Assignment 7

CIS 2168 (Section 001)

Fall 2023

Instructor: Shuvra Chakraborty

Total points: 100

Objectives

In this assignment, you will work with Breadth First Search(BFS) which is a graph traversal algorithm. You will learn how to use BFS to solve a particular problem.

Problem description

Given a binary matrix where 0 represents water and 1 represents land, and connected ones form an island, count the total islands.

For example, consider the following matrix:

0	0	0	0	1
1	1	1	0	0
0	0	0	1	1
1	1	0	0	0
1	0	1	1	1

The above matrix highlights water in 1 and land in 0 in a 5 × 5 matrix. There are three islands present in the above matrix. They are marked by distinct colors in the matrix below.

0	0	0	0	1
1	1	1	0	0
0	0	0	1	1
1	1	0	0	0
1	0	1	1	1

Assumptions:

- You may assume that arrays are being used for this assignment.
- For a particular cell with M[x,y] where M is the 2D matrix and x, y defines the row and column number, respectively, the adjacent cells are as follows.

  (x–1,y–1)
  (x–1,y)
  (x–1,y+1)
  (x,y–1)
  (x,y+1)
  (x+1,y–1)
  (x+1,y)
  (x + 1, y + 1)
- You can take a matrix input from the user using file I/O or just initialize it inside the program.

- This assignment has some written parts. Please include a report.pdf in the assignment zipped folder.

Task 1: (10x3 points)

Make a directed graph out of the given input matrix and show adjacency matrix and adjacency list representation of the generated graph.

Task 2: (20 points)

- Propose a solution to this problem using BFS.
- Explain how your proposed solution works for the given example.

Task 3: 30 points

Create a Java program that implements your BFS solution to the given problem. For example, the given example will output the number of islands: 3.

Task 4: 10 points

- Create a new example matrix of your own.
- Demonstrate that your code gives the correct answer to that one as well.

Submission Instruction

The assignment should be submitted through the available link on course Canvas shell. The assignment rubric is as follows:

1. Source code and demonstration [90 points]:

Provide the source code in zip file. Each file should have proper comments (e.g., explanations for methods, class and so on). It will be graded based on accuracy (e.g., program execution), clarity of the necessary comments, and short demonstration as instructed by TA or instructor.

2. Status.txt [10 points]:

In this text file, you need to report:

- The status of your program (completed or not; partial credit will be given even if the program is not completed).
- The design of your program (what and how the objectives have been accomplished).

- Support and advice (if any) you get from TA and/or your classmates.
- Comments and suggestions to improve this assignment.
- If you have completed the extra credit part [if any], mention it explicitly.
- If you are doing late submission, you should mention the number of days you are late since the due date. According to our policy, for N days of late submission, you get a deduction of Nx3 points per day even if your submission completes all the requirements. That said, if you are late for 5 days, your maximum point can be up to 85 out of 100.

Please have the source codes and status files zipped into a single file DSAssign7-LastnameFirstname.zip and upload the file on Canvas.