Assignment 3

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1 The Skyline Problem:

1. Rectangular Buildings

a. The series of buildings is generated randomly (format: left, height, right)

b. They are arranged using Quicksort (O(nlogn))

c. A structure called Skyline is used here which is basically a linked list with two data points (left, height), in each node.

d. Now the sorted building array is divided into left and right parts until the size is 1 (divide)

e. The base case is when there is only one building, in this case the skyline data structure to be returned will have only two nodes: (left, height)–¿(right, 0)

f. The left and right lists(skylines) are now merged recursively on the basis of their x coordinates (left) in increasing order .(conquer).

g. In this merge function two things are kept in mind: If the incoming node has the same x coordinate as the previous, but has a different height, the bigger height is taken. And if the incoing node has same height but a different x coordinate, it is dropped, as it is redundant (building overlapped by another).

h. Thus the above algorithm is a simple merge sort type algorithm which has O(nlogn) complexity.

2. Slant Buildings

This problem is largely similar to the previous one.

a. Buildings are represented by (left, left height, right, right height) format.

b. They are arranged using Quicksort (O(nlogn))

c. A structure called Skyline is used here which is basically a linked list with two data points (left, height), in each node.

d. Now the sorted building array is divided into left and right parts until the size is **2** (divide).

e. This is because for two overlapping buildings, there will now be a third point to be taken into consideration, which is basically the point of intersection of the two roof lines of the two buildings.

f. 5 points are returned in base case. (2 for left, 2 for right and 1 intersection if valid).

g. The left and right lists(skylines) are now merged recursively on the basis of their x coordinates (left) in increasing order .(conquer).

h. In this merge function two things are kept in mind: If the incoming node has the same x coordinate as the previous, but has a different height, the bigger height is taken. And if the incoing node has same height but a different x coordinate, it is dropped, as it is redundant (building overlapped by another).

i. Thus the above algorithm is a simple merge sort type algorithm which has O(nlogn) complexity.