



# Maze Solver

By

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### PROBLEM STATEMENT:

It's required to design an Application that reads the description of a Maze from a file, then the Application should be able to find the path from the Start cell 'S' to the Goal cell 'E' using the paths finding algorithms: Depth First Search (DFS) or Breadth First Search (BFS). The user can specify how he would like to solve the maze using DFS or BFS algorithm and you should output the path he should follows.

### DATA STRUCTURE USED:

- Queue: Used for BFS Algorithm.
- Stack: Used for DFS Algorithm.
- Singly Linked List: Used for the Implementation of the Stack.
- Doubly Linked List: Used for the Implementation of the Queue.

### ALGORITHMS USED:

- Search Algorithm for DFS & BFS :

```
S: empty Data Structure of cells (Stack in case of DFS or Queue in case of BFS)
T = (the start tile 'S')
S.add(T)
Mark T as visited
While S is not empty
    T = S.remove()
    Mark T as visited
    if T is target cell
        Mark that goal is reached
        return T
    End If
    for each valid unvisited neighbour N of T
        S.add(N)
    End For
End While
```

- **Generate Maze Algorithm :**

Maze: A 2D Array of Characters

Fill the Maze with '#' which represents the Walls

Pick a random point S which represents the Start Point

Find the direct neighbours of the S point

If the neighbours are walls

    Add to list of points

While the list of points is not empty

    Find the opposite of the current point on the other end

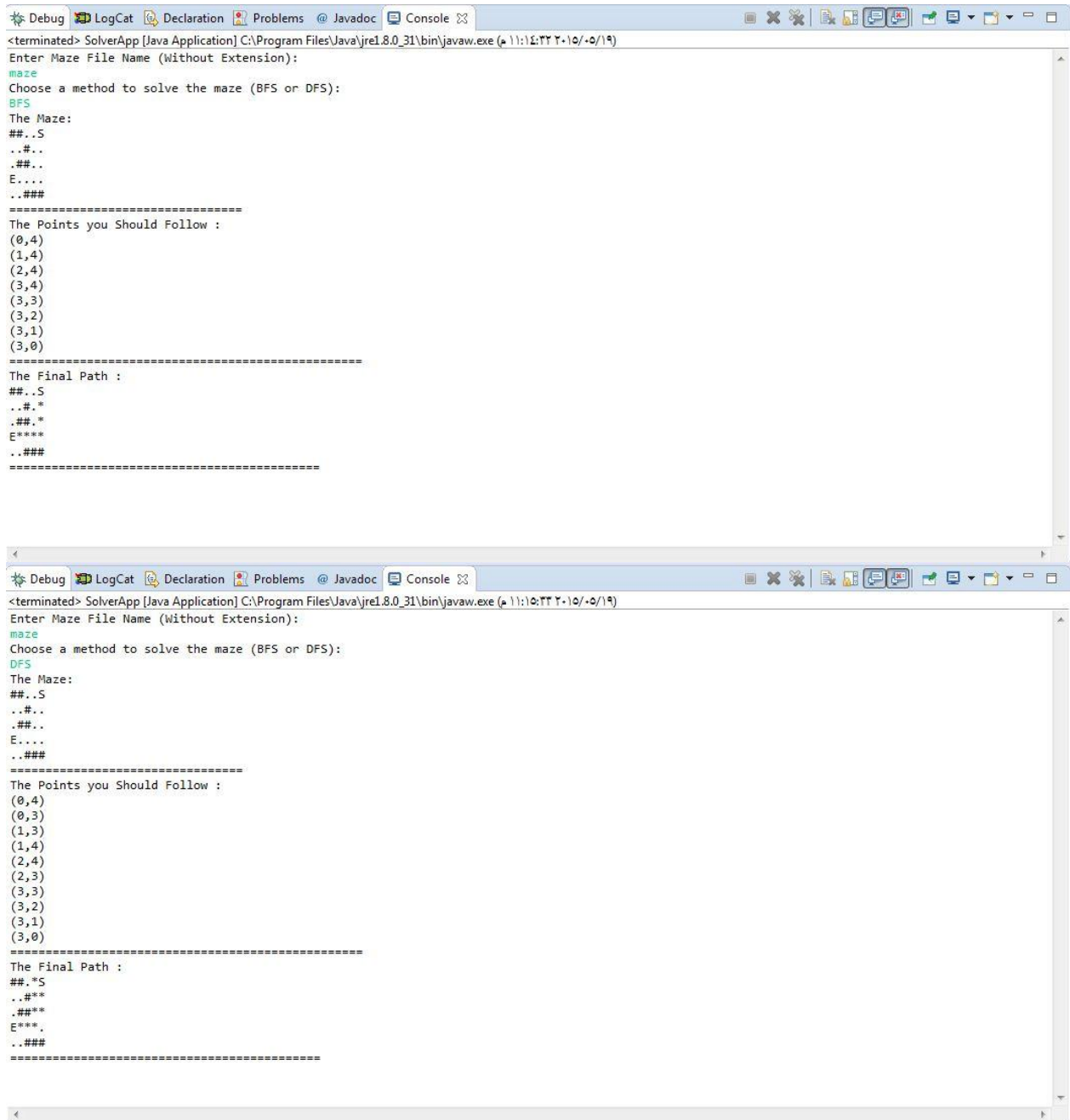
    If the point and its opposite are walls mark them a paths

