

6.851 ADVANCED DATA STRUCTURES (SPRING'10)

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Problem 2 Sample Solutions

Query Time for kd -trees. Let's consider an intersections along one edge, either vertical or horizontal, and the next intersection (horizontal or vertical). Note that the number of regions doubles after two levels of intersections, hence the depth of the kd -tree is $d = \log_2 n$. Summing up all the intersections at all depths we get that the total number of regions intersected is $O(\sqrt{n})$.

For the part 2, we can just arrange the points on the \sqrt{n} by \sqrt{n} lattice.

Segment Stabbing Note that there is no limit on the memory used. Therefore we can just use a modified segment tree. Also, we can just project the points to the x axis and for each obtained interval (at most n^2 of them, in the case of intersecting points) we store all the intersecting segments sorted by the y coordinate. This way we can answer both queries in $O(k + \log n^2) = O(k + \log n)$.

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