Interview Questions: Analysis of Algorithms (ungraded)

练习测验, 3 个问题

✔ **恭喜！您通过了!**

✔ 1 / 1
   分数

1.

3-SUM in quadratic time. Design an algorithm for the 3-SUM problem that takes time proportional to n^2 in the worst case. You may assume that you can sort the n integers in time proportional to n^2 or better.

Note: these interview questions are ungraded and purely for your own enrichment. To get a hint, submit a solution.

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您的回答不能超过 10000 个字符。

感谢您的回答。

Hint: given an integer $\mathbf{x}$ and a sorted array $\mathbf{a}[]$ of n distinct integers, design a linear-time algorithm to determine if there exists two distinct indices $\mathbf{i}$ and $\mathbf{j}$ such that $\mathbf{a}[\mathbf{i}] + \mathbf{a}[\mathbf{j}] == \mathbf{x}$.

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2.

Search in a bitonic array. An array is *bitonic* if it is comprised of an increasing sequence of integers followed immediately by a decreasing sequence of integers. Write a program that, given a bitonic array of n distinct integer values, determines whether a given integer is in the array.

- Standard version: Use $\sim 3 \lg n$ compares in the worst case.

- Signing bonus: Use $\sim 2 \lg n$ compares in the worst case (and prove that no algorithm can guarantee to perform fewer than $\sim 2 \lg n$ compares in the worst case).

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感谢您的回答。

Hints: Standard version. First, find the maximum integer using $\sim 1 \lg n$ compares—this divides the array into the increasing and decreasing pieces.

Signing bonus. Do it without finding the maximum integer.

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3.

Egg drop. Suppose that you have an n-story building (with floors 1 through n) and plenty of eggs. An egg breaks if it is dropped from floor T or higher and does not break otherwise. Your goal is to devise a strategy to determine the value of T given the following limitations on the number of eggs and tosses:

- Version 0: 1 egg, $\leq T$ tosses.
- Version 1: $\sim 1 \lg n$ eggs and $\sim 1 \lg n$ tosses.
- Version 2: $\sim \lg T$ eggs and $\sim 2 \lg T$ tosses.
- Version 3: 2 eggs and $\sim 2\sqrt{n}$ tosses.
- Version 4: 2 eggs and $\leq c\sqrt{T}$ tosses for some fixed constant c.

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您的回答不能超过 10000 个字符。

感谢您的回答。
Hints:

- Version 0: sequential search.
- Version 1: binary search.
- Version 2: find an interval containing T of size $\leq 2T$, then do binary search.

- Version 3: find an interval of size $\sqrt{n}$, then do sequential search. Note: can be improved to $\sim \sqrt{2n}$ losses.

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- Version 4: $1 + 2 + 3 + \ldots + t \sim \frac{1}{2}t^2$. Aim for $c = 2\sqrt{2}$.