



BIRZEIT UNIVERSITY

Electrical and Computer Engineering Department

ENCS3340 Artificial Intelligence, Second Semester, 2020-2021

Programming Project 1

Instructor: Dr. Adnan H. Yahya,

Due: 10/4/2021 Partner and topic Selection Deadline: October 15/3/2021

Search for Optimal Service

This assignment is for groups of 2 students each (at most). If you want to do it alone you must get the permission of the instructor.

1. Goal

This programming project can be viewed as an implementation of search algorithms. One useful aspect is to serve a series of requests with optimal performance.

2. Specifications:

We have a graph with each node representing a location. The directed edge between nodes ($A \rightarrow B$) represents the existence of a path between A and B and the link is labelled by the cost of moving from A to B. It could be the distance, but it could also be the time needed to move from A to B (time/gas, ...).

Some of the nodes are labelled as Goal nodes to be visited. In one case we may want to reach one of the goal nodes, in another we want to reach them all no matter in which sequence. A,B,C,D,E are Palestinian cities (20 at least), some of which are designated as Goal cities and one is designated as Start city: locations. W,X,Y,Z are street distance (km), Areal distance (km), Travel Time (hr), Best Travel Time (hr). One of the nodes is start node. One or more are goal nodes (e.g. A is start, D,E are goals).

	A	B	C	D	E
A	W,X,Y,Z				
B		0,0,0,0			
C			0,0,0,0		
D				0,0,0,0	
E					0,0,0,0

Each team has to implement several search algorithms as follows (based on least student id in the team mod5) :

	Alg1	Alg2	Alg3
0	Greedy	Breadth First	Optimal1-All Goals
1	A*	Depth First	Optimal2-All Goals
2	Uniform	Iterative Deepening	Optimal1-All Goals
3	A*	Breadth First	Optimal2-All Goals
4	Greedy	Iterative Deepening	Optimal1-All Goals

Algorithm Optimal1-All goals deals with the distance as the main parameter to be optimized and requires that we visit all the goal nodes in the table.

Algorithm Optimal2 deals with the time as the main parameter to be optimized and time is the function of the distance and congestion factor per edge: meaning at rush hour the time is max and at other times the time is less and requires that we visit all the goal nodes in the table.

The input for this assignment is as follows:

- A list of Palestinian Cities with real distances between the cities and an estimate to the goal (e.g. the straight line –areal- distance).
- The congestion factor when needed to estimate the time it takes to cover a certain distance based on the traffic conditions.
- A start node and a list of goal nodes.
- The parameters we try to optimize: mainly the distance travelled to reach the goal(s).

3. Bonus Elements:

- Your program needs to have a reasonable interface. Extra credit may be given to better interface designs.
- More factors for optimization.
- Have something new and it will be rewarded if convincing!
- Extra algorithms you feel of interest.

5. Submissions: Please submit the following:

1. **Report:** Write **up to 4** pages to describe how you designed and implemented your program and list any assumptions you made for your project. Describe how to compile and run your program only when special directions are needed and unavoidable. In case you completed some extra credit items, you should describe how to enable and test them. Please, do not repeat in the report the text provided in this description.

2. **Source Code :** Include all the source code you developed or extended from the program. These need to be submitted only electronically (no hardcopies of the code). The running program needs also to be submitted electronically.

3. **Demo:** You will be asked to demo your work to your instructor. For that you need to be able to work with your program, introduce minor modifications and defend your choices.

Honor Policy: All are required to adhere to the University honor policy and violations will be dealt with according to University regulations.

Good Luck