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Prof. Charles Cowan
Introduction to AI CS440
Thursday, July 13, 2017

Assignment 1

Notes

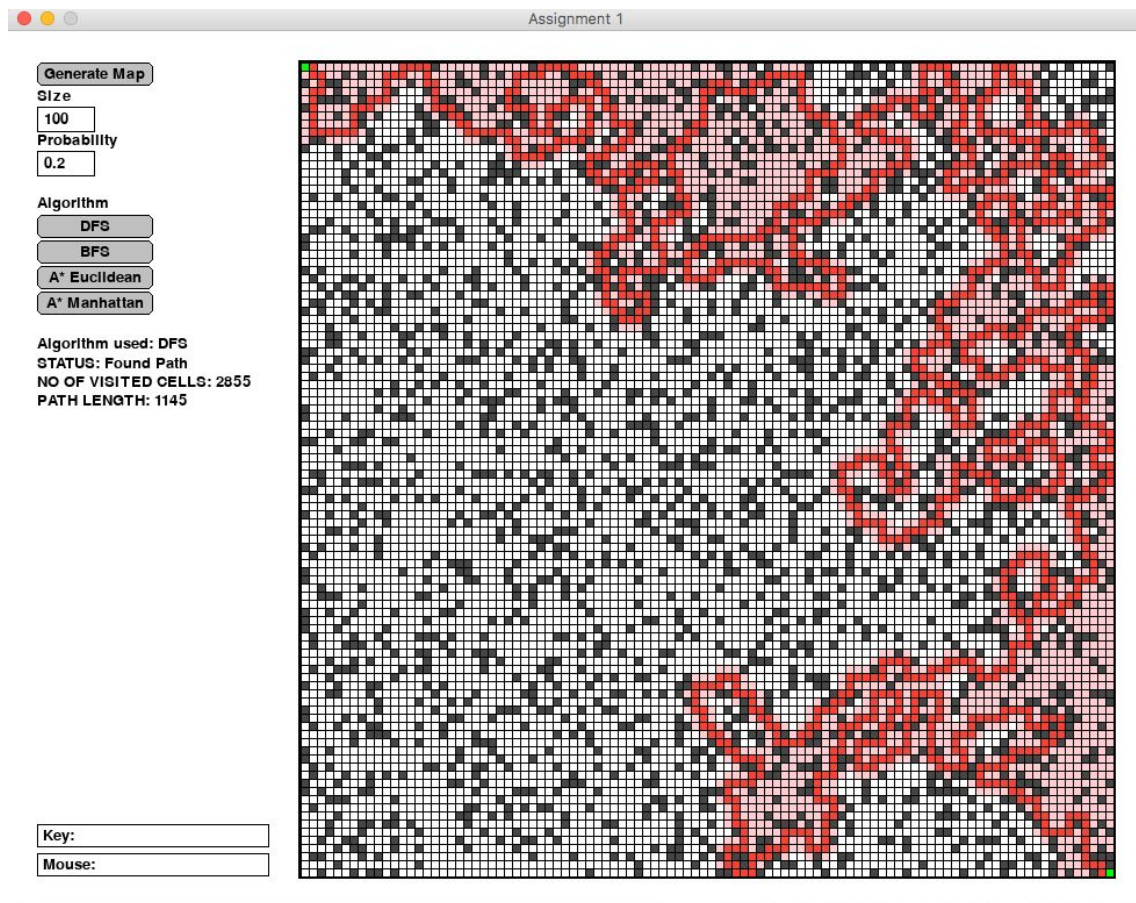
- I used Python for this assignment. I worked on my own this assignment.
- Please install Python, [Numpy](#) and [SimpleGUICS2Pygame](#) to run my code

Question 1

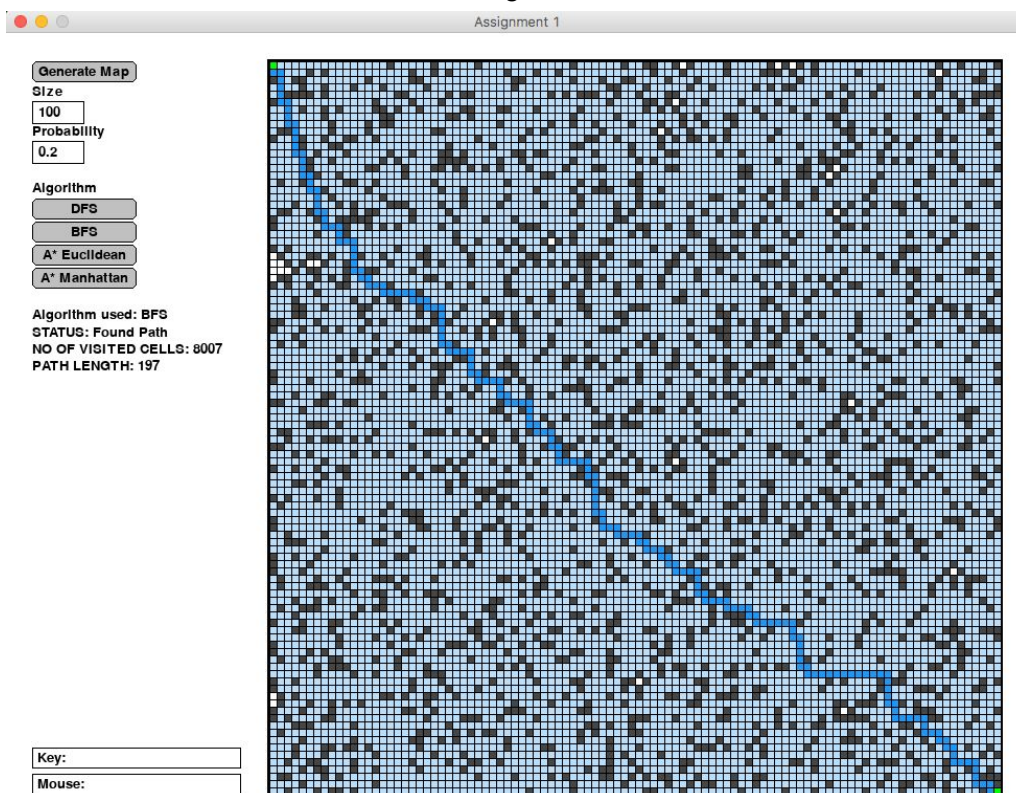
For each of the implemented algorithms, I found out that the map can be size 1000x1000 without GUI or 100x100 with GUI for algorithm to return an answer in a reasonable amount of time.

