# CIS*3700 - Introduction to intelligent systems

Assignment 2 conclusion

## How to use:

To use the software I wrote as part of this assignment one simply needs to launch the terminal, navigate to the folder that contains the 3 files (Maze.py, 3x3.py, 4x4.py, SearchProblem.py), and type "<interpreter> <problem>.py" as an example:

```
python 3x3.py
```

Each of the two problem set algorithm's will run the necessary code to find a solution; 3x3.py will generate 50 random 3*3 sliding tiles board, and each of those boards will run through two best first search algorithms: one that is based off the number of pieces out of place and one that is based on the manhattan distance of each piece. 4x4.py will do the same thing as 3x3.py except it will generate a 4*4 board. Maze.py will generate a random maze of size hw*hw (currently set to 40) and run it through two best first search algorithms: one does a manhattan distance from the current location, and the other does a straight line distance to the end which is calculated using pythagoreans theorem.

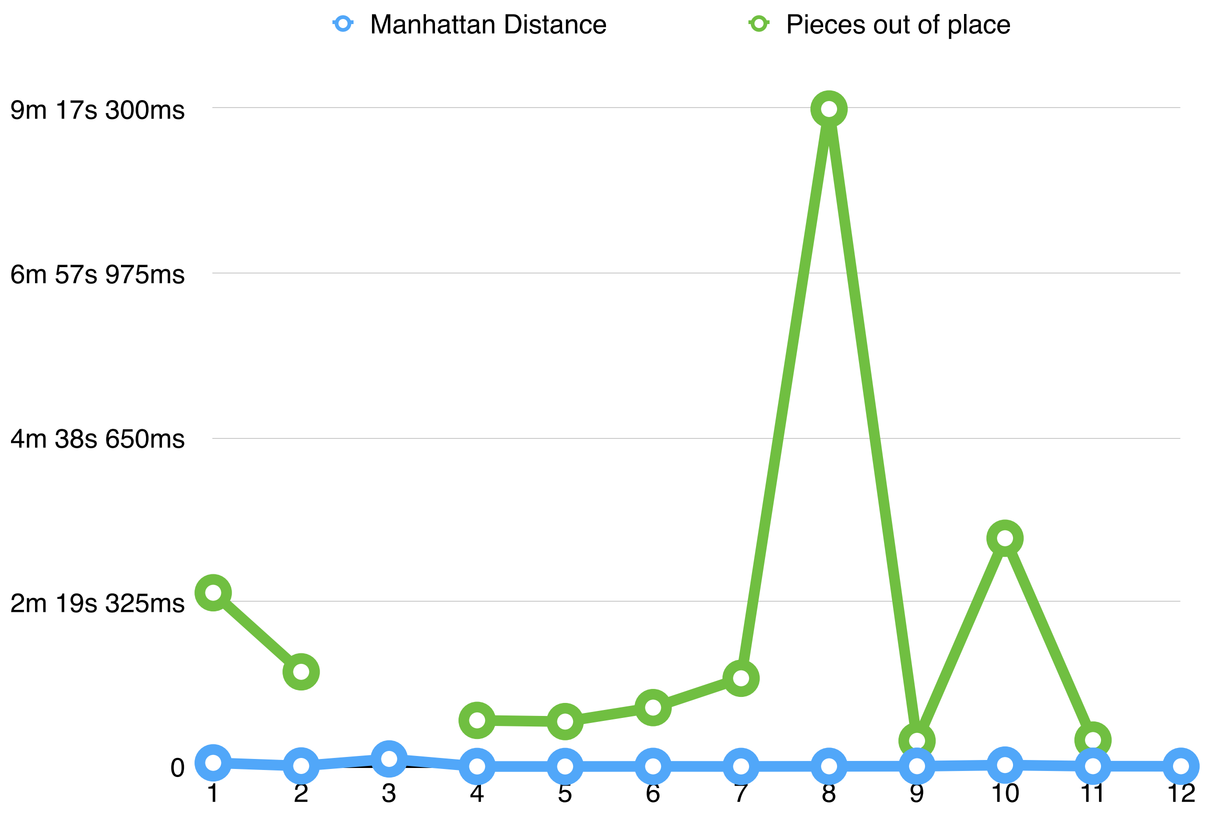
## Results:

