Homework Set 6

Due: Friday, April 6, 2012 at 6pm Solutions should be submitted in PDF form using LATEX.

In this assignment, you will add two more sorting algorithms to our investigation of the algorithmic complexity and performance ramifications of the sorting problem. You will implement these two algorithms, add optimizations to make them perform as well as possible, and assess and analyze the results.

The Sorts

- **Randomized Quicksort** Implement the randomized quick sort algorithm and enhance and tune it to make it perform as well as possible. Optimizations may include a hybrid approach and using an n^2 algorithm on sufficiently small base problems, or going to sequential code for small enough problems. Ask yourself if the tail recursion can be transformed into iteration.
- Linear Sort Implement one of radix sort or bucket sort. Make your implementation general and allow tunability in the parameters of the algorithm, such as number of digits versus digit size in radix sort, or number of buckets in bucket sort.

The Analysis

The quality of your analysis will be the primary evaluation criteria for your grade. Your analysis must include a description of your algorithm implementation, a clear and coherent set of test cases, clear presentation of evaluative results, and a discussion of those results, including hypothesis as to why the results came out the way they did. Please exclude any earlier n^2 algorithms from your graphs, as I want you to focus on the relative performance of the $n \lg n$ and linear algorithms. You may include trials that demonstrate where the linear algorithm assumptions are violated (such as uniform distribution for bucket sort), or parameters are chosen poorly (such as number of digits versus digit size in bucket sort). In a document intended to communicate, such as this, those inclusions help demonstrate to me your mastery of the material.