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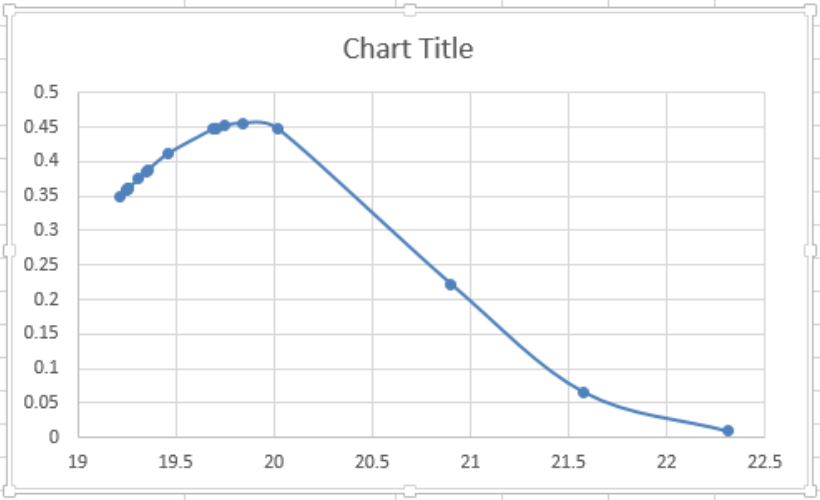
Project 2 – Merge Sort vs Quick Sort

After testing both algorithms it became very clear that the quick sort algorithm is superior to the merge sort. I am not certain that the vast difference in performance results isn't due to some bug I have in the merge sort code. The results of both algorithms are correct but the average response time for the quick sort algorithm is .0309 seconds (including outliers) compared to 19.85 seconds for merge sort (also including outliers). See the details below:

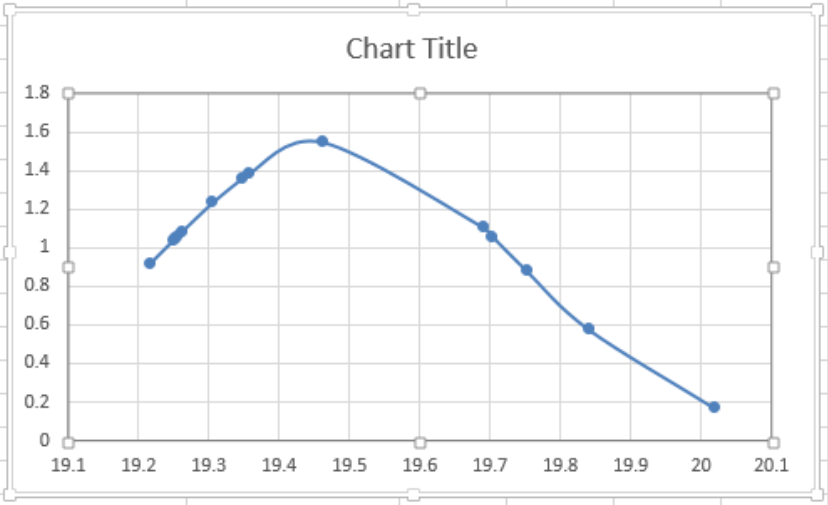
Merge Sort:

Mergesort			
50k Words	Distribution	Average	Std. Dev.
19.2159	0.349921358	19.85228824	0.875290551
19.2492	0.359475263		
19.2502	0.359758113		
19.2534	0.360661566		
19.2602	0.362572852		
19.3048	0.374801031		
19.3469	0.385801791		
19.3555	0.387977969		
19.461	0.412441591		
19.6891	0.447929743		
19.7021	0.449122255		
19.7506	0.452717196		
19.8391	0.455730955		
20.0174	0.447745176		
20.9006	0.222473047		
21.5778	0.065293226		
22.3151	0.008701893		



In this graph you can see there is almost a resemblance of a bell curve. If you remove the outliers from the graph it turns into this:

Mergesort			
50k Words	Distribution	Average	Std. Dev.
19.2159	0.921929505	19.47824286	0.256868632
19.2492	1.043636727		
19.2502	1.047257883		
19.2534	1.058822387		
19.2602	1.083264382		
19.3048	1.236507504		
19.3469	1.362779429		
19.3555	1.385533168		
19.461	1.549603243		
19.6891	1.108861413		
19.7021	1.062377112		
19.7506	0.885269343		
19.8391	0.578958889		
20.0174	0.171603981		
20.9006	3.41281E-07		
21.5778	4.8291E-15		
22.3151	5.07884E-27		

