

Assignment 6

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1 Report

Well, this assignment was supposed to take 2 hours, but it ended up taking closer to 6. Truth be told I could have done it in 2 hours, but some of the sort functions behaviors seemed off to me so I played around with the them for a while. To start out with, bubble sort really sucks. On my MacBook Pro, I gave Docker 12GB of RAM and 2 out of my 4 cores, and with those resources it took bubble sort just under 18 minutes to sort 500,000 numbers, selection sort exactly 5 minutes, insert sort just over 3, and merge sort didn't work- I got a segmentation fault. Once I reduced it down to 100,000 numbers, I didn't understand how, but merge sort worked almost instantly- within one second. I didn't believe it, so I checked my code to make sure it wasn't sorting an array that's already been sorted by another algorithm, and then I ran it again a few more times. I still wasn't satisfied so I went to my desktop for more testing, where I gave docker 24GB of RAM and 4 out of my 8 cores. With this I got similar results- for 330,000 numbers bubble took 9 minutes, selection took 2 minutes, insert took 2 minutes, and merge sort took, once again, less than a second. After some testing, I found that merge sort starts getting a segmentation fault somewhere between 330,000 and 350,000. At this point I wondered if quick sort was similar to merge sort in run times, so I Frankenstein'ed that algorithm together using google and the textbook (like I did with merge sort). Quick sort ended up always running less than a second too, but this time clunked out somewhere between 500,000 and 750,000 values. These results were more drastic than I expected. I didn't realize how big of a difference $x \cdot \log x$ was on a graph from x until I graphed them out and set x to 500,000 (representing the two big-oh run times)- the former takes about 88,000 (!!!) times longer than the latter. Trade off wise I am inclined to believe the $O(n)$ equations in this case are better for memory since they could run with more values, but for speed and any realistic practicality, the two $O(n \log n)$ equations are light years ahead. The biggest shortcoming of this empirical analysis was that I used a sample size of 2 (since I only screenshotted 2 of the outputs and my tests were too similar to make me want to go back and run more tests).