

## Programming Assignment 1

(100 points)

Assigned Date: Thursday, February 21, 2019

<b>Due Date:</b>	<b>2:00 PM Tuesday, March 12, 2019 (online)</b> <b>Paper copies submitted on Tuesday March 19, 2019 (in class)</b> <b>2:00 PM Thursday, March 7, 2019</b>
<b>TA Evaluation:</b>	<b>1) 3:20 to 4:20 PM, Tuesday March 19, 2019, the Unix Lab or</b> <b>2) 12:50 to 1:50 PM, Thursday March 21, 2019, the Unix Lab</b>

### Educational Goal

Become familiar with uninformed and informed search strategies.

### Requirements

(80%) Implement the IDA and A\* Search on the Romania example (Lecture “Solving Problem by Searching”, Slides 16 and 19). Goal State is in Bucharest. A traveler could be initially in any city depicted in the map of Slide 16. Write a program that takes any city as an initial state, output the cities it visits, calculate total path cost (notice that each step does not cost 1 for IDA in this example and you should expand the node with the lowest cost when exploring a subtree), and report the solution path from the initial state to the goal state.

- Inputs: Your program should allow two different search algorithms: 1) IDA 2) A\*. Your program should allow any city as an initial state including the goal state Bucharest.
- Output: The solution path and path cost to Bucharest.
- You cannot just copy what has been used in the lecture notes that  $h$  calculates the straight line distance when using the A\* Search. You must define a new  $h$  function in this homework, but the use of the straight line distance can be part of the  $h$  function that you will define.
- (20%) write a report with minimum 500 words to discuss the strength and weakness of the 2 search strategies including the time and space analysis based on your empirical observation. Will IDA still be optimal when the step cost is no longer uniform? Why?

### Submission Requirements

1. Your program should be well-documented. Variable names and function names should be self-descriptive. Major functions should be explained clearly in comments. The program outputs should be presented in a clear sequence.
2. Turn in the paper copy and soft copy of all the files of this assignment(Source code, a txt file contains a copy of your program output with the sample input, and a readme file if you need explain something). Submit a single zipped file of all the files of this assignment through your Blackboard account. Submit the paper copy along with the cover page in class. Paper copy should be bound firmly together as one pack (for example, staple, but not limited to, at the left corner). 5 points will be deducted for unbounded homework.
3. Name your file with AI\_ lastname\_ firstname\_ pa1. For example, student John Smith should name his file as AI\_Smith\_John\_pa1.zip.
4. No hard copies or soft copies results in 0 points.