Question 2

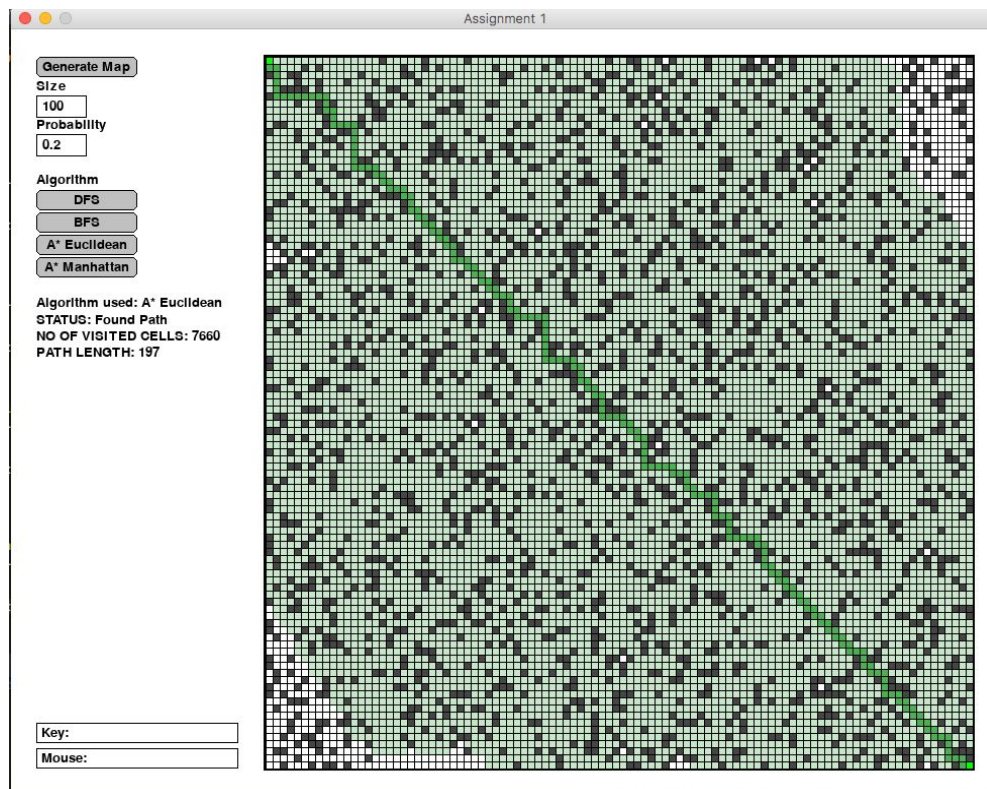
Using DFS



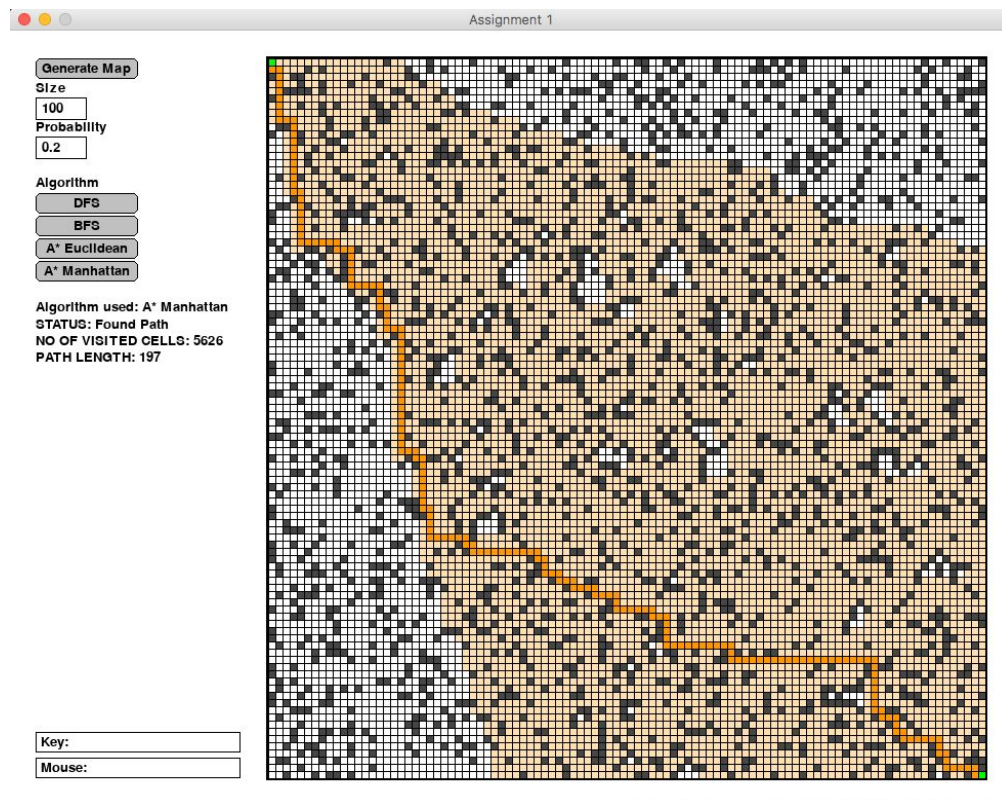
Using BFS



Using A* Euclidean

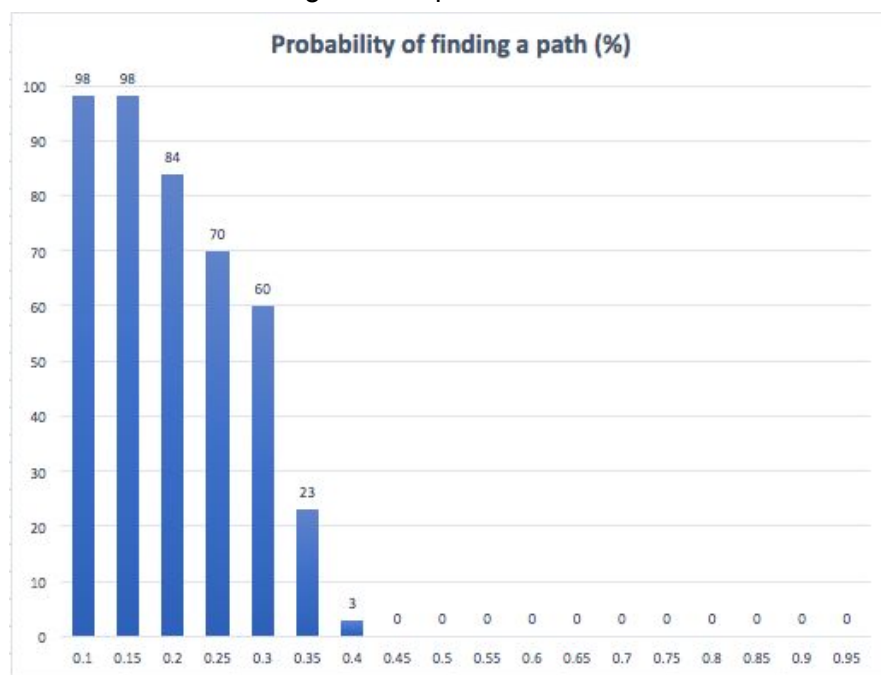


Using A* Manhattan



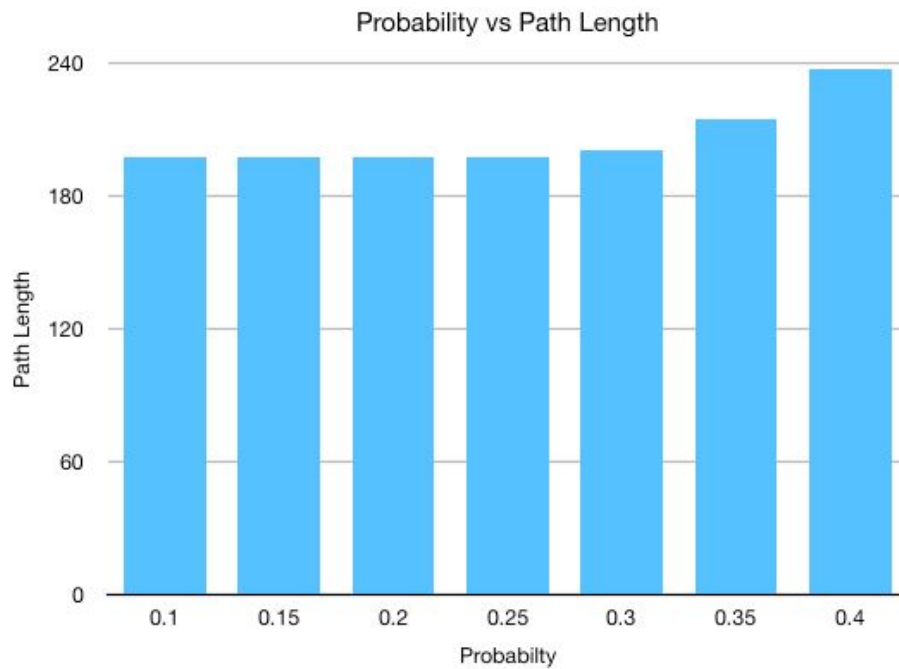
Question 3:

