一、题目说明

题目是42. Trapping Rain Water，翻译起来就是“接雨水”。给n个非负正数代表高度，每个正数宽度为1，让计算能多少雨水。题目难度是Hard

二、我的解法

这个题目是找“坑”，然后计算里面可以存的“雨”。总共提交了5次，前面几次都是边界错误。

代码如下：

```
#include<iostream>
#include<vector>

using namespace std;
class Solution{
    public:
        int trap(vector<int>& height){
            if(height.size()<1) return 0;
            int len = height.size();
            int sum = 0,area=0,h;
            bool lflag = false,rflag = false;

            int left=0,leftStart,right,rightEnd=len-1,mid;

            while(left<rightEnd){
                //从左边开始找第1个高度
                leftStart = left;
                while(leftStart<len-1 && height[leftStart]<=height[leftStart+1])
{
                    leftStart++;
                }
                left = leftStart;

                //从右边开始找第1个高度
                right = rightEnd;
                while(right>left && height[right]<=height[right-1]){
                    right--;
                }
                rightEnd = right;

                if(height[rightEnd]<=height[left]){
                    right = rightEnd;
                    //降
                    while(right>left && (height[right]<=height[rightEnd])){
                        right--;
                    }
                    //升
                    while(right>left && (height[right]<height[right-1])){
                        right--;
                    }

                    h = height[right]<height[rightEnd] ? height[right]:
height[rightEnd];
                    area = 0;
                    for(int t=right+1;t<rightEnd;t++){
```

```
                        if(h>height[t]){
                            area = area + (h-height[t]);
                        }
                    }

                    sum += area;
                    rightEnd = right;
                }else{
                    leftStart = left;
                    //降
                    while(left<rightEnd && (height[left]<=height[leftStart])){
                        left++;
                    }
                    //升
                    while(left<rightEnd && (height[left]<height[left-1])){
                        left++;
                    }

                    h = height[left]<height[leftStart] ? height[left]:
height[leftStart];
                    area = 0;
                    for(int t=leftStart+1;t<left;t++){
                        if(h>height[t]){
                            area = area + (h-height[t]);
                        }
                    }

                    sum += area;
                    leftStart = left;
                }
            }

            return sum;
        }
};
int main(){
    Solution s;
    vector<int> r;
    r = {0,1,0,2,1,0,1,3,2,1,2,1};
    cout<<s.trap(r)<<":"<<(6==s.trap(r))<<"\n";

    r = {5,4,1,2};
    cout<<s.trap(r)<<":"<<(1==s.trap(r))<<"\n";

    r = {5,2,1,2,1,5};
    cout<<s.trap(r)<<":"<<(14==s.trap(r))<<"\n";

    r = {5,5,1,7,1,1,5,2,7,6};
    cout<<s.trap(r)<<":"<<(23==s.trap(r))<<"\n";

    r = {6,4,2,0,3,2,0,3,1,4,5,3,2,7,5,3,0,1,2,1,3,4,6,8,1,3};
    cout<<s.trap(r)<<":"<<(83==s.trap(r))<<"\n";
    return 0;
}
```

性能如下:

```
Runtime: 8 ms, faster than 61.40% of C++ online submissions for Trapping Rain Water.
Memory Usage: 9.1 MB, less than 91.14% of C++ online submissions for Trapping Rain Water.
```

三、优化措施

代码虽然正确，但看起来很难过！多番寻找，相对优雅的代码如下：

```
class Solution{
    public:
        //left、right
        int trap(vector<int>& height) {
            int n = height.size();
            int lhigh = 0, rhigh = n-1;
            int diff = 0;

            // scan from left to right
            for(int i = lhigh; i<n; i++)
            {
                if (height[i] < height[lhigh]) continue;
                for (int j = lhigh+1; j<i; j++) diff += height[lhigh]-height[j];
                lhigh = i;
            }

            // scan from right to left
            for (int i = rhigh; i>=lhigh; i--)
            {
                if (height[i] < height[rhigh]) continue;
                for (int j = i+1; j<rhigh; j++) diff += height[rhigh]-height[j];
                rhigh = i;
            }

            return diff;
        }
};
```

性能虽然差点，但可读性好多了。

```
Runtime: 12 ms, faster than 17.25% of C++ online submissions for Trapping Rain Water.
Memory Usage: 9 MB, less than 94.94% of C++ online submissions for Trapping Rain Water.
```