returning --  
Joseph:  
Node: 9 Time: 59  
Node: 10 Time: 62  
Node: 6 Time: 67  
Node: 3 Time: 68  
Node: 1 Time: 75  
Node: 0 Time: 78  
  
-- returning --  
Lucy:  
Node: 15 Time: 53  
Node: 16 Time: 62  
Node: 14 Time: 70  
Node: 5 Time: 81  
Node: 10 Time: 85  
Node: 6 Time: 90  
Node: 3 Time: 91
```

Then they successfully came back their hotels.