DFS is most useful here, because we just want to find a path from start to finish as fast as possible, we don't care about the length of the path. $P_0 = 0.4$



Question 4

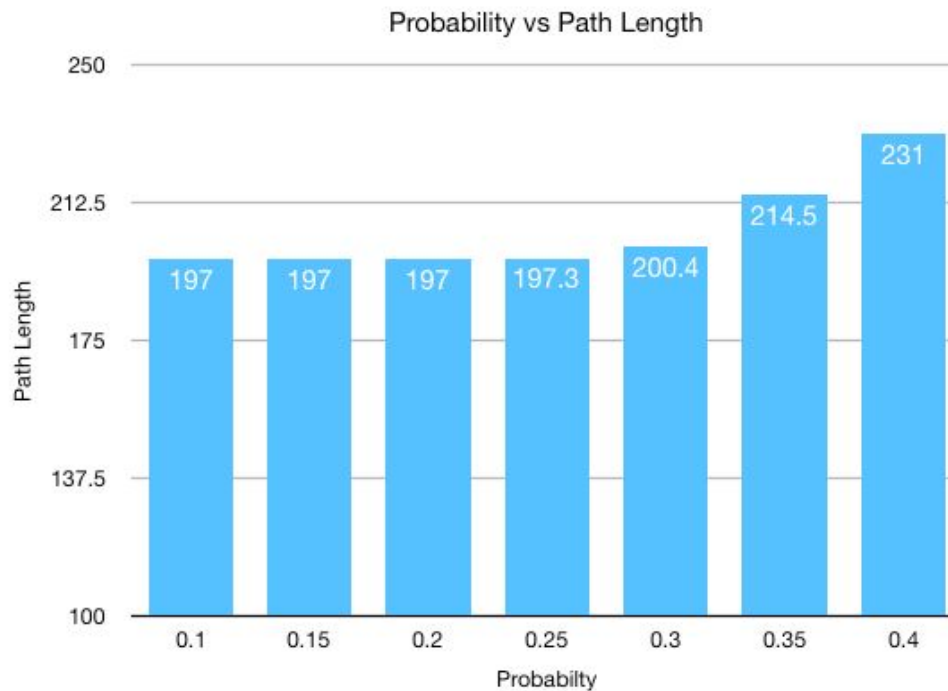
I used A* Manhattan because it gives the shortest path with minimum number of visited cells. Size of map 100x100

