

DM19 – Fall06 – Weekly note 3

A misprint

In JBJ notes on lower bounds the first line on page 8 should say “increased by at most a factor of two (see rule 1) ... “

Stuff covered September 20, 2006

Indicator random variables. Cormen sections 5.1 and 5.2

Randomized Quicksort. Cormen Sections 7.3 and 7.4

Selection in guaranteed linear time. Cormen Section 9.3.

Lower bound for finding the median. JBJ notes pages 8-11 and DM19 Notes Baase 138-140.

Excercises September 26, 2006

- Exercises 6-8 in JBJ notes on lower bounds.
- 9.3.1, 9.3.3, 9.3.5 and 9.3.9 page 192-193.
- The nuts and bolts problem is defined as follows. You are given a collection of n bolts of different widths and n corresponding nuts. You are allowed to try a nut and a bolt together, from which you can determine whether the nut is too large, too small or an exact match for the bolt, but there is no way to compare two nuts together, or two bolts together. Your job is to match each bolt to each nut.
 1. Show that any algorithm for the nuts and bolts problem must make $\Omega(n \log n)$ comparisons in the worst case. Hint: consider a decision tree for any algorithm that solves the problem using comparisons of bolts and nuts.
 2. Devise an algorithm with expected running time $O(n \log n)$. Hint make a modification of Quicksort.
 3. Suppose that instead of matching all the nuts and bolts, you wish to find the smallest bolt and its corresponding nut. Show that this can be done with only $2n - 2$ comparisons.

Lecture September 27, 2006

- Amortised analysis. Sections 17.1-17.3.
- Binomial heaps. Chapter 19. We will not cover everything, some of it will be left for selfstudy. What we need is a basic understanding that can lead up to Fibonacci heaps which we will cover next time. You should recapitulate the definition of a binary heap from DM02.