Locating Vertically & Horizontally Align Points in Cartesian Plane

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Outline:

- Problem Statement
- Algorithm For the Problem
- Conclusion
- References

Problem Statement :

Locating vertically aligned points and horizontally aligned points given the points with XY coordinates in a Cartesian space.

Algorithm For the Problem

We have used simple logic for vertical align point general form x = K. The x axis has the equation y = 0 taken as reference. And similarly for horizontal align pont general form y=k.

Steps to Follow:

```
srand( time(0));
  int n = 50 + (rand()%1000 );
```

- Generated the random integer value greater than 50 for no of point.

```
map<int,vector<int> > mx;
map<int,vector<int> > my;

 int k=0;
 vector<pair<int,int> >v;
 for(int i=0;i<n;i++)
 {
    int x=1+rand()%10000,y=1+rand()%10000;
mx[x].push_back(y);
 my[y].push_back(x);
  }
```

- Run the for loop no. of points time and generated the x , y coordinate for the point.
- In the hash map for the vertical align point store the y coordinate value corresponding to the given x key.
- In the hashmap for the horizontal align point store the x coordinate value corresponding to the given y key.

```
int f=0;
 for( const auto& pair : mx )
       {  int s=0;
          int min =INT_MAX;
          int max= INT_MIN;
          for( double d : pair.second )
                {   if(d > max)
                      max=d;
                    if(d<min)
                    min=d;
                      S++;}
           if(s>=3)
          { f=1;
             cout <<pair.first<<"," <<min<<" "
<<pair.first<<"," <<max<< "\n" ;}
       }
        if (f==0)
         cout<<"-1\n";
         cout<<"\n";
```

- Traverse the map for x key if more than or equal to 3 y coordinates are available print the start and end point of the vertical align point.
- Traverse the map for y key if more than or equal to 3 x coordinates are available print the start and end point of the horizontal align point.

Conclusion

Thus we have successfully implement a algorithm using hashmap to store the y or x value to x or y key in order to find out the horizontal and vertical alignment of point. Time complexity for this Algorithm is O(nlogn) and space complexity is O(n).

References:

Map of vector

https://www.geeksforgeeks.org/map-of-vectors-in-c-stl-with-examples/

Vertical and horizontal align point

https://magoosh.com/math/coordinate-geometry-vertical-and-horizontal-lines/#:~:text=Vertical%20lines%20have%20the%20general,coordinate%2C%20they%20are%20vertically%20separated.


Thank
you