

COMP 3711 Design and Analysis of Algorithms
Spring 2015
Programming Assignment 1

Implement quicksort in your favourite programming language, and perform the following experiments.

1. Generate an array of $n = 10$ million random 32-bit integers. Run quicksort on it and record the time it spends. [Hint: Don't use your own stopwatch! Use system calls that can measure the time in microseconds, e.g., `gettimeofday` on Linux.]

Repeat the experiment 100 times and plot the distribution of the running times using a histogram. [Hint: make sure you use a different seed for your random number generator for every run.] How does the distribution look like? What is the average running time over the 100 runs? What is the standard deviation (as a percentage of the average running time)?

2. Try 10 different values of n in the range between 0 and 10 million, and repeat the above experiments. Plot how the average running time and the standard deviation (as a percentage of the average running time) of quicksort change as n increases.

Note: You may adjust the values of n if your computer is too slow.

What to submit:

1. A printout of your quicksort code.
2. The figures you have plotted.
3. A brief discussion of what you have observed from the experiments.