Trapping Rain Water

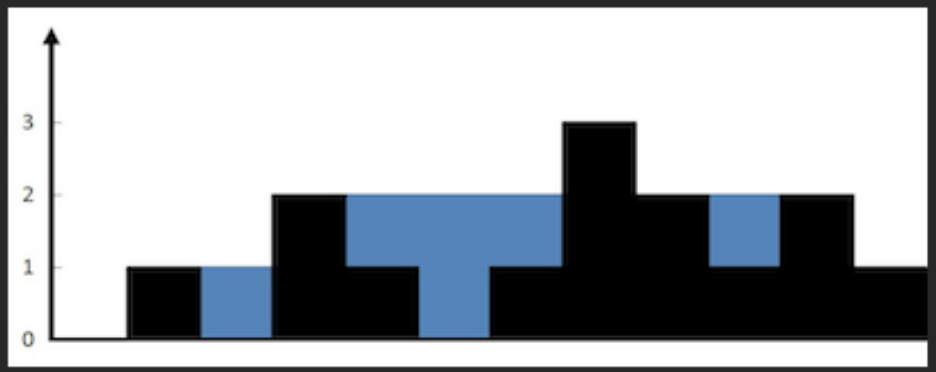
42. Trapping Rain Water

Hard 29.7K 431

Companies

Given `n` non-negative integers representing an elevation map where the width of each bar is `1`, compute how much water it can trap after raining.

Example 1:

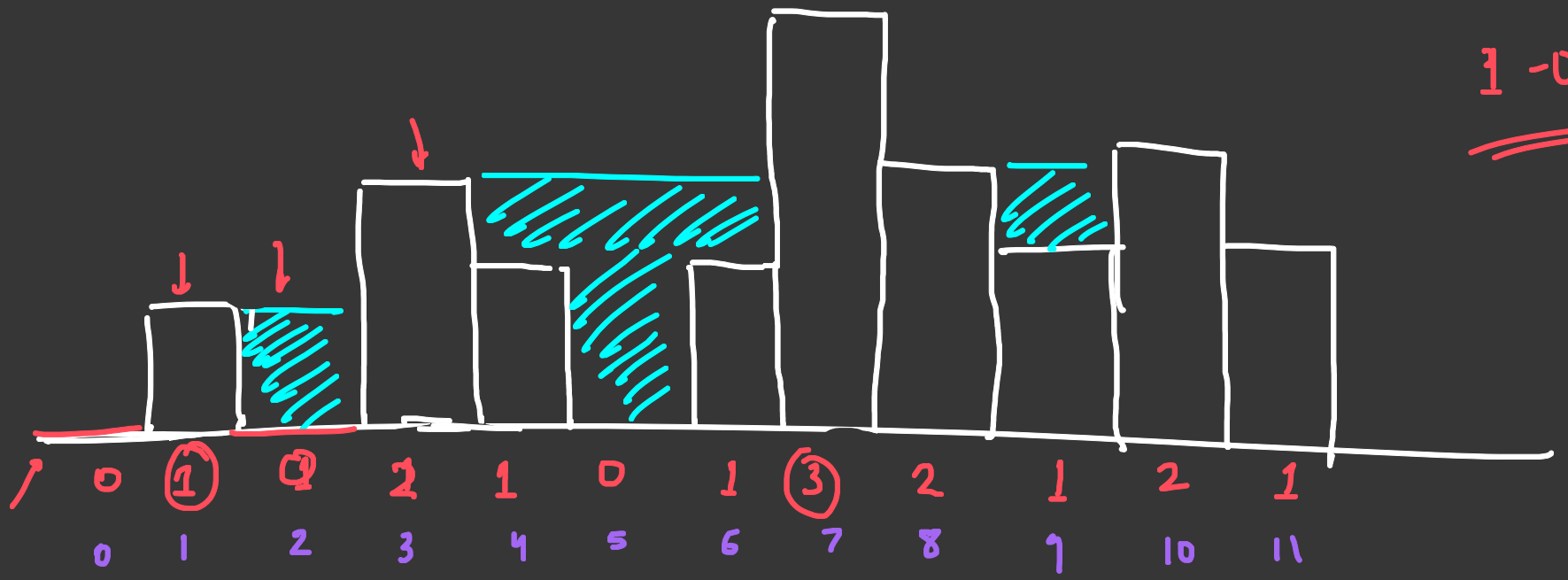



```
Input: height = [0,1,0,2,1,0,1,3,2,1,2,1]
Output: 6
Explanation: The above elevation map (black section) is represented by array [0,1,0,2,1,0,1,3,2,1,2,1].
In this case, 6 units of rain water (blue section) are being trapped.
```

