

Module: 5SENG002C Algorithm Theory Design Pattern and Implementation

UOW: w1583002 Tutorial Group: E

IIT: 2014191

Name: Musadique Hassen Mohamed Murshid

Empirical study

The Empirical study is to find the path between any given point in Square-grid of Size (**NxN**) [Boolean matrix], which has blocked and unblock obstacles in it.[0 false unblocked][1 true blocked]. For Calculation of Distance metrics being used as [Manhattan, Euclidean, Chebyshev] for movement of paths.

Analysis and Pattern

Approaching to the problem, As observing the from fundamental of the grid. Grid is a simple multiplication of type nodes{One big Grid simply itself} and has traveling directions in either x or y direction. This is simply a growing graph. why cause directions manipulations are of type graph. Graph given here is a directed graph cause it uses metrics to travel through the a given direction plus the points are generated randomly(by user).

it is of type **adjacency Matrix[boolean matrix]**. which has the order of growth **Big $O(V^2)$ [Vertex x Vertex]** of type of graph calculations Matrix. These type of graph are easy to represent the type of data we gather, but has a disadvantage of growing in size. From the grid its easy if we can find the path **MST** (Clue Minimum Spanning Tree) (Correct true in the boolean array [1 in matrix] path).

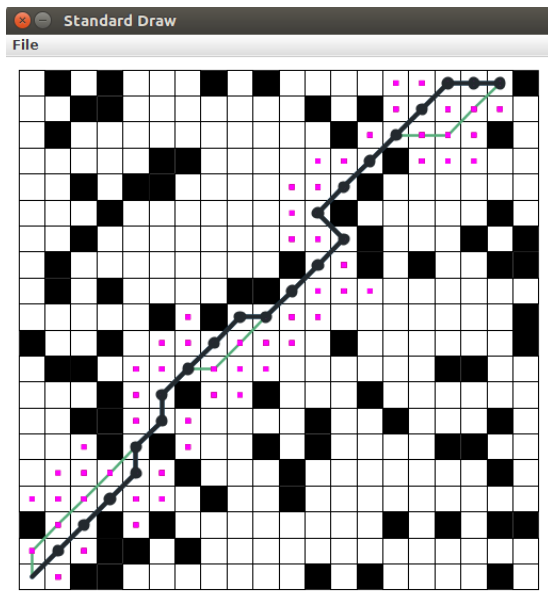
Using the modern day data-structures **Priority Queue** we can optimize search while calculation for storing or gathering data. Initial Search can be done as of type **BFS-Approach** to find the exact need. Search algorithm can be Optimized using todays Gaming algorithm like **A* star** for better performance. (Doubling and linear) Increment of Data is the best hypothesis is best to analyzed the data set given

Probability of Obstacles increase 0.0-0.9 [0.9 means higher Obstacles]

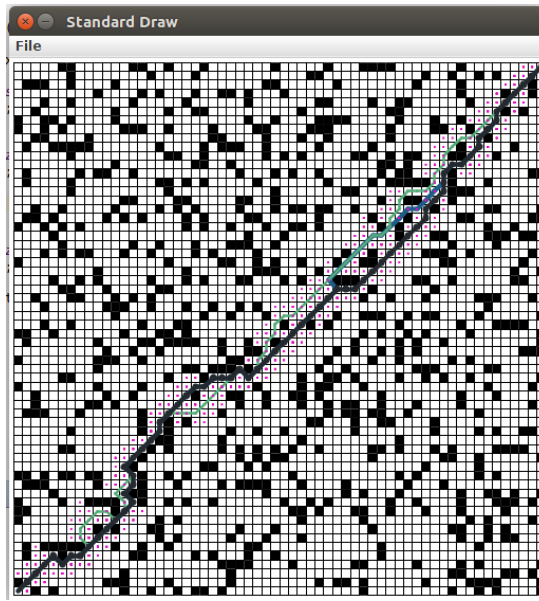
| Grid Size | Probability of Obstacle | Time Taken | Cost of Travel | Log base 2 of Input | Log base 2 of Time |
|-----------|-------------------------|------------|----------------|---------------------|--------------------|
| 10 | 0.6 | 39.324 | 24 | 3.321928 | 5.297338 |
| 20 | 0.2 | 33.268 | 100 | 4.321928 | 5.056063 |
| 30 | 0.2 | 65.502 | 216 | 4.906891 | 6.033467 |
| 40 | 0.2 | 29.982 | 420 | 5.321928 | 4.906025 |
| 50 | 0.2 | 29.982 | 532 | 5.643856 | 4.522432 |
| 60 | 0.2 | 22.982 | 640 | 5.906891 | 4.522432 |
| 70 | 0.2 | 14.762 | 830 | 6.129283 | 3.883816 |
| 80 | 0.2 | 20.543 | 1100 | 6.321928 | 4.360575 |
| 90 | 0.2 | 16.166 | 1778 | 6.491853 | 4.014891 |
| 100 | 0.2 | 14.289 | 2130 | 6.643856 | 3.836833 |
| 150 | 0.2 | 33.066 | 3240 | 7.22881 | 5.047277 |