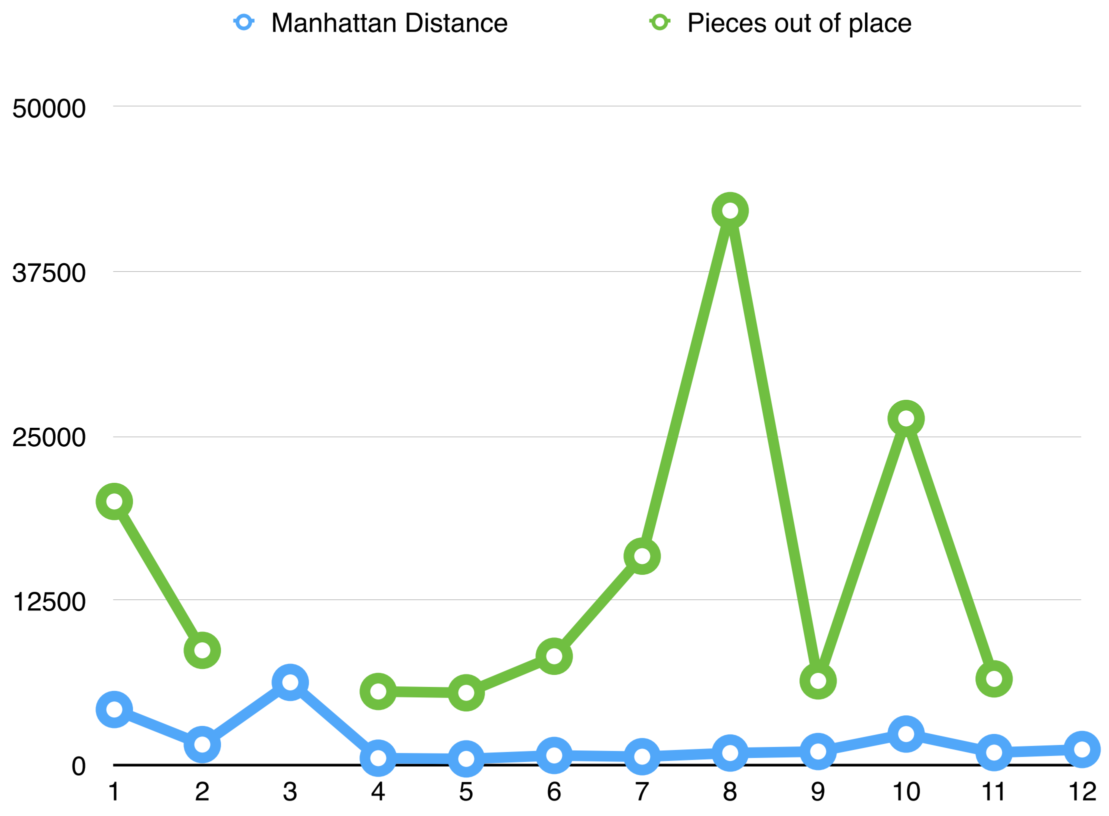
Below I've laid out a comparison on the results of the 3x3.py algorithms

| | **Manhattan Distance** | **Pieces out of place** |
|---|---|---|
| **Time** | 0.1 to 95 seconds | 0:15 to 35:00 minutes |
| **Total states visited** | 300 to 10,000 | 5,000 to 300,000 |
| **Puzzle's solved** | All | Some unsolved before maximum recursion is reached |

On the next page are 2 charts comparing the two algorithms; some of the results have nothing for the Pieces out of place algorithm, this is from when I left the algorithm to go for 15 minutes and didn't receive any results.

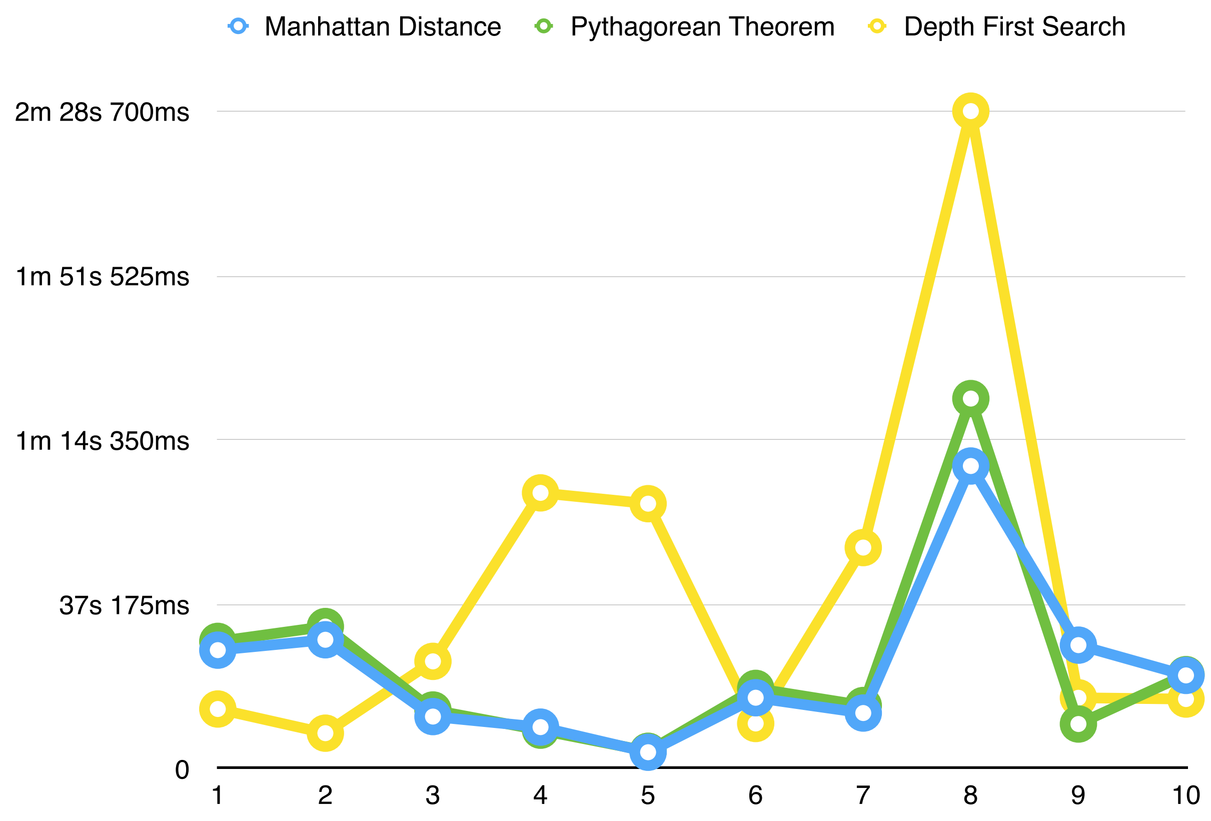
Unfortunately the 4*4 puzzle takes too long to get any reasonable results

