CS4750 Homework 2

Group:
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Software: Python3
Hardware: 15-inch 2019 Macbook Pro (macOS Monterey v12.6)
CPU: 2.3 GHz 8-Core Intel Core i9
RAM: 16GB 2400 MHz DDR4

Iterative Deepening Tree Search: This algorithm is implemented by, first, adding the starting position (node) to the fringe queue. From here, the algorithm expands and adds the newly expanded nodes to the fringe. The program then runs the algorithm until the depth limit is reached. Upon reaching the depth limit, the depth limit is increased and the program runs the algorithm again.

Running Result:
Instance #1:
First 5 searched nodes: (2,2) (2,2) (1,2) (2,1) (2,3)
Generated Nodes: 716
Expanded Nodes: 323
CPU Execution Time: 0.00484 seconds
Path Found: (2,2) (1,2) (1,3) (1,4) (2,4) (2,5) (3,5)
Instance #2:
First 5 searched nodes: (3,2) (3,2) (2,2) (3,1) (3,3)
Generated Nodes: 283
Expanded Nodes: 119
CPU Execution Time: 0.00211 seconds
Path Found: (3,2) (2,2) (1,2) (1,3) (1,4) (2,4) (2,3) (3,3) (3,4) (4,4)

Uniform Cost Tree Search: This algorithm also initially adds the starting position node to the fringe. The lowest cost node is expanded and the indexes that are neighbors are added to the fringe. This algorithm also allows nodes to be expanded multiple times to find the lowest cost.

Running Result:
Instance #1:
First 5 searched nodes: (2,2) (3,2) (1,2) (2,3) (2,1)
Generated Nodes: 566
Expanded Nodes: 169
CPU Execution Time: 0.00202 seconds
Path Found: (2,2) (1,2) (2,2) (2,3) (2,4) (3,4) (3,5)
Instance #2:
First 5 searched nodes: (3,2) (4,2) (2,2) (3,3) (3,1)
Generated Nodes: 191
Expanded Nodes: 56

CPU Execution Time: 0.002094 seconds
Path Found: (3,2) (2,2) (1,2) (1,3) (2,3) (3,3) (4,3) (4,4) (3,4) (2,4)

Uniform Cost Graph Search: We implemented this algorithm by adding the starting point to the fringe queue. Next, the nodes are expanded and the neighboring node that contains the lowest cost is then added to the fringe if it is not in the list. Therefore, the lowest path cost will be found.

Running Result:

Instance #1:

First 5 searched nodes: (2,2) (3,2) (1,2) (2,3) (2,1)
Generated Nodes: 62
Expanded Nodes: 43
CPU Execution Time: 0.001075 seconds
Path Found: (2,2) (1,2) (1,3) (2,3) (2,1)

Instance #2:

First 5 searched nodes: (3,2) (4,2) (2,2) (3,3) (3,1)
Generated Nodes: 28
Expanded Nodes: 50
CPU Execution Time: 0.00211 seconds
Path Found: (3,2) (2,2) (1,2) (1,3) (1,4) (2,4) (2,3) (3,3) (3,4) (4,4)