PES UNIVERSITY

UE20CS202 Data Structures and its Applications
Assignment II
Extended version of Assignment I
Max Marks: 25(will be scaled down)

A particular 'RPA' firm is in the process of developing a restaurant which has bot waiters. Bot needs to deliver the food from the specified exit door, of the kitchen with multiple exit doors to the specified table.

The restaurant has blocked areas where Bot cannot move and the passages where it can move. The layout of restaurant can be rectangular or square.

Layout map can be considered as a matrix of cells where cell with '0' represents the passage and cell with '1', the blocked area. Bot has memorised this map in a particular format for faster processing. Given a particular table location bot needs to find the path from the kitchen, starting from the specified exit door to the table to serve the customer. Bot has a constraint it can move only in either right or down direction **one step at a time** (i.e. only to the **adjacent cell** in right or down direction provided it is not blocked) **without preference to any particular direction.**

Layout matrix is stored in the file input.txt

You need to provide the code that helps the bot with the path form specific exit door of the kitchen to the mentioned table if there exists the one. If multiple paths exists your code should find any one.

Implementation

Your code should provide the following functionalities

1. Readmap

   Layout matrix consists for '0' (allowed for moving) and '1' (Blocked area)

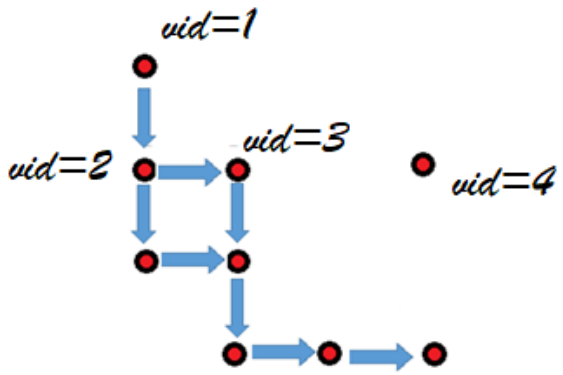
   You need to interpret layout matrix as a directed graph .Each vertex in this graph has max degree 2. For each vertex, vertex id and location (rowno, columnno) of the layout matrix should be maintained. Vertex id numbering should be row wise.

0 1 1 1

0 0 1 0

0 0 1 1

1 0 0 0



Your code should read the layout matrix from the file input.txt (file reading) and store it as a graph using adjacency list representation. List should be created using **"insert at front option" only.**

2. Find path

   Help bot to find path from the start point to the end point if one exists.

   You should access data from the created adjacency list representation and using graph traversal techniques (BFS and DFS) determine the path from start point to end point if it exists. Give your comments on the path generated by BFS and DFS Traversal techniques.

   BFS: Breadth First Search

   DFS: Depth First Search

3. Store path

   Your program should generate output files outbfs.txt and outdfs.txt

If path exits, program should store coordinates of the path given by BFS traversal in outbfs.txt and DFS traversal in outdfs.txt (each coordinate on new line same as done for Assignment I). If no path exists '-1' should be stored in output file.

Input file description

First line indicates the start point for the Bot, second line termination point, 3rd line onwards represent the layout matrix.

Sample Input file:

0 0

3 3

0 1 1 1

0 0 1 0

0 0 1 1

1 0 0 0

C programming language should be used for implementation

Implementation should consists of three files

- Header file (function prototypes, user defined data type definitions)(H)
- Implementation File (function definitions)(F)
- Client file (Driver function)(C)

The file names should be

SRN_H.h

SRN_F.c

SRN_C.c

**** Do not copy paste codes from your friends or any internet source if found you will end up scoring '0' marks .Code it yourself**.

Marks Distribution:

Reading map from file and storing as a graph data structure	5 Marks
Finding path using BFS	7.5 Marks
Finding path using DFS	7.5 Marks
Storing path in output file	5 Marks

Submission guidelines:

You need to submit

1. Implementation files

SRN_H.h

SRN_F.c

SRN_C.c

2. Output files generated by your program (outbfs.txt and outdfs.txt)
3. Screenshot of command prompt(compilation and execution) in your system
4. Comments on path generated by BFS and DFS(pdf file)

Submission Deadline: 27/11/2021 12.30 P.M.