Lab 2 Report

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1 Selection Sort

The selection sort will run 2 nested for loops which should give the result of $O(n^2)$ for all cases as there is no check to see if the list is sorted before the algorithm is complete.

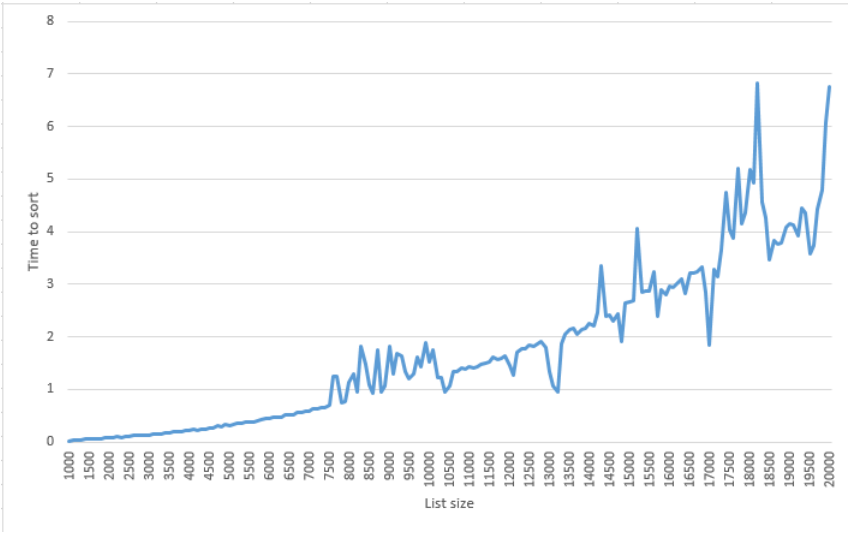

Figure 1: Selection sort best case

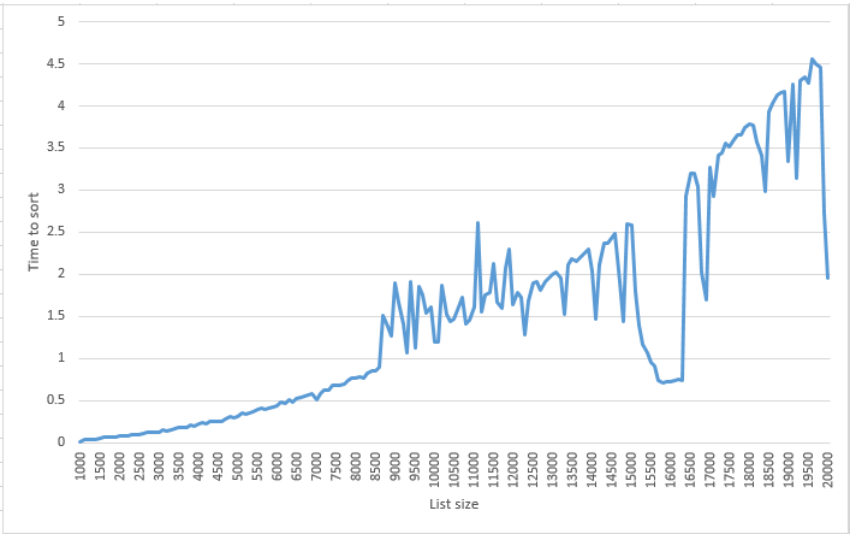

Figure 2: Selection sort worst case

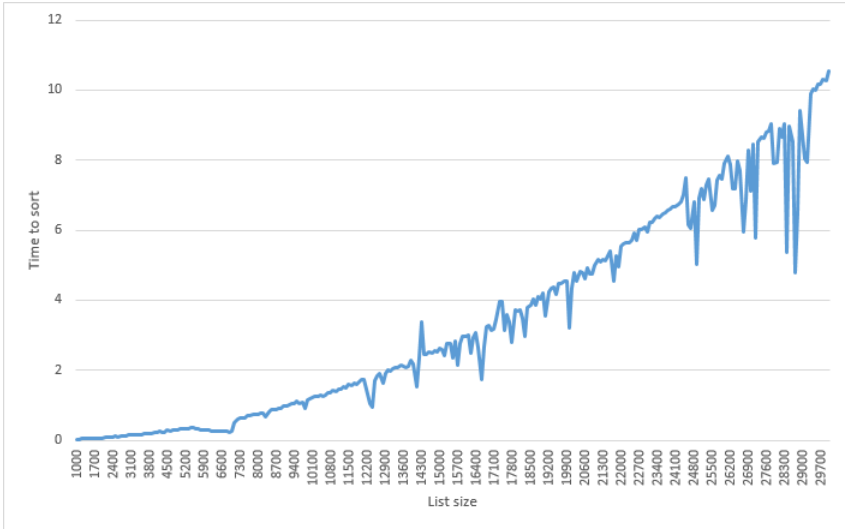

Figure 3: Selection sort average case

It is clear from the above graphs that selection sort is always $O(n^2)$ with best case having better constants than the worst case.