Growth Complexity: Growth of Complexity of the Search Algorithm is analyzed, with the given data is Big $O(N)$ but Since the Loops consider here is 2 For Loops using the exact Growth is Big $O(N \times N)$

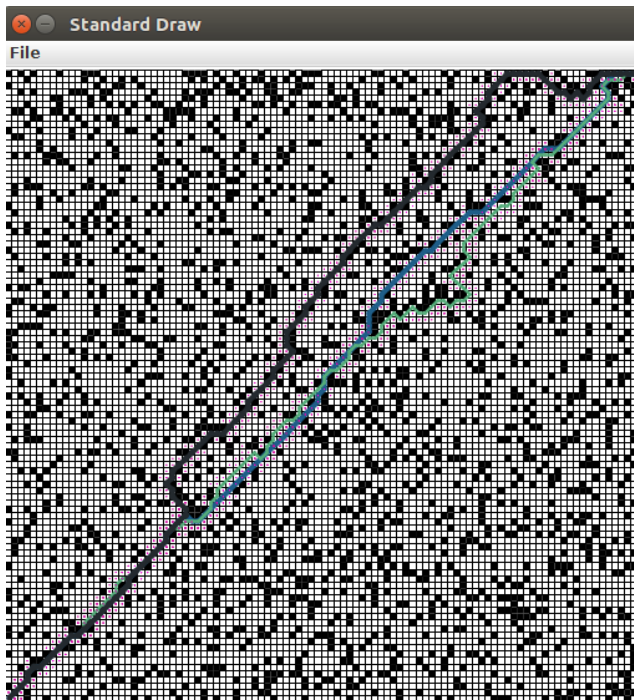
Appendix Screen-Shots



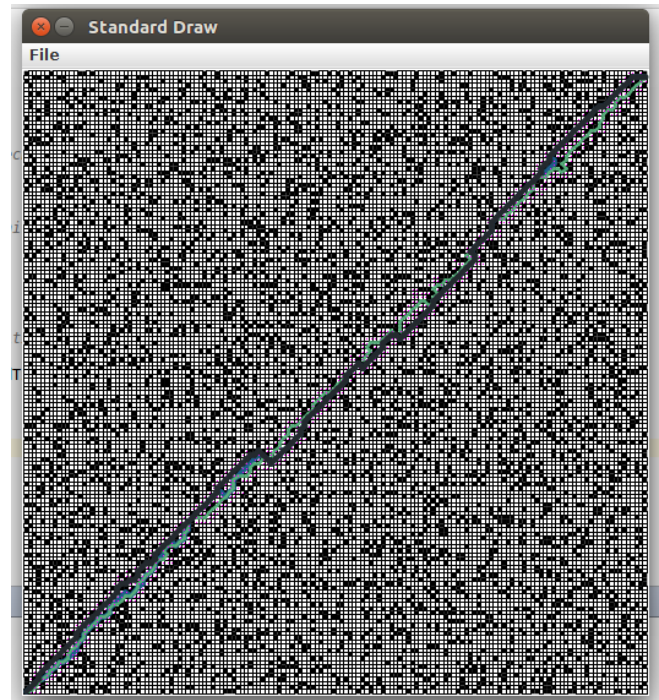
Grid of Size 20x20



Grid of Size 60x60



Grid of Size 100x 100



Grid of Size 150x 150