CS 581 Homework 4 PA Grading Rubric

March 1, 2018

Programming Assignment Grading Rubric

For the documentation, the following items are checked (30 points)

- A reasonable value of r is chosen and the reason is justified.
- A good sorting algorithm for small arrays is used such as insertion sort when sorting each group.
- A reasonable threshold is determined and justified when the linear-time selection should revert to sorting.

For the code. the following items are checked (70 points)

- It compiles and runs fine according to your instruction.
- It produces the correct results across a selected set of test inputs. The points are distributed on each input. So you missed some inputs but got some other correct, there will be partial credits.
- The code has correct logic and does not miss any pieces of linear-time selection (when it does produce correct results).

The tests are ran as follows. I have a standard executable that will always produce the correct result, and another program that takes your executable as the input and run your executable along with my executable. After that I will inspect the outputs from the two executables. Both 0-indexed and 1-indexed results are accepted. If they match, your executable is considered have passed the tests. Possible ks are some random values plus some special values such as boundaries.

A total of 100 points are distributed among all the key points stated above. Note that if the code does not run or produce correct results, your source code is briefly reviewed to check your basic grasp of linear time selection (10 points). This is a programming assignment, so the main point is about writing correct programs. Besides, you should also demonstrate that you have put effort into finding the best r and a reasonable reverting threshold. Finally your code should show that you indeed understand linear time selection to get a full score. Note the importance ordering of each item in this assignment, so basically if your code produces all wrong results, don't expect to receive a good score for a programming assignment.

Programming Assignment

Problem 1. Recall that in the selection problem, we take as input a list L, its length n, and an integer k. We are asked to report the value of L's kth smallest element. In class we discussed the median-of-medians rule. Use C99 or C++98 to implement this technique and solve the selection problem in linear time. The code should compile and run on the Hydra Lab machines. Specifically,

- Set r at one of 5, 7, 9 or 11. Justify your decision.
- Choose your sorting algorithm when n becomes small and justify the decision.
- Experimentally determine the value of n at which your linear-time selection code should revert to sorting and unwind the recursion. Describe how you made this determination, and the factors upon which it depended.

In addition,

- Suppose your code is compiled to executable program `linear_select`. It should take command line arguments as

  ```
  linear_select input_file k n
  ```

  where input_file is the name of a file containing integers separated by spaces. Your program should read in the first n elements in that file and output the kth smallest element among them.
- No need to do any error-checking of inputs.
- The possible n values will be 1024 (1k) to 1024*1024 (1M), and the input file will have sufficient elements in it.
- Include a README file if your program needs special compile procedures or parameter passing methods.

Submission: Send the TA all files necessary to compile and run your code before it's due.