CO222: Programming Methodology

Recursion.

Aim: The aim of this laboratory class is to familiarize with recursion and few other programming techniques (macros) that would be useful in development.

Introduction:

The idea of this laboratory class is to find a path through a maze from a given square to a target square. The squares of the maze are represented using a 2-D matrix of integers with 0 denoting a square that you can move to and 1 denoting a one which is blocked. The target is fixed and it is the bottom last square. For example;

```
int maze[X_MAX][Y_MAX] = {{0, 0, 0, 0, 0, 1},
                          {1, 1, 1, 1, 0, 0},
                          {0, 0, 0, 0, 0, 0},
                          {0, 1, 1, 1, 1, 1},
                          {0, 0, 0, 0, 1, 1},
                          {1, 1, 1, 0, 0, 0}};
```

Your objective is to write a function `int findpath(int x, int y)` that would return 1 if there is a path from given square (x,y) to the target.

Part 0: You are not given any marks for this part; but would be useful in future laboratory classes. You are suppose to answer the following questions. At the next laboratory class, 3 persons will be randomly selected and will be asked to answer one of the questions.

1. How does `VISITED(x,y)` work? Look at the hint given in the code.
2. What is the meaning of `printf("%s", findpath(0, 0) == 1 ? "\n" : "No path\n");`
   `(one more question given below)`

Part I: Your fist task is to implement the `findpath` function.

Part II: In addition to saying whether there is a path or not, your `findpath` function should display the path as well. In this case, you are just required to print the coordinates of the squares you need to visit in the **reverse** order; for example for the above maze your code should print; (5, 5) (5, 4) (5, 3) (4, 3) (4, 2) (4, 1) (4, 0) (3, 0) (2, 0) (2, 1) (2, 2) (2, 3) (2, 4) (1, 4) (0, 4) (0, 3) (0, 2) (0, 1) as the path from (0,0) to (5,5).

Rename your findpath function as findAndPrint and modify the code to achieve the above.

Part 0: continues..

3. Can you print the path from the start to end? That is, for the above example (0,1) (0,2) (0, 3) … (5,5). What is the challenge in doing that?

Submission: You should submit your answers to Part I and II. Deadline is 6th September 2019 @ 1200hr.

Hint: Use recursion. When you are at a square you can move to 4 other squares (depending on where you are and whether they are blocked). You have a path to this square only if you have path to one of the squares that you are connected. Use the given maze.c file.