COMP 341: Introduction to Artificial Intelligence

Fall 20 / Project 1

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Q1: DFS has higher path cost and lower number of expanded nodes than BFS has, because DFS attempts to find the goal state by expanding the deepest node in the frontier whereas BFS expands level-by-level uniformly, which allows DFS to have a smaller space complexity. However, as it happened on this project, in terms of Completeness and Optimality, BFS is more advantageous.

DFS should be preferred over BFS if the priority is a lower space complexity in finding a solution, but if the optimality and a lower cost is prioritized, it should be the otherwise.

Q2: Main difference is that UCS orders by calculated/backward cost whereas A* orders by the sum of calculated cost and estimated/forward cost, namely the heuristic function. A* is an informed search algorithm that has domain knowledge and should be preferred over UCS whenever there is any prior knowledge so that it can detect and prevent obstacles.

Q3: I have defined my state as the tuple of the position coordinates and another tuple of Booleans that check and indicate all 4 corners are found or not, which made it easier to check the goal state.

Q4: I have chosen Manhattan Distance as the heuristic function for the Finding All the Corners problem since the Pacman can only move horizontally or vertically. It iterates over the map and picks the maximum value for each state. It is admissible since the function did not overestimate the cost on test cases, as the autograder states:

*** PASS: heuristic value less than true cost at start state

Q5: I have chosen Maze Distance as the heuristic function for the Eating All the Dots problem; it also iterates over the map and picks the maximum value for each dot. It does not overestimate the cost for any expanded node.

Q6: An admissible heuristic function does not overestimate the cost to the goal state and is zero for goal states, non-zero for all others. Admissibility of a heuristic helps Completeness and Optimality; however, it increases the time complexity. So, we can prefer an inadmissible heuristic if we are prioritizing the time complexity with a cost of low Optimality.