Interview Questions: Analysis of Algorithms

Help Center

Warning: The hard deadline has passed. You can attempt it, but **you will not get credit for it**. You are welcome to try it as a learning exercise.

These interview questions are for your own enrichment and are not assessed. If you click the *Submit Answers* button, you will get a hint.

- [ ] **In accordance with the Coursera Honor Code, I (abhijit taware) certify that the answers here are my own work.**

Question 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.

Question 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).

Question 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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You cannot submit your work until you agree to the Honor Code. Thanks!