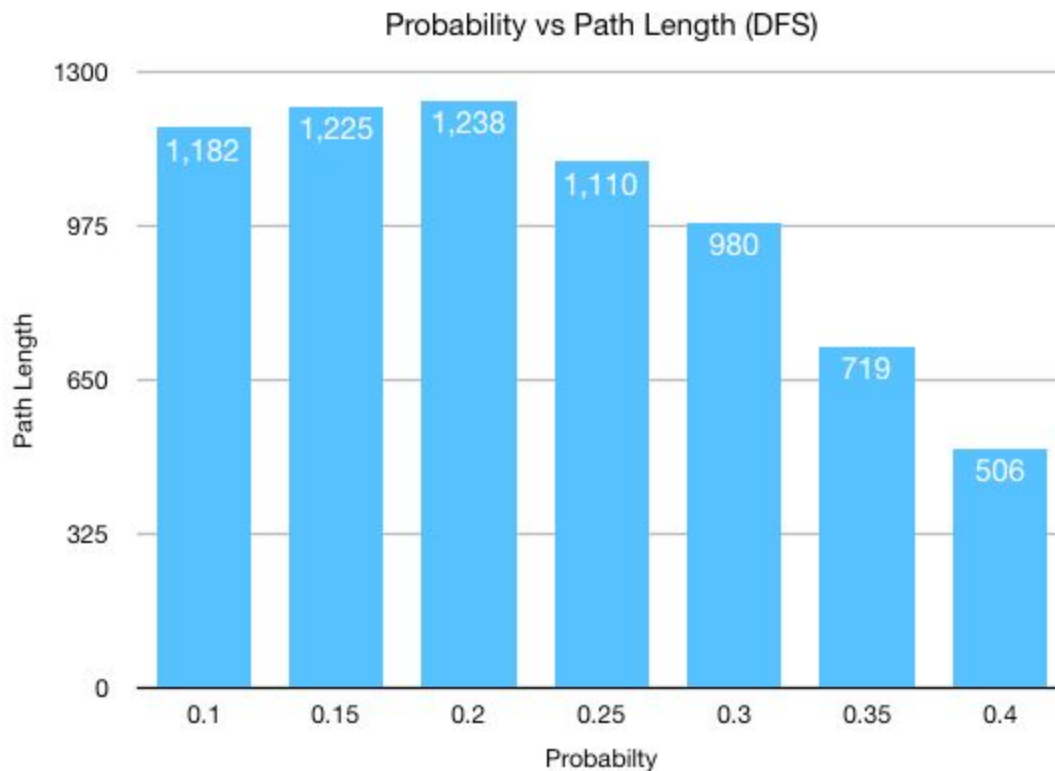


Question 5

Using A* Manhattan : same as chart in Question 4

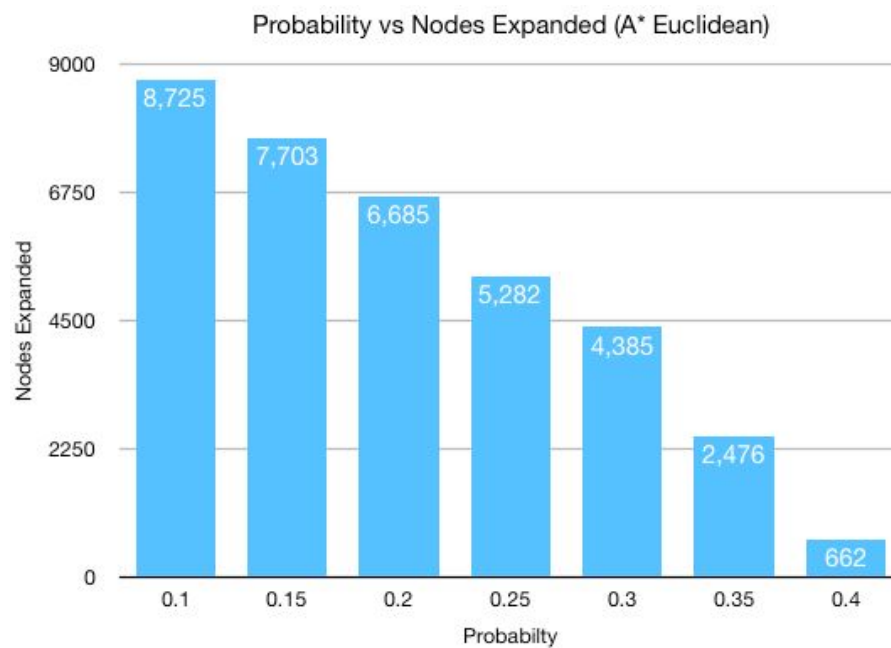
Using A* Euclidean

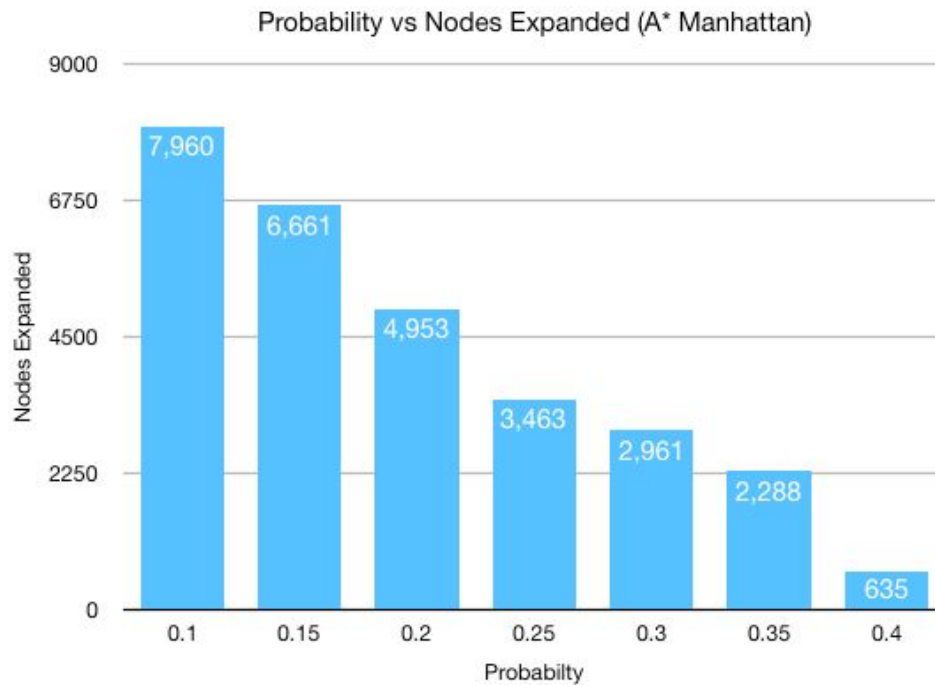




Question 6

Using Manhattan gives better results (fewer nodes) because it models the map better. Agent cannot move freely but can only move up, down, left, right. For $p > p_0$ both give the same value because they have to expand all nodes. Since when $p > p_0$ there are no paths from start to finish.

