

FTP_Alg_Week 5: Exercises

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Exercise 1 We apply $BUILDKDTREE(P, 0)$ (the pseudocode given in Lecture 8) to the following set P of points of the plane:

$$P = \{(1, 3), (12, 1), (4, 5), (5, 4), (10, 11), (8, 2), (2, 7)\}$$

1. Give the height of the tree
2. How many leafs there are?
3. The second leaf (starting from left) is the point with first coordinate the number ...

Exercise 2 (* (It is enough to give an intuitive idea)) Prove that the $BUILD-KDTREE$ for a set of n points has running time $O(n \log n)$ and uses $O(n)$ storage

Exercise 3 (Optional) In Lecture 10 we have seen the recursive formula for the expected running time $E[T(n)]$ for *Randomized-Select*

$$E[T(n)] = \frac{2}{n} \sum_{k=\lceil n/2 \rceil}^{n-1} (E[T(k)] + O(n)).$$

Prove by induction that $E[T(n)] = O(n)$.

Exercise 4 (Optional) In Lecture 10 we have seen the recursive formula for the running time $T(n)$ for *SELECT*:

$$T(n) \leq \begin{cases} = O(1) & \text{if } n < 140 \\ T(\lceil n/5 \rceil) + T(7n/10 + 6) + O(n) & \text{if } n \geq 140 \end{cases}$$

Prove by induction that the running time $T(n)$ is in $O(n)$