Example 2:

```
Input: height = [4,2,0,3,2,5]
Output: 9
```

arr[] = { 0, 1, 0, 2, 1, 0, 1, 3, 2, 1, 2, 1 } ⟶ 6



1 - 0 = 1

0, 3

0 - 1 = -1 ✗

Q When a water is stored and how much water is store at any index ?

⟶

min(left max, right max) − curr height = ⟶

Brute force:

- We find the how much water can be stored in each index and sum up the valid water stored in to get the answer.

Water stored = min(max left, max right) − curr height;

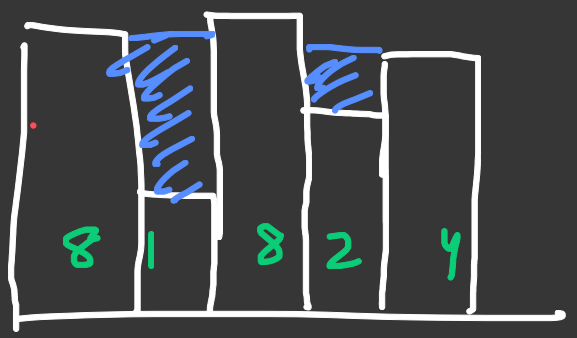
Better Approach:

→ We use space to generate left max and right max of every index before hand. We can use stack or array to store the left max and right max

```
int n = arr.size();
    vector<int> leftMax(n), rightMax(n);
    leftMax[0] = 0;
    rightMax[n-1] = arr[n-1];
    for(int i=1; i<n; i++)  leftMax[i] =
max(leftMax[i-1],arr[i]);
    for(int i=n-2; i>=0; i--)  rightMax[i] = max(rightMax[i
+1],arr[i]);

    int waterTrapped = 0;
    for(int i=0; i<n; i++){
        waterTrapped += min(leftMax[i],rightMax[i]) -
arr[i];
    }
    return waterTrapped;
```

arr[] = {8, 1, 8, 2, 4}



8-1=7 4-2=2

7+2=9

left max[] = {8, 8, 8, 8, 8}

right max[] = {8, 8, 8, 4, 4}

8 1 8 2 4 - 0

8-1=7

8-8=0

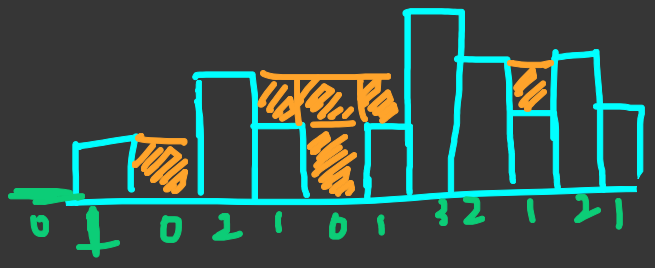
0+7=7+0+2=9

9

T.C = O(3N)

S.C = O(N)

Optimal Approach:



* We use two pointer Approach:

arr[] = { 0, 1, 0, 2, 1, 0, 1, 3, 2, 1, 2, 1 }

left = 0

leftmax = 0

right = 11

rightmax = 1

```
if(a[l] <= arr[r])
    if( a[l] > leftmax)
        leftmax = a[l];
    else
        cnt = leftmax - a[l];
    l++;
```

Logic: We compare is there a greater height towers on right for current left if yes then there is possibility of storing water from

T.C = O(N) S.C = O(1)