BLG381E

Advanced Data Structures

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Report of Project 1

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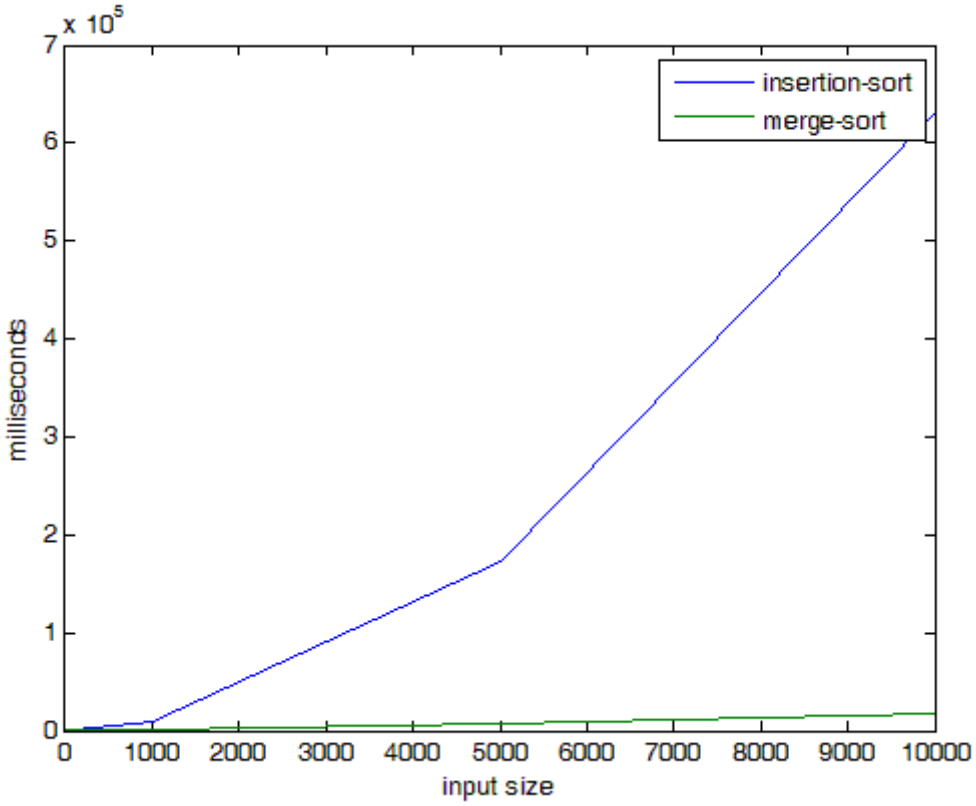
Analysis of sorting algorithms

It is known that the insertion-sort algorithm has a complexity of $O(n^2)$ while the merge-sort algorithm has $O(n\lg n)$. During the execution of the program that is written for the homework, the average time needed for an algorithm to execute - which is represented with big-oh notation - is computed. Below is the table that consists running times of the algorithms and the input size.

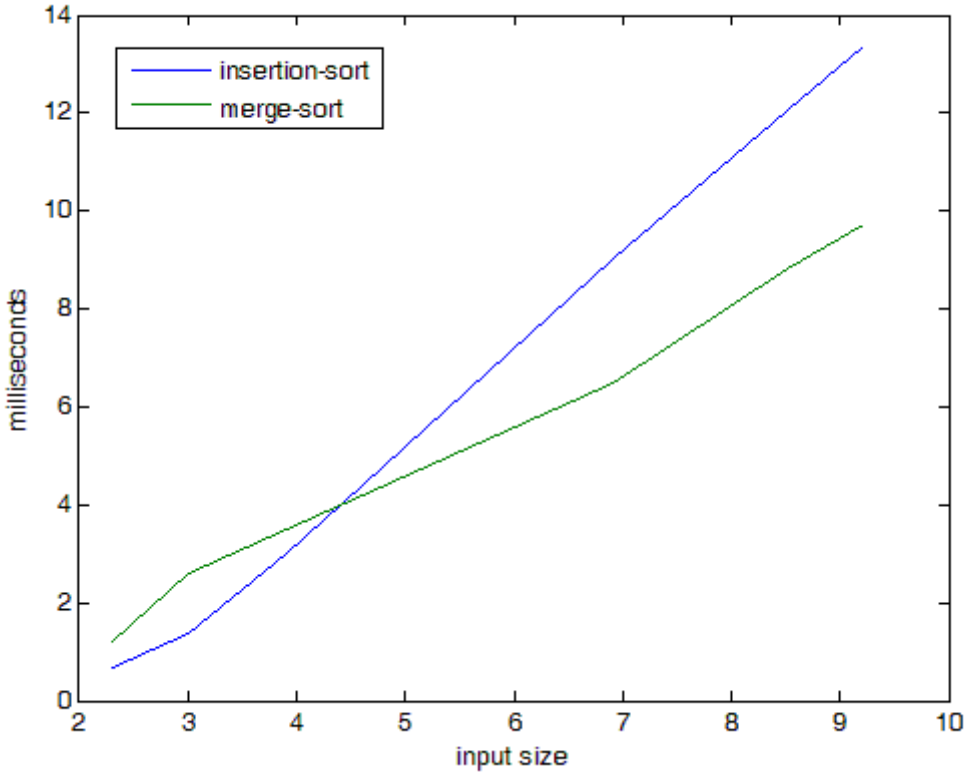
Input Size	10	20	50	100	1000	5000	10000
Insertioin Sort	2 ms	4 ms	20 ms	80 ms	8200 ms	172000 ms	632000 ms
Merge Sort	3.33 ms	13.33 ms	33.3 ms	66.67 ms	666.6 ms	6666.7ms	16666.6 ms

To visualize the table, the graphs which are plotted using MATLAB are given below:



In this figure, its impossible to clearly see the results and compare the graphs for smaller inputs.

That is why the logarithm graph is given below:



Now we can clearly see how functions grow.

Since this graph values are generated through a program without a perfect, ideal running-time-computing-algorithm in addition to the values being mean values and having a standard deviation, the graph may not look like the theoretical comparison of sorting algorithms. Even though, the above data is not completely invalid. When we compare the two algorithms, it is clear that after one point, merge sort algorithm takes the advantage which is what the complexity analyses of those algorithms imply.