

Comp341

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Assignment 1

Q1)

In the DFS, the algorithm searches all the paths all the way until it finds a goal. The goal does not have to be a close goal. But it expands less nodes. In the BFS, the algorithm expands more nodes and searches in every level which results in the closest goal. BFS is optimal where DFS is not since if a way has infinite depth the cost would be infinite as well. I would always use BFS.

Q2)

```
python3 pacman.py -l mediumMaze -z .5 -p SearchAgent -a fn=astar,heuristic=manhattanHeuristic --
frameTime=0
```

[SearchAgent] using function astar and heuristic manhattanHeuristic

[SearchAgent] using problem type PositionSearchProblem

Path found with total cost of 68 in 0.0 seconds

Search nodes expanded: 221

Pacman emerges victorious! Score: 442

Average Score: 442.0

Scores: 442.0

Win Rate: 1/1 (1.00)

Record: Win

```
python3 pacman.py -l mediumMaze -z .5 -p SearchAgent -a fn=ucs,heuristic=manhattanHeuristic --
frameTime=0
```

[SearchAgent] using function ucs

[SearchAgent] using problem type PositionSearchProblem

Path found with total cost of 68 in 0.0 seconds

Search nodes expanded: 269

Pacman emerges victorious! Score: 442

Average Score: 442.0

Scores: 442.0

Win Rate: 1/1 (1.00)

Record: Win

Both algorithms found same path where A* expanded less nodes because of the cost addition. A* calculates the cost via adding heuristic cost to path which results in minimal number of expanded nodes. I would use A* every time there is an admissible heuristic cost.

Q3)

In corners problem I have created the state as it contains the starting position and all the corners as a list as not visited in the beginning. As the algorithm works the starting position changes as the current position and if any corner is visited it is removed from the list. Removing from the list is done by calling the existing list and if the current position is a corner, that corner is not put in the new corners list and new corners list pushed to the successors. To check for success, I simply check the length of the updated list, if it does not have any corners inside it would give 0 as result.

Q4)

I have used maximum of the Manhattan distance. Since the Manhattan distance of the farthest corner would always be bigger than the actual cost and actual distance would always be bigger or equal to the Manhattan distance in a maze, it is consistent and admissible.

Q5)

The answer and the solution are similar to the Q4. To create more realistic heuristic, I have used mazeDistance method since it consist walls unlike Manhattan. The maximum heuristic between each food and the agent cannot be exceeded by the total cost.

Q6)

I would choose consistent heuristic since it is always admissible. The inadmissible heuristic is not guaranteed to give the shortest path but in single solution it would give the same result with admissible.