SM2-21st Computer Lab 11

Recursion

22 Nov 2017, Wednesday, 6:45pm

Unzip Lab11.zip sent to you.

Question 1:

The value of π can be 3.14159265. Use a recursive function in your C program to compute the value of the following series up to a tolerance of 10^{-8}.

$$2-\frac{2\pi^2}{2!}+\frac{2\pi^4}{4!}-...+2(-1)^n\frac{\pi^{2n}}{(2n)!}, \text{ where } n\geq 0.$$

Question 2:

The Maclaurin series of the sine function is given as follows:

$$\sin(x)=x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+\frac{x^9}{9!}-...=\sum_{k=0}^{\infty}\frac{(-1)^k}{(2k+1)!}x^{2k+1}$$

Use a recursive function in your C program to compute the value of $\sin(135°)$ up to a tolerance of 10^{-8}.

Question 3 (Question 19 of CS1010E - Programming Methodology, April/May 2012):

You are given a two-dimensional `array` maze whose contents are either 0 or 1. The idea is that this array represents a maze, where a 0 denotes a *vacant* spot, and 1 denotes a *blocked* spot. Assume the array has the dimension N x N where N is a defined symbolic constant. The start spot is the first cell (or top left cell) of the array, and you may assume that this spot is vacant. The destination spot is the last cell (or bottom right cell) of the array.

Write a function which navigates this maze. It should return 1 if there is a path, and 0 otherwise. You do not need to print the path itself.

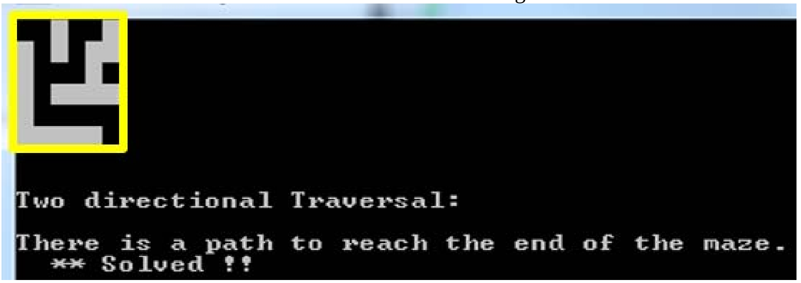
Do two versions of the function (in traverse2.c and traverse4.c). (Test your programs each with 3 mazes.)

Version 1: movement is only possible from one vacant spot A to another vacant spot B if A is directly above B, or A is directly to the left of B. (That is, move down or right only.)

Version 2: movement is possible from one vacant spot A to another vacant spot B if A is one is directly to the left or right of B, or A is directly on the top or the bottom of B. (That is, move up, down, left or right.)

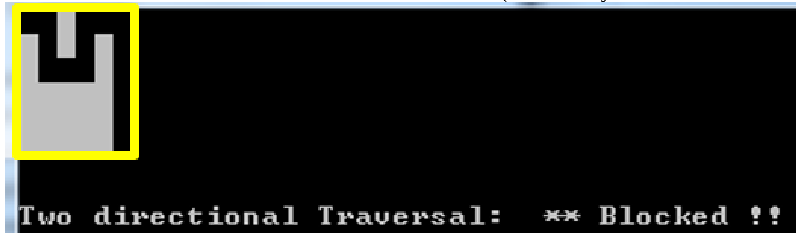
Note that there can be more than one distinct path. Your function needs only to determine if one exists. Hint: In both versions, write the function recursively

Outcome based on the traversal in two directions: Solved – right answer.



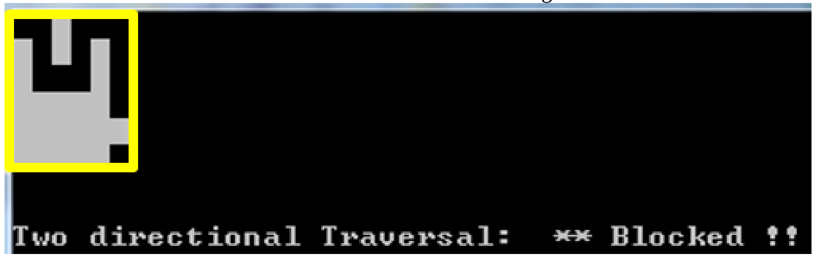
```
Two directional Traversal:
There is a path to reach the end of the maze.
  ** Solved !!
```

Outcome based on the traversal in two directions: Blocked (but actually this maze can be solved!)



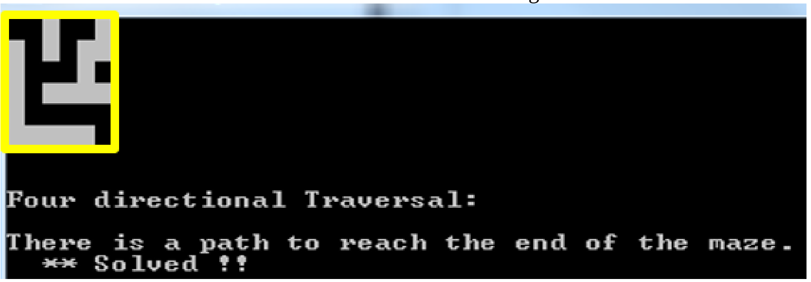
```
Two directional Traversal:  ** Blocked !!
```

Outcome based on the traversal in two directions: Blocked – right answer.



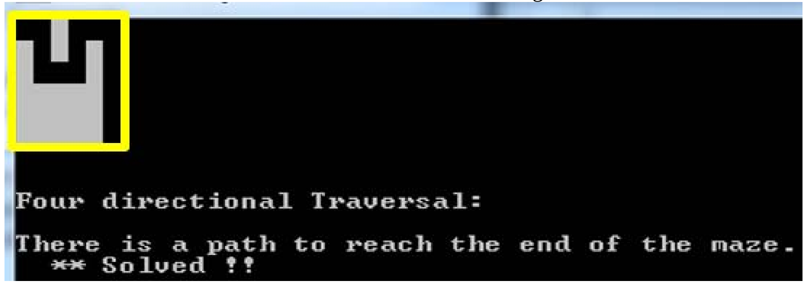
```
Two directional Traversal:  ** Blocked !!
```

Outcome based on the traversal in four directions: Solved – right answer.



```
Four directional Traversal:
There is a path to reach the end of the maze.
  ** Solved !!
```

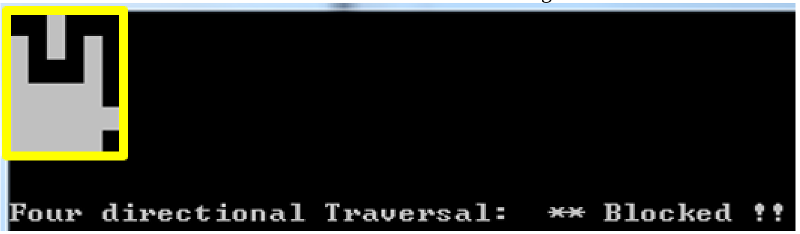
Outcome based on the traversal in four directions: Solved – right answer.



```
Four directional Traversal:

There is a path to reach the end of the maze.
   ** Solved !!
```

Outcome based on the traversal in four directions: Blocked – right answer.



```
Four directional Traversal:  ** Blocked !!
```