CDS251HW6 Report

Submission: *Run your program on Numbers3.txt (from Bubble Sort assignment). It has 200,000 numbers in it. Comment on the speed of this one compared to HW#5.*

BubbleSort runtime was 1m38.679s, compared to the much faster Quicksort runtime of 0.561s

Extra Credit: *Time how long the program runs (user time using the time command) on the Numbers3.txt data set. Compute how long it would take 700,000 numbers to be sorted from the Big O() complexity of Quicksort. Run and time Quicksort on Numbers6.txt. Compare the computed number with this run. Sort file 'Numbers3.txt' with your previous BubbleSort program. Compute but do not run how long BubbleSort would take for 700,000 numbers*

Numbers3.txt user runtime Quicksort:

0.561s

700k numbers O() Time Quicksort:

Compute how long it would take 700,000 numbers to be sorted using O() formula from algorithm complexity:

$$t_2 = t_1 \cdot \left(\frac{n_2 \log_2(n_2)}{n_1 \log_2(n_1)}\right)$$

$$t_2 = 0.561s \cdot \left(\frac{700000 \log_2(700000)}{200000 \log_2(200000)}\right) \quad = 0.561s \cdot 3.85922 = 2.165s$$

Numbers6.txt user runtime Quicksort:

1.294*s*

Compare Theoretical and Actual Run time:

Actual time was almost half the theoretical time.

700k numbers O() Time BubbleSort:

Compute how long it would take 700,000 numbers to be sorted using O() formula from algorithm complexity:

$$t_2 = t_1 \cdot \left(\frac{n_2}{n_1}\right)^2$$

$$t_2 = 1\text{m}38.679s \cdot \left(\frac{700{,}000}{200{,}000}\right)^2 = 1\text{m}38.679s \cdot (3.5)^2 = 1\text{m}38.679s \cdot 12.25 = 20m8.81775s$$