Data Structure

Homework 4

Deadline: 2022/01/03 Mon. 23:55

Task 1: (I/O: 25 points, coding style: 5 points)

Given an m x n 2D binary grid which represents a map of '1's (land) and '0's (water), return the number of islands.

An island is surrounded by water and is formed by connecting adjacent lands horizontally or vertically. You may assume all four edges of the grid are all surrounded by water.

- 1 <= m , n <= 100

Example:

Input	Output
4 5 0 0 0 0 1 1 1 0 1 0 1 1 0 0 0 0 0 0 0 0	> 3
4 5 1 1 1 1 0 1 1 0 1 0 1 1 0 0 0 0 0 0 0 0	> 1

Task2: (I/O: 25 points, coding style:5 points)

Given graphs represented by adjacency matrices, please implement Prim's Algorithm and build the minimum spanning tree starting from vertex A. The first line will be the number of vertices. Vertices are labeled alphabetically using the letters A-Z. The distance between any two vertices will not exceed 100,000. The output shows the Minimum cost. If the graph is not connected, you need to print "NO connected".

Example:

Input Output	Input Output
4 0 4 9 21 4 0 8 17 9 8 0 16 21 17 16 0	> 28
4 0 5 0 0 5 0 6 0 0 6 0 0 0 0 0 0	> NO connected

Task 3: (I/O: 25 points, coding style: 5 points)

Please implement in Kruskal's Algorithm. Given a positive integer M and N, which means that there are M points and N lines, and then there are N rows.

Each row has three values I, J and K, which represent that I point and K point are connected and their distance is the third value K. Please write a program to build a minimum spanning tree and calculate the minimum weighted. If the graph is not connected, you need to print "NO connected". And show the graph by adjacency matrices

- 0 < M,N <= 100
- 0 < K <= 100

Example:

Input	Output
3 3 0 1 3 0 2 3 1 2 4	> 6 0 3 3 3 0 4 3 4 0
5 4 0 1 7 0 2 6 1 2 8 3 4 5	> NO connected 0 7 6 0 0 7 0 8 0 0 6 8 0 0 0 0 0 0 0 5 0 0 0 5 0

Put the files below in the folder (folder name: studentID), and compress this folder as **"studentID.zip"**.
1. Two source code files (filename: studentID_1.c, studentID_2.c)
2. One report with your coding environment (OS, IDE, ...), problems you encountered, and references. (filename: studentID.pdf) (10 points)
All the file names are correct, or you'll get zero points. (10 points)
You must hand in the assignment on time, or you will get zero points.
Warning: We encourage you to discuss assignments with each other. However, you have the responsibility to finish the assignments individually. **Do not copy others' assignment, or you will get zero points.**