Laboratory Work #3 - Two-Dimensional Array Operations and Processing

Due Date: Friday, October 06, 2023
Handover Date: Monday, September 18, 2023

1   Introduction

A two-dimensional array, often referred to as a 2D array, is an extension of the concept of a one-dimensional array. While a one-dimensional array stores elements in a linear, sequential fashion, a two-dimensional array arranges elements in a grid-like structure with rows and columns, forming a matrix. This structure allows you to represent and manipulate data in a tabular format, making it suitable for various applications, such as tables, grids, and matrices.

In a two-dimensional array, elements are organized into rows and columns. Each element is accessed using two indices: one for the row and one for the column. These indices are used to pinpoint the exact location of a particular element within the 2D array.

2   Input

You will have to read n and m variables from console, then a 2D table of size n x m also from the console.

3   Task

Choose one/multiple tasks from the list below and build up your mark.

3.1   Easy - each of them is worth 1 point

- Quick Sort the entire matrix by rows.

- Quick Sort the entire matrix by columns.

- Quick Sort the matrix rows-wise.

- Quick Sort the matrix column-wise.

- Calculate the number of valleys in the given matrix

- Calculate the number of mountains in the given matrix

  Reverse the matrix, save it in another variable then:

- Add the 2 matrices

- Subtract the reversed matrix from the original one(original - reversed)

- Implement the standard matrix multiplication.

3.2   Medium - each of them is worth 2 points

For these problems, you will have a different input matrix, that will represent a graph, google it or ask ChatGPT to give you a matrix that will represent a graph(it should only contain 0 and 1), but i will provide later, if you will need it of course, a list of input matrices that you can use.

- Compute the adjacency matrix

- Compute the incident matrix

- Compute the incident list

3.3 Hard - Constructing a Mountain Matrix(worth 10 points)

You are given a matrix of size N x M. Your task is to rearrange(recursively) the elements of the matrix in such a way that it forms a mountain pattern with the largest value in the center and decreasing values as you move away from the center in all directions.

For this problem, you will have to use N, M ¿ 10(a good idea to implement a matrix generator as well). You will have to explain the algorithm/logic you have used in order to achieve the result.
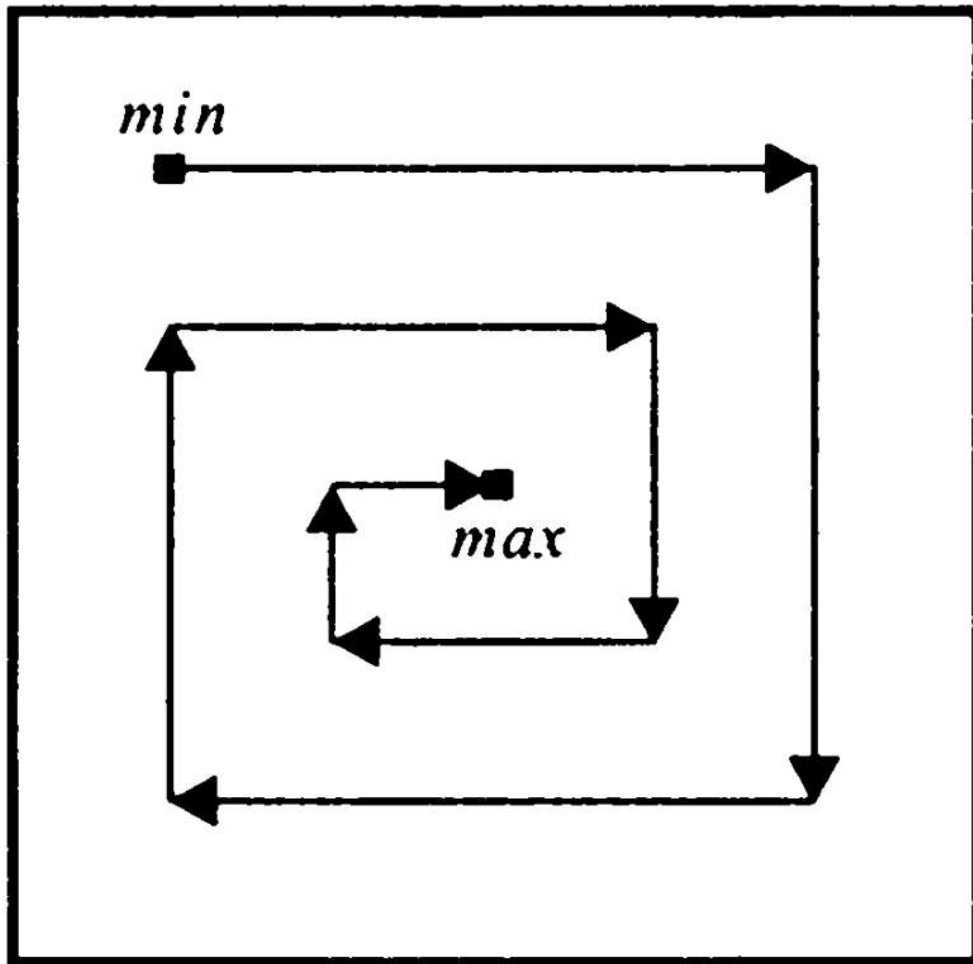

Figure 1: How insertion sort works

4 Grading

In order to get a mark for the rest of difficulties, you will have first of all to implement the task from Kulev_PC_SDA.pdf matching your variant(your number in the list). The base task is worth 5 points, so if you for only it, you will be marked only with 5.

You have the freedom of choice to build up your mark, however you must choose at least one medium problem.

If you choose the hardest difficulty, you will have 10 by default(no need for base task).

PS: No codeforces bonus for this one
PS2: For any questions, dont be shy to reach out to me or your colleagues

5 Reporting

IMPORTANT!!! As i specified on else, you have to use latex to create/format your report