QUESTION TOPICS

Range Minimum Query

Binary Indexed Tree

Binary Trees

Complexity

Data Structures

Algorithms

Computer Programming

Edit Topics

QUESTION STATS

Views	1,482
Followers	5
Edits	

How do I implement a 2D binary indexed tree for range update and range query operations?

I know how to do it in 1D Binary indexed tree. I referred to Range updates with BIT / Fenwick Tree   for that, but I am not able to come-up with a solution to do the same in 2D BIT(Binary Indexed Tree).

Re-Ask   Follow **5**   Comment Share Downvote

Have this question too? Re-Ask to get an answer.

Vijay Khandal
Add Bio • Make Anonymous

Write your answer, or answer later

1 Answer

Rishav Goyal, algorithmic programmer
705 Views

I would be glad to answer this Question as i spent much of my time trying to find 2D Binary indexed tree (Fenwick) for range update and range Query operation, so that it can help others. There does not exist any such standard algorithm or it is very difficult to find. But we can do it indirectly. It means that we can extend the Fenwick 2D Point updation Tree into Fenwick 2D range update and range query.
How?
Solution:

Lets take an example:
Given a matrix M[R][C], initially set to 0.
We have 2 operations:
1. set r,c,Value element to value.
2. r1,c1,r2,c2 ; return the sum of all the elements r,c such that r1<=r<=r2, c1<=c<=c2;

This can be done using Fenwick 2D Point updation Tree.

1. Use **update(r,c,Value)** for 1st operation;

void update(int x , int y , int val){
    int y1;

```
        while (y1 <= max_y){
            tree[x][y1] += val;
            y1 += (y1 & -y1);
        }
        x += (x & -x);
    }
}
```

2. read(r1,c1,r2,c2) = read(r2,c2) - read(r2,c1-1) - read(r1-1,c2) + read(r1-1,c1-1);

```
int read(int x,int y){ // return sum from 1,1 to x,y.
    int sum= 0;
    while( x){
```

RELATED QUESTIONS

What is the intuition behind "range updates and point queries" in a binary indexed tree?

How can we simultaneously handle updates adding and multiplying a constant in a given range and then query for sum in a gi...

How do I decide which method/DS to use while querying on a range, square root decomposition, sparse table method, segment ...

What is a brief explanation of range updates-range queries?

What is the exact method to carry out range updates in a Binary Index Trees?

Why is my binary indexed tree implementation not working? (read question detail)

Can this problem be transformed into a segment tree problem where instead of updating a range [a,b] by a constant v, we ar...

How do I maintain a segment tree for range minimum query and updation?

How do I find the maximum element in a subarray between range [l,r] using segment trees?

What are some good sources to understand a binary indexed tree and its implementation?

More Related Questions

```
        int y1 = y;
        while(y1){
           sum += tree[x][y1];
           y1 -= y1 & -y1;
        }
        x -= x & -x;
     }
   return sum;
}
```

This was just an example like how we can extend the 2D Point Fenwick Tree into 2D Range Fenwick Tree. There exist problems of large variation based on this concept.

One such problem: Problem - D - Codeforces
Resource to Fenwick Tree : https://www.topcoder.com/communi...

Written 18 May • View Upvotes

Top Stories from Your Feed

Sourabh Jain Adarsh S
upvoted this • Wed

Upvote **2**   Downvote   Comment   Share **1**

What is the reason behind reading a decimal number such as 8.47 as eight point four seven and not eight point forty seven?

Hitesh Pindikanti • Request Bio
109.6k Views • Upvoted by Sourabh Jain • Rahul Kumar • 4 others you follow

Ok lets say we speak 8.47 as eight point forty seven. Then my question is how would you say 4.56 and 4.056 ? 'four point fifty six'? for both? But both the values are different. Hence, its good to ...

Read In Feed

### Can you give me some short inspirational message?

Sangeeta Goel, A professional storyteller! Stories find me wherever I go.
132.1k Views • Upvoted by Rahul Kumar • Bhanu Pasrija • 4 others you follow

Q: What is water at 99 degrees? A: It is just water. Probably quite hot but just plain water. Q: What happens at 100 degrees? A: It becomes steam. ...

Read In Feed

Anudeep Nekkanti wrote this • 2013

w did Anudeep Nekkanti become so good at competitive programming?

Anudeep Nekkanti, ";" key hates me the most..
49.4k Views • Upvoted by Lalit Kundu, Algorithmist. Qualified for ACM ICPC World finals 2015 • Balajiganapathi Senthilnathan, ICPC 2014 World Finalist • Saurabh Gupta • Vivek Sah • 1 other you follow

I came to know about online judge for the first time in 2012 Jan. That was because of IOPC (programming contest by IIT Kanpur).

Read In Feed