Selected Problems in CLRS

Section 9

Notifications

Selectino in worst-case linear time is little tricky. You need to study carfully.

Problem Difficulty (count with star)

1. you can solve w/o the brain
2. you can solve if you think a bit
3. you can solve if you think carefully
4. you might solve if you push yourself
5. you can solve if you use other's brain

Exercise

9.1-1 $\star\star\star$

Show that the second smallest of n elements can be found with $n + \lceil \lg n \rceil - 2$ comparisions in the worst case.

> **Hint :** what are the candidates of the second smallest element if we find the smallest element in linear time

9.2-4 $\star\star$

Suppose we use RANDOMIZED-SELECT to select the minimum element of the array $A = \langle 3, 2, 9, 0, 7, 5, 4, 8, 6, 1 \rangle$. Describe a sequence of partitions that results in a worst-case performance of RANDOMIZED-SELECT.

9.3-1 $\star\star\star$

In the algorithm SELECT, the input elements are divided into groups of 5. Will the algorithm work in linear time if they are divided into groups of 7? Argue that SELECT does not run in linear time if groups of 3 are used.

9.3-4 $\star\star\star\star$

Suppose that an algorithm uses only comparison to find the ith smallest element in a set of n elements. Show that it can also find the $i-1$ smaller elements and the $n-i$ larger elements without performing any additional comparisons.

9.3-7 $\star\star\star\star$

Describe an $O(n)$-time algorithm that, given a set S of n distinct number s and a positive integer $k \leq n$, determines the k numbers in S that are closest to the median of S.

9.3-8 $\star\star\star\star$

Let $X[1..n]$ and $Y[1..n]$ be two arrays, each contatining n numbers already in sorted order. Give an $O(\lg n)$-time algorithm to find the median of all $2n$ elements in arrays X and Y.

> **Note :** you can solve this problem in LeetCode problem.4