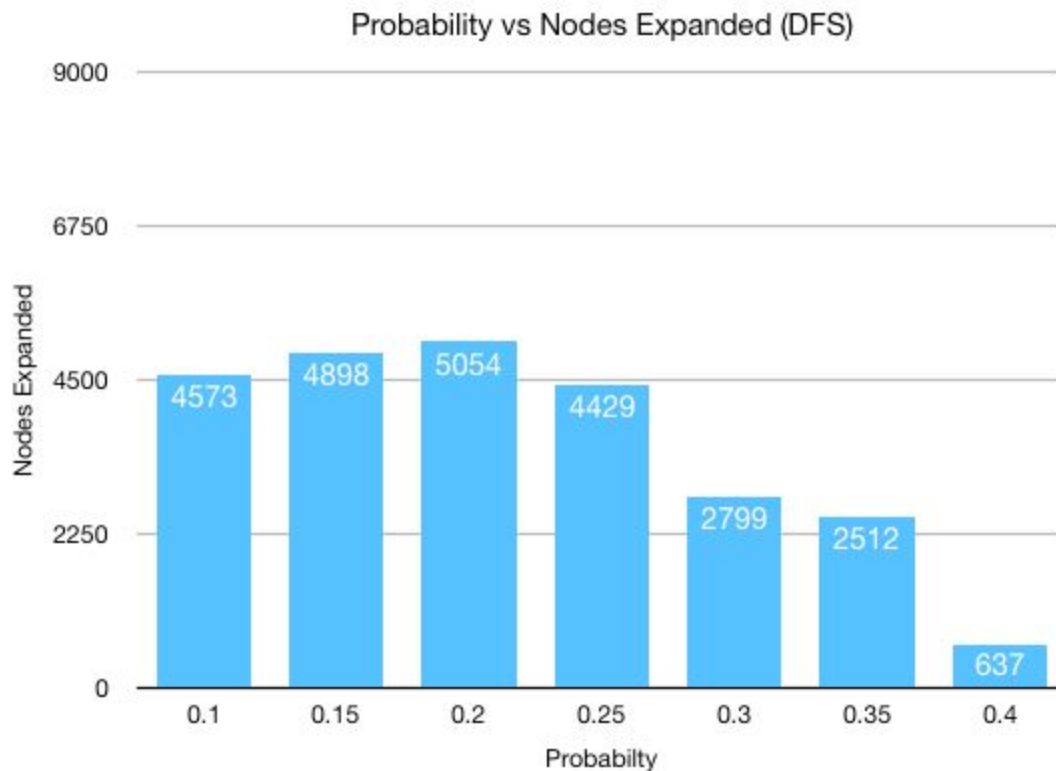


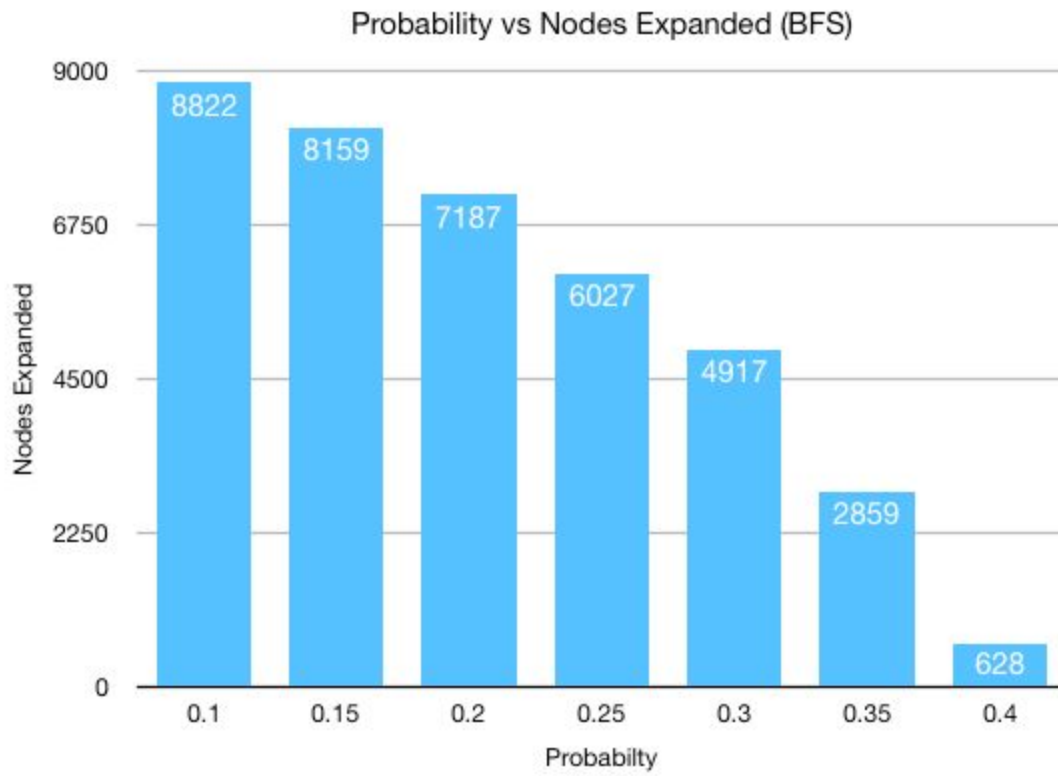


Question 7

DFS gives fewer nodes because BFS visit all possible nodes. DFS only cares about find a path, not the shortest path

