Programming 4 (ADEV-3001)
Assignment #2 – Stack

Create a program that will read in a file containing a maze and find an exit out of that maze. Your program must implement:

Maze File:

- A file that contains the maze that the program must navigate through
  - Give the file an extension of '.maze'
  - Be creative – have some fun with your maze designs!!
- Your file must contain the following information (in this order on separate lines)
  - Size of the maze (rows, columns)
  - Starting position (row, column)
  - String values indicating the maze contents (one line for each row, one data value per line for each column)
    - A space indicates that this point in the maze can be traversed
    - A 'W' indicates a wall, the space cannot be traversed
    - An 'E' marks the maze exit
    - See the following sample for a simple maze (this maze *cannot* be used for testing your program, it is for reference only).
    - Notes:
      - Individual points that can be navigated through will not contain values
      - Make sure the border of the maze is surrounded by walls

Point Class:

- Describes a point in the maze.
- It must contain the coordinates (row, column) of this point in the maze.

Stack Class

- A new class that implements the Stack methods as discussed in the lectures.
- Cannot contain any other methods or properties other than those discussed.
- Can contain any type of data

Node Class

- Contains information added to the stack (a point in the maze in this assignment)
- Must contain only the properties and methods discussed in the lectures
- Can contain any type of data

DepthFirst Class:

- A class to find an exit out of the maze
- Must contain
  - A private reference to the maze to be solved
- A single constructor to create an instance of the class to solve the passed maze from the passed starting point.
- A single public method called DepthFirstSearch to find an exit out of the maze (may contain other methods if you need them). It receives the row and column coordinates to search.
- Must use recursion to find the path

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Main (Testing) Program:

- Use the supplied class (P4Utils) to prompt the user for the maze file to open. This file will list all mazes in the same directory as the class is located. See the supplied Java documentation for instructions on its use.
- Load the file containing the maze into a character array (convert the Strings in the file to a 2 dimensional character array)
- There may be more than one path the same length, your program only has to find one of them.
- Print out the coordinates to follow to navigate from the starting point to the exit. See this sample output.
- Print out the maze to the console once the path has been found. Use a period '.' To indicate the path necessary to go from the start to the end of the maze. If there is no exit in the maze, print out a message indicating so. See this sample output.

Documentation

Full documentation of all code is expected. A class Javadoc similar to the following is required in all your classes:

```
/**
 * Class Name - Class Description
 *
 * <pre>
 *
 * Assignment:   #1
 * Course:       ADEV-3001
 * Date Created: May 12th 2016
 *
 * Revision Log
 * Who       When       Reason
 * --------- ---------- ----------------------------------
 *
 * </pre>
 *
 * @author Your Name
 * @version 1.0
 *
 */
```

All methods must have a Javadoc fully explaining their purpose and listing all parameters (@param) and return values (@return).

Individual lines do not need to be commented, however complex sections of lines should be.

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Pre Hand-in Testing

Three days before the assignment due date two testing files containing mazes will be made available to you. These mazes will put your code 'through the paces'. They will thoroughly test all your methods to make sure everything works ok. Make sure to run the mazes through your test program to ensure your program functions as it should.

Hand In

Hand in the entire assignment folder you create for this assignment. This folder must contain your

- All Classes you created for the assignment
- Your testing program
- The P5Utils class provided for the assignment
- The mazes you created to test your code
- The mazes you receive three days before the due date.

Submission Instructions

- The file *must* be a zip archive (which ends with the suffix '.zip').
- Submit the zip file directly to the appropriate LEARN dropbox.

Marking Guidelines

In order to be eligible for marking your program must compile cleanly. An assignment will be given a mark of zero if it has any class that does not compile properly. In addition the methods written must work correctly. If any method produces an exception (other than those expected), the assignment is given a mark of zero.

Marking breakdown is as follows:

Classes and Method Implementation (50%)

- Required methods implemented
- Required Methods operate according to design
- New methods you create contain a valid justification (in the method Javadoc)

Your test program (20%)

- Loads maze from a file
- Navigates maze correctly
- Produces required outputs

Supplied testing mazes (20%)

- Solved successfully

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Coding standards and documentation (10%)

- Javadocs
- Commenting as required
- Naming Standards followed
- Other coding standards followed

Completion of this assignment is mandatory as it will be used (and modified) for assignments #3 and #4.

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Appendix A – Sample Maze

Find a path using the Depth First Search (any path out)

```
11 13
1 1
WWWWWWWWWWWWW
W      W      W
W WWW W WWW W
W W         W W
W WWWWWWWW WWW
W   W   W   W
WWW W WWW   W
W      W   W W
W WWWWW W WWW
W        W   W
WWWWWWWWWWWWW
```

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Appendix B – Point traversal from Start to Exit

Path to follow from Start to Exit:
[1, 1]
[2, 1]
[3, 1]
[4, 1]
[5, 1]
[5, 2]
[5, 3]
[6, 3]
[7, 3]
[7, 2]
[7, 1]
[8, 1]
[9, 1]
[9, 2]
[9, 3]
[9, 4]
[9, 5]
[9, 6]
[9, 7]
[8, 7]
[7, 7]
[7, 8]
[7, 9]
[6, 9]
[6, 10]
[6, 11]
[7, 11]

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Appendix C – Maze showing exit path

Exit Path:

```
WWWWWWWWWWWWW
W.     W      W
W.WWW  W  WWW  W
W.W          W  W
W.WWWWWWW  WWW
W...WVVVW    W
WWW.WVWWW...W
W...VVW...W.W
W.WWWWW.WVWWW
W.......WVVVW
WWWWWWWWWWWWW
```