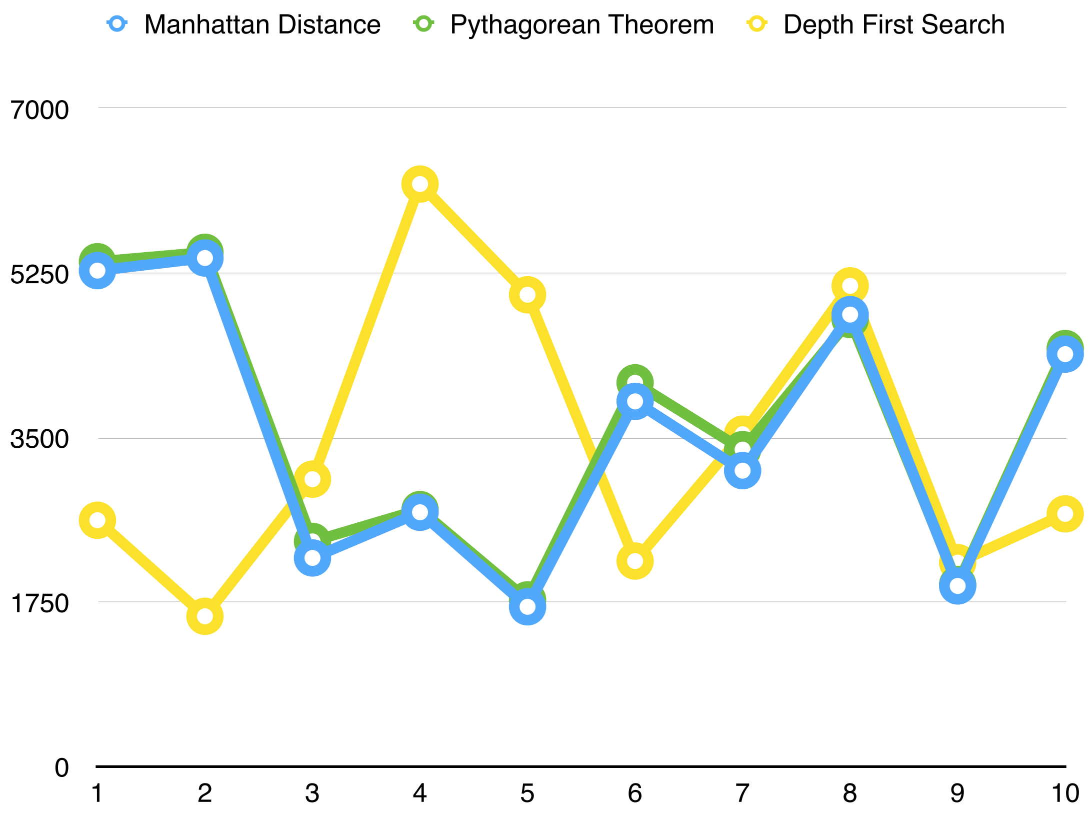

Manhattan Distance
Pieces out of place
9m 17s 300ms
6m 57s 975ms
4m 38s 650ms
2m 19s 325ms
0
1
2
3
4
5
6
7
8
9
10
11
12


Manhattan Distance
Pieces out of place
50000
37500
25000
12500
0
1
2
3
4
5
6
7
8
9
10
11
12

Below I've laid out a comparison on the results of the Maze.py algorithms when the maze is 80*80

| | Manhattan Distance | Pythagorean Theorem | Depth first search |
|---|---|---|---|
| **Time** | 3 to 90 seconds | 4 to 90 seconds | 7 to 180s |
| **Total states visited** | 1600 to 6000 | 1800 to 6000 | 1500 to 8000 |
| **Puzzle's solved** | All | All | All |





Manhattan Distance
Pythagorean Theorem
Depth First Search
7000
5250
3500
1750
0
1
2
3
4
5
6
7
8
9
10