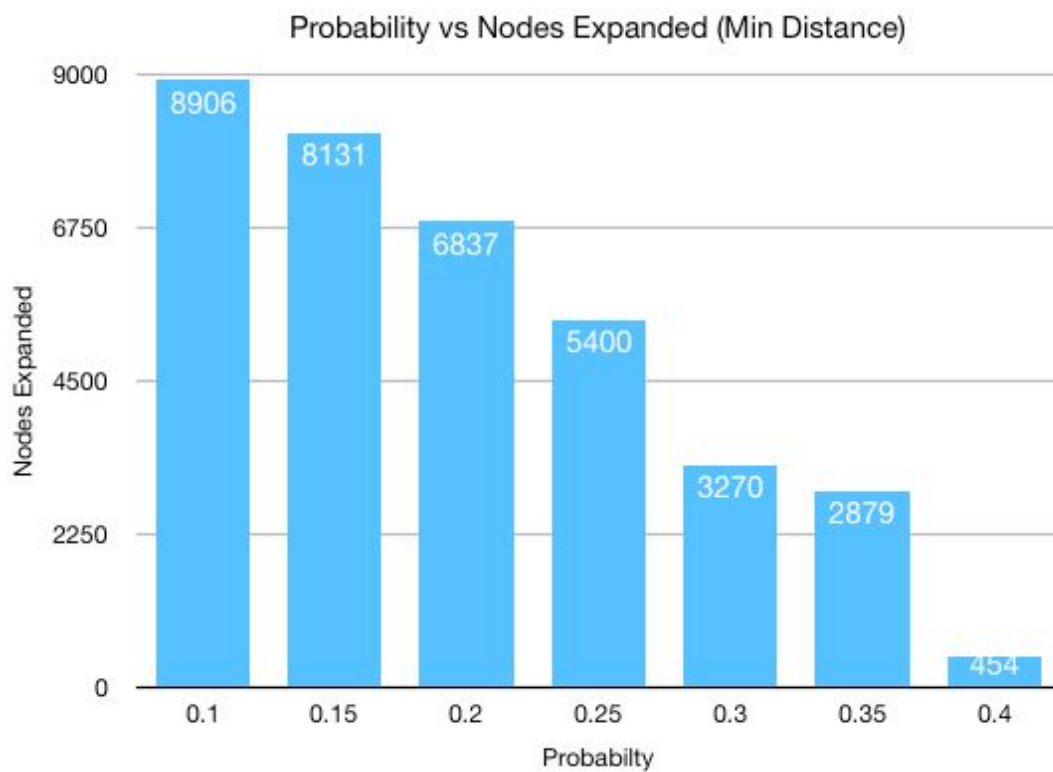
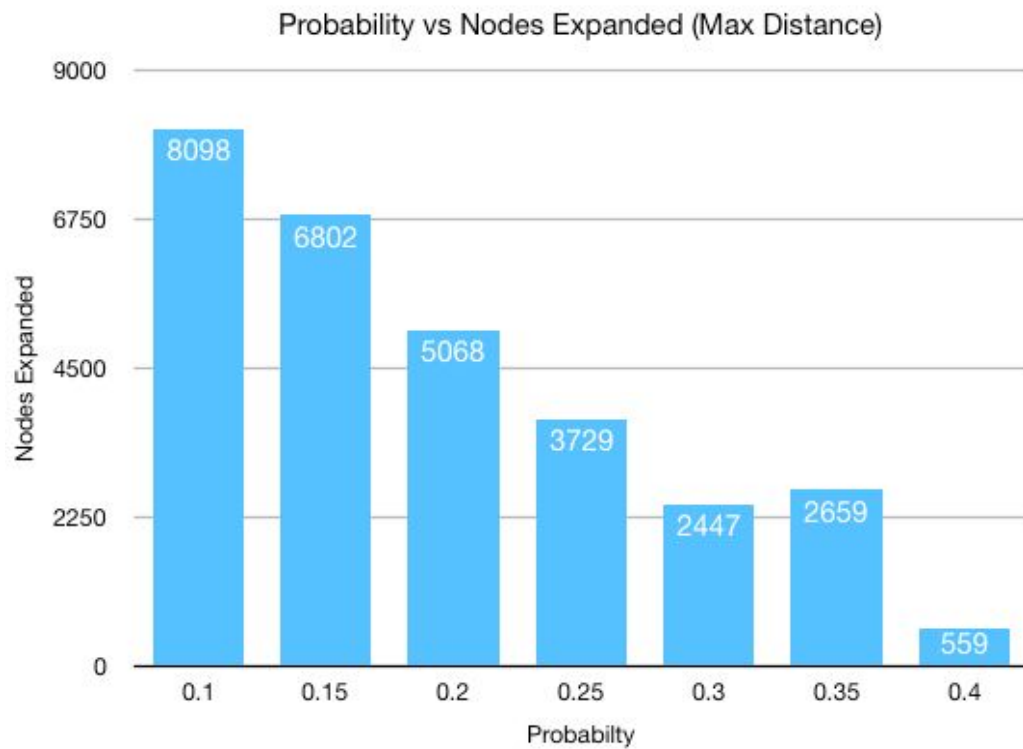
In term of number of nodes visisted: DFS < A* Manhattan < A* Euclidean < BFS

