INFS4205/7205 Advanced Techniques for High Dimensional Data

Tutorial 2: Spatial Data Organization 1

Semester 1, 2021

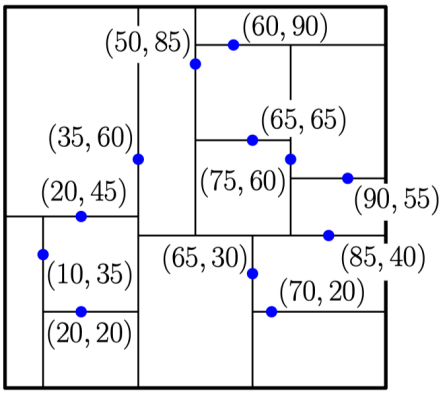
Question 1: What is the query time of answering the vertical line query using an interval tree? What is the query time of answering vertical segment query?

Question 2: The segment tree organizes the segments based on their end points. The line segments are stored at any nodes u that it covers it entirely while it doesn't cover u's parent's region. Why it cannot appear in the same level for more than two times?

Question 3: Compare how to answer the line segment range query with interval tree, priority search tree, and segment tree.

Question 4: Quadtree is a tree structure in which each internal node has exactly four children. In a quadtree, each node represents a bounding box covering some part of the space being indexed, with the root node covering the entire area. Is quadtree a balanced tree? What is the worst case of the two quadtrees? What's the main difference between Point Quadtree and Region Quadtree?

Question 5: Consider the Kd-Tree shown below. Assume that the cutting dimensions alternate between x and y.
(1) Show the result of inserting (80,10) into this tree.
(2) Show the Kd-Tree that results after deleting the point (35,60) from the *original* tree. Show both the tree structure and the subdivision of space of the two operations.


(50, 85)
(60, 90)
(65, 65)
(35, 60)
(75, 60)
(90, 55)
(20, 45)
(65, 30)
(85, 40)
(10, 35)
(70, 20)
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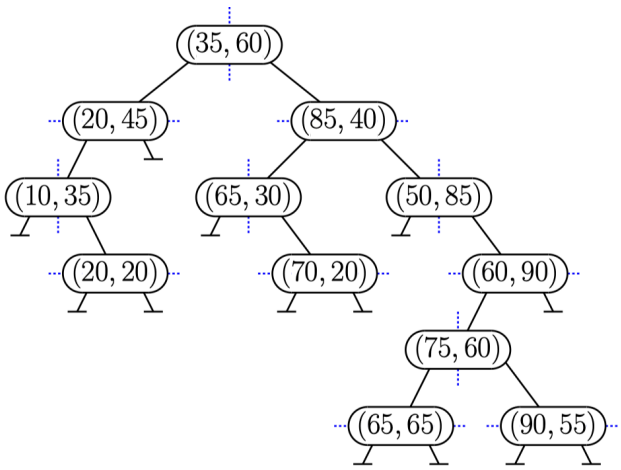
(35, 60)
(20, 45)
(85, 40)
(10, 35)
(65, 30)
(50, 85)
(20, 20)
(70, 20)
(60, 90)
(75, 60)
(65, 65)
(90, 55)