

CS121 - Computer Science II

Lab Assignment #10

Fall 2011

The purpose of this exercise is to allow you to explore algorithm efficiency.

The maximum segment sum problem has several solutions. The actual purpose of this algorithm is irrelevant here, since we are strictly concerned with finding the run-time efficiency of the algorithms. However, for the curious, the problem is to find the maximum sum that can be formed from a sequence of one or more numbers in an array.

Four different algorithms have been provided; they have the orders shown below:

Algorithm	Order
A	N^3
B	N^2
C	$N \log N$
D	N

The four files are available from the class website - they are executables (i.e., already compiled) and will only run on Linux machines - they have been compiled on wormulon, which is a CentOS-based Linux distribution, but should run on any x86-based Linux OS. They have been compiled in "random" order. That is, the program Max1 is not necessarily the executable for Algorithm A above, etc. After you download the files, you may need to make sure that they are *executable*; that is, the "x" bit in the directory is set. If it is not, then the following command will make them executable:

```
chmod +x Max*
```

You are to determine which algorithm is which by experimentation. The main program that is linked with each algorithm is the same; it is expecting the first number to be input is the number of values that follow. It then is expecting numerous positive and negative ints that comprise the list that will be used. The easiest way to provide data to this program is to create several data files of varying sizes (Hint: write a short program that uses a random number generator to create the data files), and then use input redirection to send the file to the program's stdin. The number you use should range in value from -1000 to +1000.

To determine the time required to execute the file, you can use the Linux `time` command. For example, to execute the program Max1 with data file `infile1`, and time it, do:

```
time Max1 <infile1
```

The output will look something like:

The Maximum Segment Sum is 1831

```
real    0m0.37s
user    0m0.16s
sys     0m0.02s
```

In the above example, the execution time for the program is the user time, 0.16 seconds (or 160 milliseconds). Since the time command is not exact, you might want to run each case a few times and determine the average run time.

You should turn in a short report which summarizes your findings. Use an editor or word processor to write this report. First, your report should analyze each algorithm's source code, and verify the orders that are listed above. The paper should then specify the running time of each executable (i.e., which executable is algorithm A, which is algorithm B, etc.). Your report should also include tables and/or graphs as necessary to justify your conclusions.

For this assignment, use `cscheckin` to submit your report.