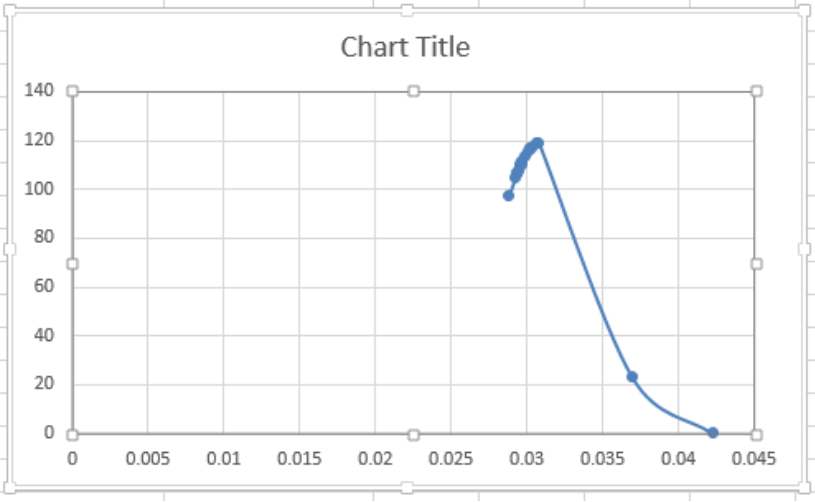


This looks a little better.

Quick Sort:

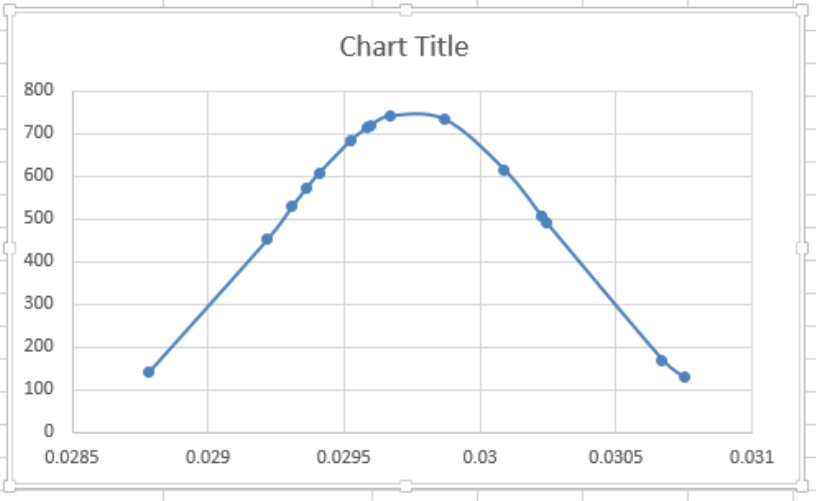
The initial graph for this algorithm is also skewed by outliers:

Quicksort			
50k Words	Distribution	Average	Std. Dev.
0.0287828	97.44555002	0.030912465	0.003341519
0.0292163	104.9580692		
0.0293084	106.3964063		
0.0293593	107.1648227		
0.0294069	107.8657919		
0.0295254	109.5342465		
0.029583	110.304425		
0.0295959	110.4731547		
0.0296666	111.3730107		
0.0298679	113.6963563		
0.030089	115.818738		
0.0302232	116.8764082		
0.0302428	117.0158911		
0.0306693	119.0738034		
0.0307522	119.2522654		
0.0369606	23.20455996		
0.0422623	0.373033418		



Once they are removed it looks like this:

Quicksort			
50k Words	Distribution	Average	Std. Dev.
0.0287828	142.1445595	0.0297526	0.000531647
0.0292163	451.1509332		
0.0293084	529.2961217		
0.0293593	570.7535354		
0.0294069	607.3977485		
0.0295254	684.9032208		
0.029583	713.1621382		
0.0295959	718.4922463		
0.0296666	740.6355404		
0.0298679	732.9482138		
0.030089	614.2520979		
0.0302232	507.1596769		
0.0302428	490.5430406		
0.0306693	169.7028412		
0.0307522	128.127572		
0.0369606	9.12462E-38		
0.0422623	4.4517E-118		



Analysis:

Both of these algorithms are supposed to be O(nlogn) but my results show that quick sort is much faster than merge sort. Even in the worst case, quick sort it 461 times faster than merge sort.