BIRZEIT UNIVERSITY
Electrical and Computer Engineering Department
ENCS3340 Artificial Intelligence, Second Semester, 2021-2022
Programming Project 1 Instructors: Dr Yazan Abu Farha, Dr. Adnan H. Yahya**,**
Due: May 15, 2022 Partner and topic Selection Deadline: April 21, 2022

Search Algorithms for Route Navigation

Teams: 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. The teams can be cross sections (from different sections)

Goal: This programming project is an implementation of search algorithms for a specific goal of finding an optimal path between cities in Palestine.

Specifications: We have a graph with each node representing a location (City) in Palestine. The directed edge between nodes(A →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 by car (CarDist(A,B). One of the nodes is a start node (S) and another is the goal (G).
For each pair of nodes we have: CarDist(A,B), WalkDist(A,B) plus for each node n we have h1(n): the aerial (straight line distance) between n and G, which is an admissible heuristic. Another heuristic h2(n) is the **Walking** distance from n to G. Clearly, h2 dominates h1. So for each city pair we have W,X,Y are street distance (km), Aerial distance (km), Walking Distance (KM). One of the nodes is start node. One or more are goal nodes (e.g. A is start, D,E are goals).

For experimentation you need to select at least 20 Palestinian cities (Historical Palestine). The start city is one closest to your residence (selectable). The goal is selectable.

Each team has to implement 3 search algorithms as follows (based on last digit of the least student id in the team mod4): A* plus 2 out of the three others for your number:

	Algorithm1	Algorithm2	Algorithm3	Algorithm4
0	BFS	Greedy	DFS	A*
1	DFS	BFS	Greedy	A*
2	IDS	BFS	Uniform Cost	A*
3	Uniform Cost	IDS	Greedy	A*

So if your team numbers are 119206, 119401: use 6 Mod 4=**2**
You choices are

2	IDS	BFS	Uniform Cost	A*

A* should be implemented in two ways: A* for walking distance using Aerial distance as the heuristic (h1). Use this to find the walking distance from each node to the goal G. The Walking distance between cities may not be readily available. You can find it using Google maps navigation (if that works) or just compute it as the average between the car distance and straight line (aerial) distance. Then use the shortest distance you got as h2 for the travel distance

Bonus Elements:

- Your program needs to have a reasonable interface. Extra credit may be given to better interface designs.
- More factors for optimization.
- Extra algorithms you feel of interest.

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.
This includes that all the codes and reports submitted are the result of your team work and wasn't copied and that any references used are listed in the report.

https://info.wafa.ps/ar_page.aspx?id=2794
https://lahodod.blogspot.com/2015/04/distances-between-palestinian-cities-in.html
https://ps.utc.city/3678568-3599396

Good Luck