Check if the result Maze is solvable

#### **ASSUMPTIONS:**

- The entered file name should be valid and Without the Extension and the file should be found in the Project Main folder with Extension (.txt) like: maze.txt.

## SAMPLE RUNS:



```
<terminated> SolverApp [Java Application] C:\Program Files\Java\jre1.8.0_31\bin\javaw.exe (a 11:15:22 2015/10/19)
Enter Maze File Name (Without Extension):
maze
Choose a method to solve the maze (BFS or DFS):
BFS
The Maze:
##..S
..#..
..#..
E....
..###
=====
The Points you Should Follow :
(0,4)
(1,4)
(2,4)
(3,4)
(3,3)
(3,2)
(3,1)
(3,0)
=====
The Final Path :
##..S
..#.*
..#.*
E****
..###
=====

<terminated> SolverApp [Java Application] C:\Program Files\Java\jre1.8.0_31\bin\javaw.exe (a 11:15:23 2015/10/19)
Enter Maze File Name (Without Extension):
maze
Choose a method to solve the maze (BFS or DFS):
DFS
The Maze:
##..S
..#..
..#..
E....
..###
=====
The Points you Should Follow :
(0,4)
(0,3)
(1,3)
(1,4)
(2,4)
(2,3)
(3,3)
(3,2)
(3,1)
(3,0)
=====
The Final Path :
##.*S
..***
..***
E****
..###
=====
```

```
Debug LogCat Declaration Problems @ Javadoc Console
<terminated> SolverApp [Java Application] C:\Program Files\Java\jre1.8.0_31\bin\javaw.exe (a 1):17:02:05/-0/19)
Enter Maze File Name (Without Extension):
maze2
Choose a method to solve the maze (BFS or DFS):
BFS
The Maze:
##...
S.###
..###
#..##
##...#
###..E
=====
The Points you Should Follow :
(1,0)
(2,0)
(2,1)
(3,1)
(3,2)
(4,2)
(4,3)
(5,3)
(5,4)
(5,5)
=====
The Final Path :
##...
S.###
*****
*****
*****
*****E
=====

Debug LogCat Declaration Problems @ Javadoc Console
<terminated> SolverApp [Java Application] C:\Program Files\Java\jre1.8.0_31\bin\javaw.exe (a 1):17:10:20/-0/19)
Enter Maze File Name (Without Extension):
maze2
Choose a method to solve the maze (BFS or DFS):
DFS
The Maze:
##...
S.###
..###
#..##
##...#
###..E
=====
The Points you Should Follow :
(1,0)
(1,1)
(2,1)
(3,1)
(3,2)
(4,2)
(4,3)
(5,3)
(5,4)
(5,5)
=====
The Final Path :
##...
S*###
.*###
*****
*****
*****E
=====
```



<terminated> SolverApp (1) [Java Application] C:\Program Files\Java\jre1.8.0\_31\bin\javaw.exe (x) - :2A:1V 2+10/-0/2+)

New Maze or Load from file (Enter New or Load):

New

```
...#####
.#.#####
...S.####
##.#####
##. ....##
###.#####
###.E..#
#####.##
#####...#
#####
```

Do you want to solve it ? Y or N

Y

Choose a method to solve the maze :  
BFS or DFS

BFS

The Points you should follow :

```
(2,3)
(2,2)
(3,2)
(4,2)
(4,3)
(4,4)
(5,4)
(6,4)
(6,5)
(6,6)
```

The Final Path :

```
...#####
.#.#####
```

<terminated> SolverApp (1) [Java Application] C:\Program Files\Java\jre1.8.0\_31\bin\javaw.exe (x) - :2A:1V 2+10/-0/2+)

```
#####.##
#####...#
#####
```

Do you want to solve it ? Y or N

Y

Choose a method to solve the maze :  
BFS or DFS

BFS

The Points you should follow :

```
(2,3)
(2,2)
(3,2)
(4,2)
(4,3)
(4,4)
(5,4)
(6,4)
(6,5)
(6,6)
```

The Final Path :

```
...#####
.#.#####
..*S.####
##*#####
##**..###
##*#####
##**E..#
#####.##
#####...#
#####
```