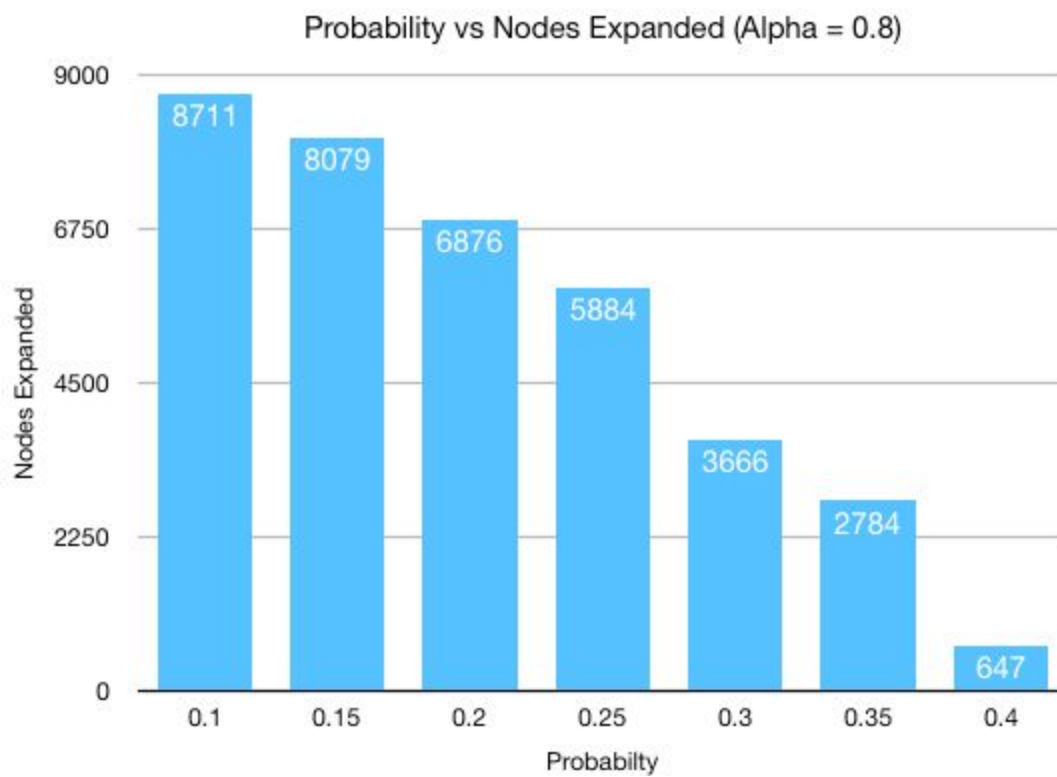
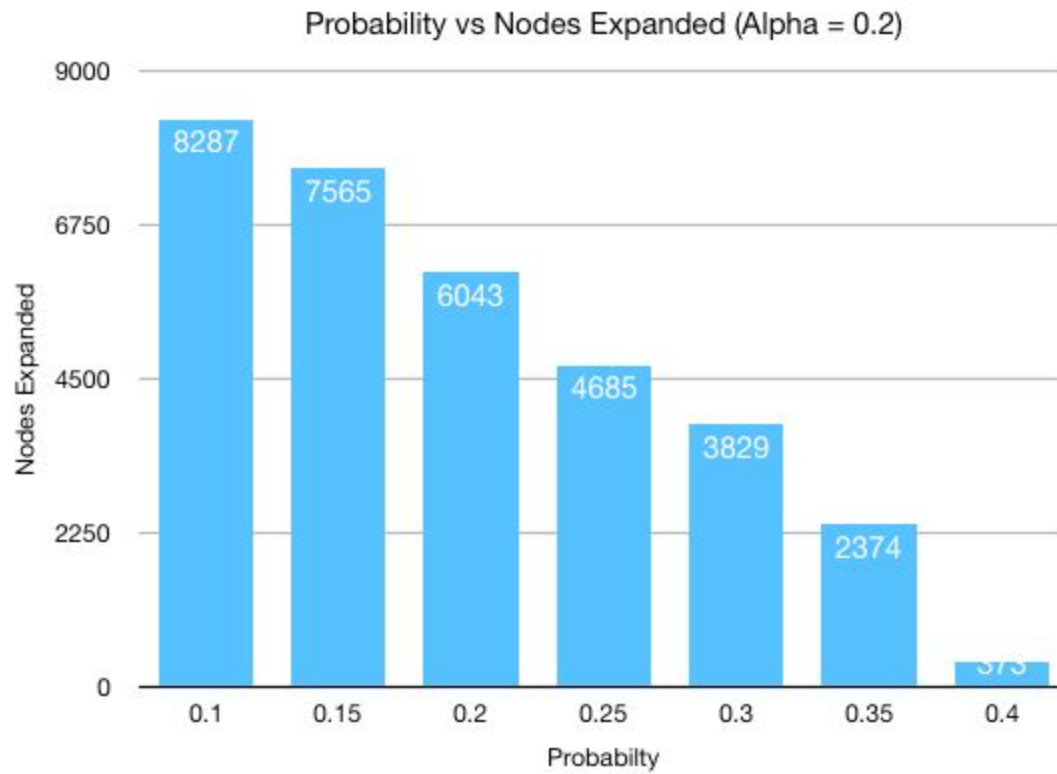


