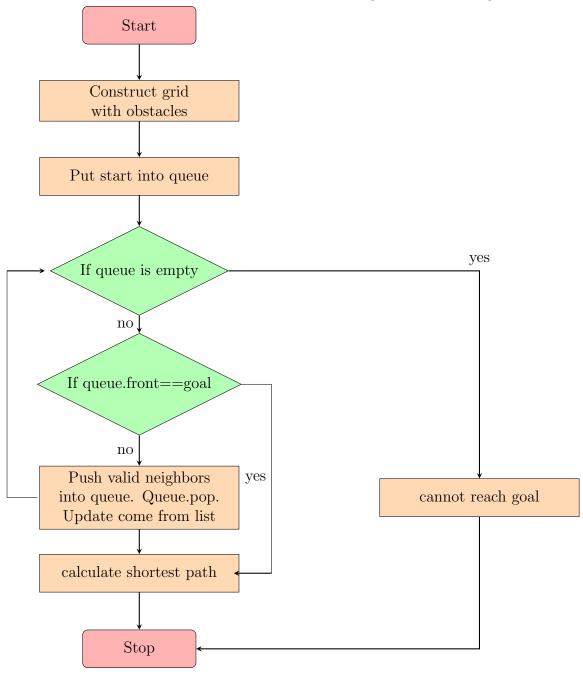
## Problem 1

The problem is to simulate a 2D space with obstacles and free space (4 connect grid). Run the search algorithm to find the shortest path. Since BFS can gaurantee the shortest path but DFS can not. I will choose BFS and the flow-diagram of search algorithm is as follows.



I choose grid size 30-by-30. Starting point is the left top corner. Goal point is the right bottom corner. There are three configurations shown as following. The red line is the shortest path

calculated by BFS. The cost and running time are compared as stated in the table. Since BFS consider the same cost value for all four direction. The cost is simply the length of path. In all three cases, the costs have the same value. For running time, configuration 3 has the shortest running time. This is because obstacle in the middle takes a larger space, which makes it easy for search.

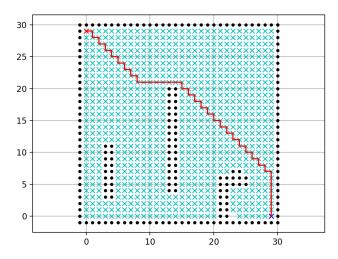


Figure 1: configuration 1

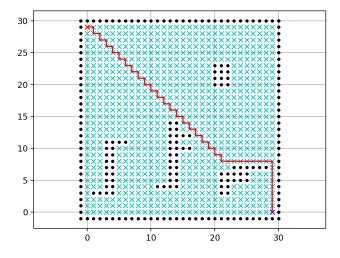


Figure 2: configuration 2

## Assignment 3

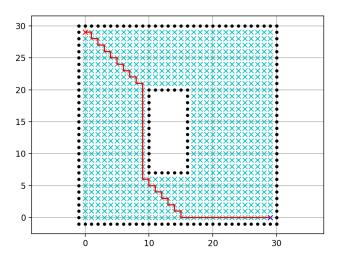


Figure 3: configuration 3

BFS	config1	config2	config3
cost(steps)	59	59	59
running time(s)	0.01118	0.01173	0.0078