

BM2043 - Algorithms and Data Structures

Exercise - 7

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Version 1

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Write the most efficient algorithm for the following problems in C++ and mention the Time and Space Complexity of your algorithms in the comments (at the end).

1. Create a graph using adjacency list and adjacency matrix and implement the following traversals for each of them:
 - BFS
 - DFS
2. Given an $m \times n$ 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.

Test Case:

Input: grid = [["1","1","1","1","0"],
["1","1","0","1","0"],
["1","1","0","0","0"],
["0","0","0","0","0"]]

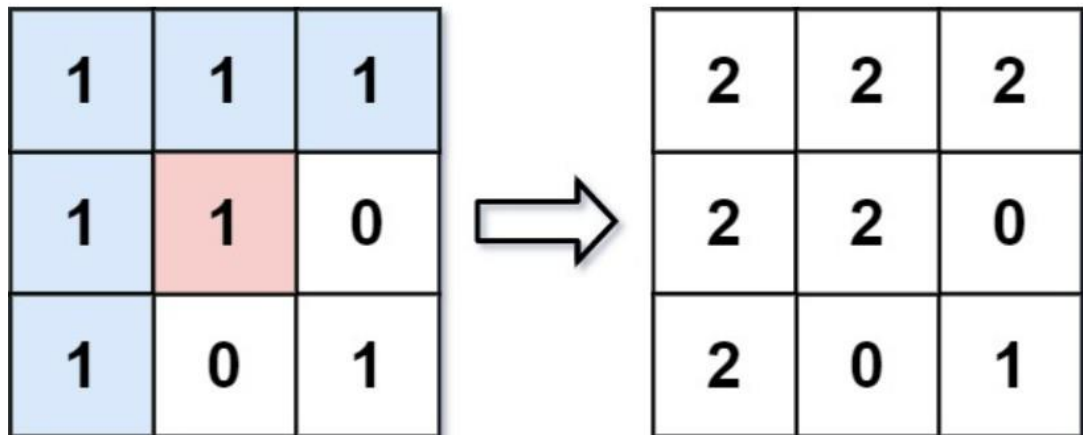
Output: 1

3. An image is represented by an $m \times n$ integer grid image where `image[i][j]` represents the pixel value of the image. You are also given three integers `sr`, `sc`, and `colour`. You should perform a flood fill on the image starting from the pixel `image[sr][sc]`. To perform a flood fill, consider the starting pixel, plus any pixels connected 4-directionally to the starting pixel of the same colour as the starting pixel, plus any pixels connected 4-directionally to those pixels (also with the same colour), and so on. Replace the colour of all the aforementioned

pixels with colour. Return the modified image after performing the flood filled.

Test Case:

Example 1:



Input: image = [[1,1,1],[1,1,0],[1,0,1]], sr = 1, sc = 1, color = 2

Output: [[2,2,2],[2,2,0],[2,0,1]]

Explanation: From the center of the image with position (sr, sc) = (1, 1) (i.e., the red pixel), all pixels connected by a path of the same color as the starting pixel (i.e., the blue pixels) are colored with the new color.

Note the bottom corner is not colored 2, because it is not 4-directionally connected to the starting pixel.