COMP 341 – ASSIGNMENT 1

REPORT

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Q1) BFS does a better job in finding a shorter path (optimal path) while DFS has a better value of nodes expanded. I would prefer BFS when I want to find an optimal solution, and I would prefer DFS when I have memory (space) concerns.

Q2) A* and UCS both find the optimal path. However, A* does a better job in expanding less nodes. I would prefer UCS when there is no good (admissible, consistent) heuristic available for the problem, and I would prefer A* when I want to find the optimal solution faster, if a good heuristic available.

Q3) In my implementation of the four corners problem, a state is represented by a tuple containing the current position of pacman and list of the unvisited corners. These two are enough to solve the problem. Successor function transfers the list of unvisited corners which is tested in the goal test function to check if the list is empty (meaning goal state is reached).

Q4) My corner heuristic function uses a loop to find the minimum of manhattan distances from pacman's position to the corners in the unvisited corner list, removes the nearest corner from the list and moves pacman's position to that location. It repeats this until there is no unvisited corner remains. The algorithm then returns the sum of the distances. In other words, the algorithm calculates the cost of the optimal path for reaching to all unvisited corners from a specific position, assuming no walls exist (manhattan distance). Since the sum of manhattan distances to unvisited corners is never greater than the cost of the optimal solution, this heuristic is admissible. This algorithm is also consistent, because a state's heuristic is always equal to a successor state's heuristic plus the actual cost between these two states.

Q5) My food heuristic function gets the list of food locations and iterate on the list to find the maze distances from the position of pacman to each food. Then it takes the average of these distances and returns it as the heuristic value. It is admissible, because the estimated value (average distance to all existing food) is never bigger than the cost of optimal solution. Moving from a state to its successor decreases the heuristic no more than 1, which means it is always less than the actual cost between the two states. So, this heuristic is consistent.

Q6) We can find a solution quicker by using an inadmissible heuristic, but an optimal solution is not guaranteed. If time complexity is a greater concern than optimality, I would choose to use an inadmissible heuristic to get a solution faster. Otherwise, I would use a consistent heuristic to get an optimal solution.