CS5100 Foundations of Artificial Intelligence

Homework 2

Marking Guidelines

Question 1: (8 Marks : 2 Marks each)

Compare the following search strategies according to whether or not they are complete, optimal and informed. Justify your answers.

i. Breadth-first search

ii. Depth-first search

iii. Greedy best-first search

iv. Uniform-cost search

For each search strategy

1 Mark: Correct identification of Complete, optimal and informed

1 Mark: Justification

Question 2: (2 Marks)

Explain in your own words the difference between tree search and graph search.

1 Mark: Clear explanation in own words Tree Search, Graph Search

1 Mark: Key difference.

Question 3: (5 Marks) This question concerns heuristics in search.

i. Explain what is meant by a heuristic and how heuristics can be useful in efficiently finding solutions. (1 Mark)

1 Mark: Clear explanation of heuristic in own words

ii. Describe two heuristics for the 8-puzzle. (2 Marks each)

2 marks for each heuristic - Description (1 Mark) & Reason (1 Mark)

Question 4: (35 Marks) For this question, you will need to use the simplified map of Romania and the table of straight-line distances to Bucharest from Chapter 3 of AIMA.

a) Calculate the routes that would be chosen from Mehadia to Bucharest by each of:

i. Greedy search (5 Marks) -

ii. Uniform-cost search (5 Marks)

iii. A* search. (5 Marks)

2 marks: Correct route

2 marks: Detailed steps taken (Node/costs at each step)

1 mark: Explanation

b) Suppose you are travelling from Sibiu to Bucharest. The possible routes on the map include:

- Sibiu-Fagaras-Bucharest
- Sibiu-Rimnicu Vilcea-Pitesti-Bucharest
- Sibiu-Rimnicu Vilcea-Craiova-Pitesti-Bucharest.

i. If you use the A* algorithm to calculate the route, which of these paths will be explored and which will be selected as the optimal route? (10 Marks)

5 Marks: Correctly apply A * algorithm, including step-by-step calculation of path costs

3 Marks: Correct identification of the optimal path

2 Marks: Brief explanation

ii. What solution would be returned if you use the greedy best-first algorithm? (10 Marks)

5 Marks: Correctly apply greedy algorithm, including step-by-step calculation, comparison of heuristic values

3 Marks: Correct identification of final path

2 Marks: Brief explanation