

Flood Fill

● EASY

■ Introduction

Flood Fill is the algorithm behind the "paint bucket" tool in image editors. Given a pixel position and a new color, change that pixel and all connected pixels of the same original color to the new color. It's DFS/BFS on a grid with a color-matching condition.

■ Core Intuition

Key Steps

- Start at (sr, sc). Note the original color = image[sr][sc].
- DFS/BFS in 4 directions. For each cell: only proceed if it has the ORIGINAL color.
- Change color as you visit — prevents re-visiting.
- Edge case: if new color == original color, return immediately (no change needed).

■ Java Implementation

Java

```
class Solution {  
    public int[][] floodFill(int[][] image, int sr, int sc, int color) {  
        int origColor = image[sr][sc];  
        if (origColor == color) return image; // Nothing to change  
        dfs(image, sr, sc, origColor, color);  
        return image;  
    }  
  
    private void dfs(int[][] img, int r, int c, int orig, int newColor) {  
        if (r < 0 || r >= img.length || c < 0 || c >= img[0].length) return;  
        if (img[r][c] != orig) return; // Not same original color  
  
        img[r][c] = newColor; // Fill  
        dfs(img, r-1, c, orig, newColor); // Up  
        dfs(img, r+1, c, orig, newColor); // Down  
        dfs(img, r, c-1, orig, newColor); // Left  
        dfs(img, r, c+1, orig, newColor); // Right  
    }  
}
```

```
}
```

Time & Space Complexity

Case	Time	Space	Why
Time	$O(m \cdot n)$	$O(m \cdot n)$	Each cell visited at most once
Space	$O(m \cdot n)$	$O(m \cdot n)$	Recursion depth in worst case fills entire grid

Common Mistakes

Avoid These

- Forgetting the "new color == original color" early return — causes infinite recursion.
- Changing color AFTER recursive calls — always change BEFORE to mark as visited.
- Using `!= newColor` as condition instead of `== orig` — wrong logic.

Practice Problems

Case	Time	Space	Why
Easy	LC 733	Flood Fill	Direct application
Medium	LC 542	01 Matrix	BFS flood from all 0s
Medium	LC 286	Walls and Gates	Multi-source BFS fill

Mental Model

Remember Forever

- "Paint bucket: click a pixel, color spreads to all connected same-colored pixels. The check is: same original color AND not already painted."