School of Computing and Informatics Technology
CSC 2114: Artificial Intelligence
Semester 1, 2020/2021
Class Assignment 1, 1-03-2021

1. Consider the graph shown in the figure below. We can search it with a variety of different algorithms, resulting in different search trees. Assuming that children of a node are visited in alphabetical order. Draw a search tree or write an expanded list for each of the following search algorithm.
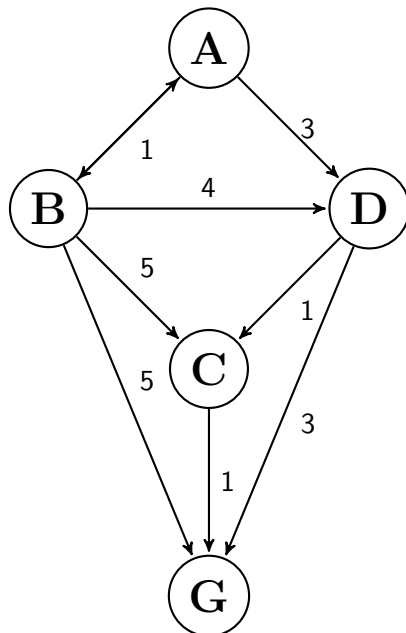
	H_1	H_2
A	3	3
B	6	3
C	4	0
D	3	2
G	0	0

 (a) Depth first search

 (b) Breadth first search

 (c) Uniform cost search

 (d) A* search with H_1 as a heuristic

 (e) A* search with H_2 as a heuristic

 (f) Best-first (greedy) search with H_1 as a heuristic

 (g) Best-first (greedy) search with H_2 as a heuristic

2. Consider the graph shown in figure 1 where the numbers on the links are link costs and the numbers next to the states are heuristic estimates. Let A be the start state and G be the goal state.
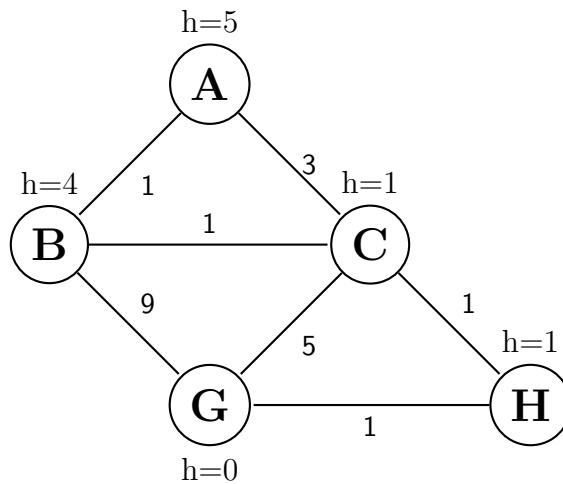
Figure 1: graph

(a) Simulate A* search on this graph. At each step, show the path to the state of the node that's being expanded, the length of that path, the total estimated cost of the path (actual + heuristic), and the current value of the expanded list (as a list of states) see table below

Path to State Exapanded	Length of Path	Total Estimated Cost	Expanded List
A	0	5	(A)

(b) Is the heuristic given in the problem admissible? Explain

(c) Is the heuristic given in the problem consistent? Explain

3. You and your friends have gone for fieldwork and you have got lost in some strange city. You get into a big fight about the best way to find a path from your start position (**S**) to your goal (**G**), and so you split up and each try a different search technique. You and your friends always break ties by expanding nodes in alphabetical order. Figure 2 indicates the graph of the cities you are supposed to visit during your fieldwork. A double arrow indicates that you can move in either directions

(a) Judith decides to try Greedy search, because it seems like the easy way out. She asks for your help.

  i. In what order will Judith search the graph so as to find the path?

  ii. What is the final path that Judith will find?

(b) James suggests that you use the Uniform cost search so that way you will find the shortest path to your destination. He also asks for your help, and again, he suggests a search tree to help visualize the process, and to help provide you
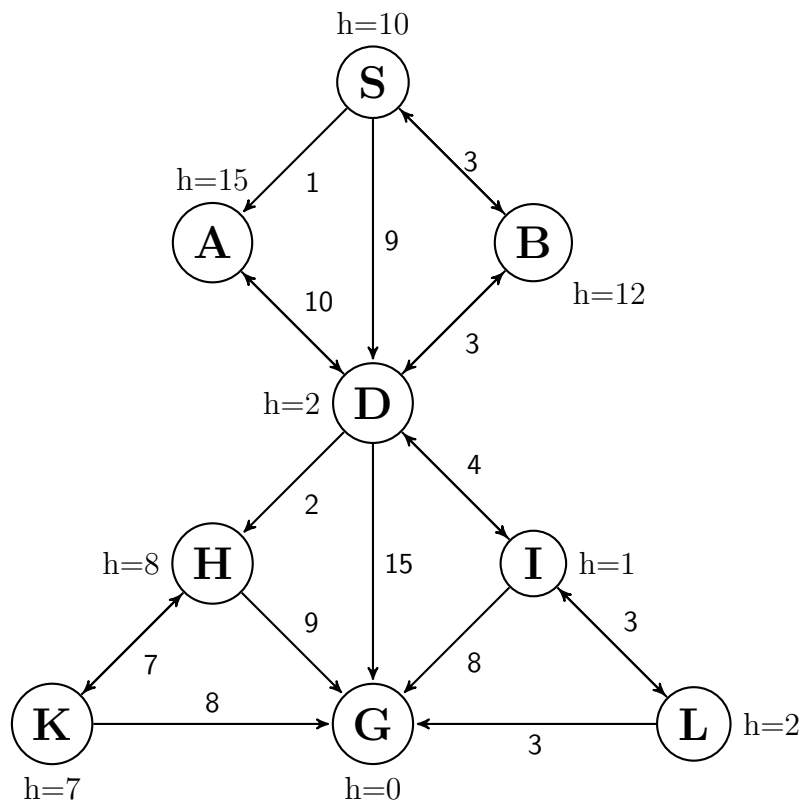
Figure 2: graph

partial credit if you make a mistake. Remember that you and your friends always break ties by expanding nodes in alphabetical order.

   i. The tree

   ii. What is the final path that James will find?

(c) Ogwang is still skeptical about the results so far. He proposes A* search. Will Ogwang's search produce the same path as James's? If so, explain why. If not, explain why not.

Good Luck!