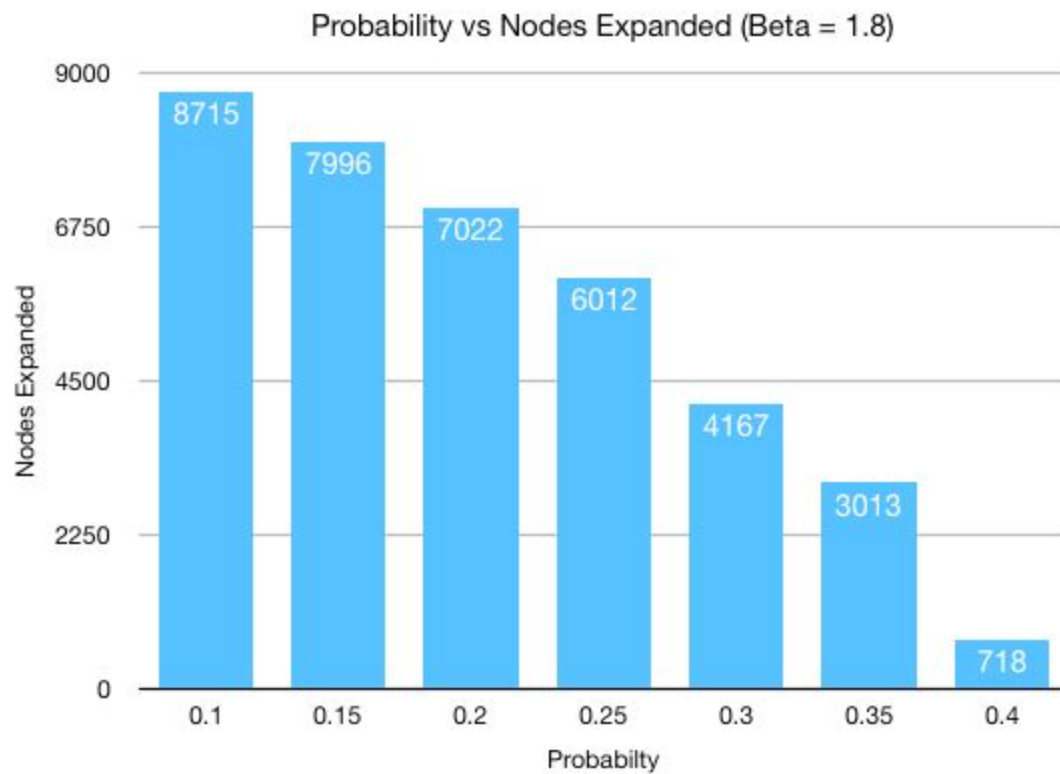
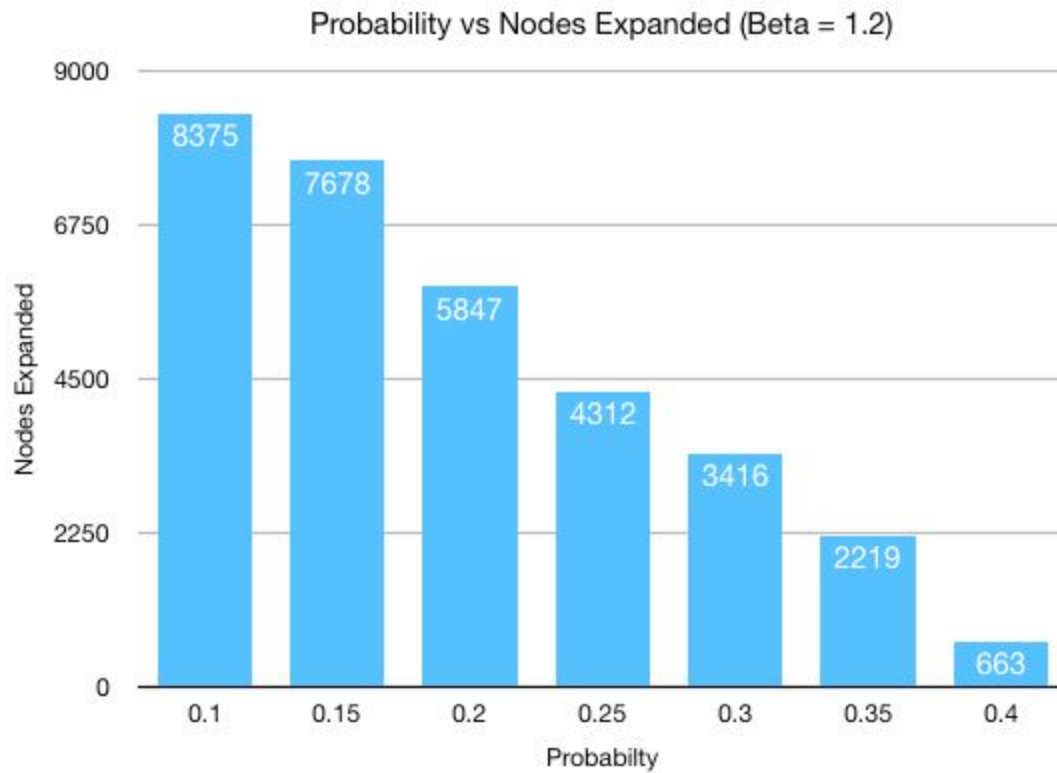


Question 8

I think Alpha gives better result when Alpha is close to 0, and Beta gives better results when Beta is close to 1.







Bonus 2

Heuristics given in this assignment are admissible and consistent because:

- For Manhattan, the real path from start to finish is always greater or equal than heuristic because there are blocks in the path that heuristic does not account for. So the real path must avoid these blocks, hence the longer path.
- For Euclidean, the heuristic is always shorter than the real path because agent cannot move freely. He can only move up, down, left, right. The hypotenuse is always shorter than sum of two adjacent sides.