2 Bubble Sort

The bubble sort will also have 2 nested for loops which will always result in $O(n^2)$ as there is no check to see if the list is sorted before the algorithm is complete.

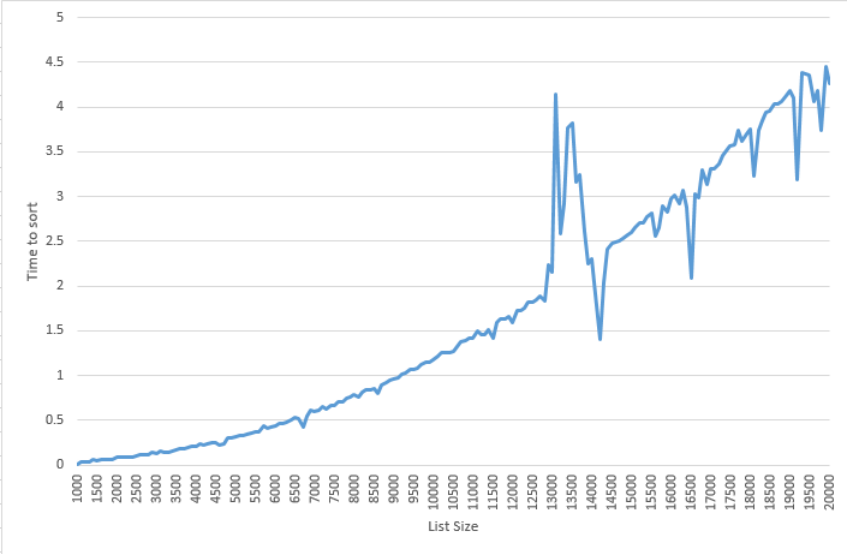

Figure 4: Bubble sort best case

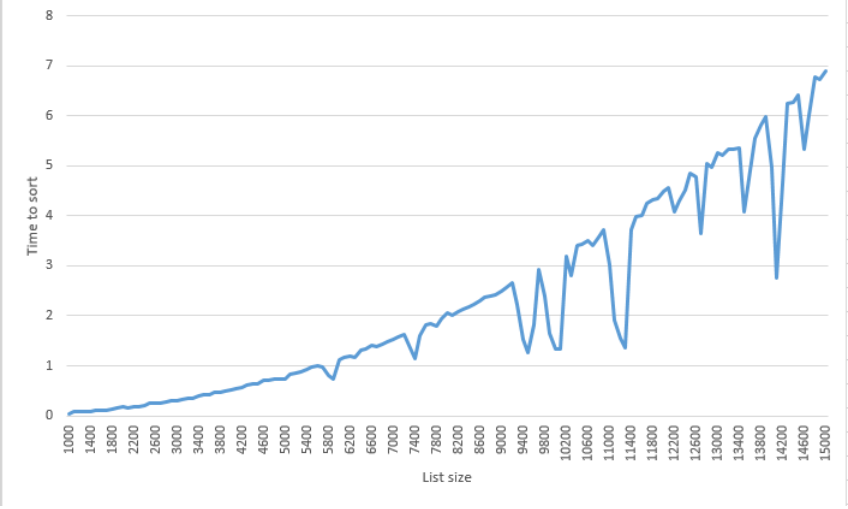

Figure 5: Bubble sort worst case

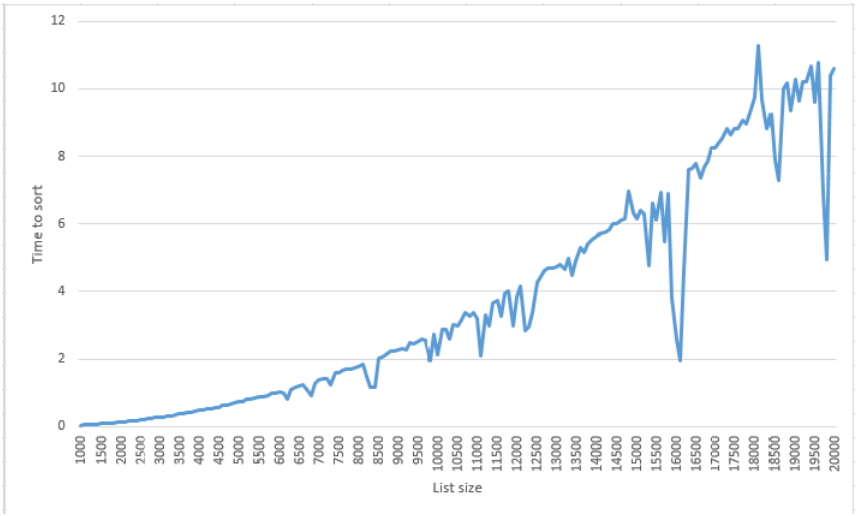

Figure 6: Bubble sort average case

It is clear from the above graphs that bubble sort is always $O(n^2)$.

3 Improved Bubble Sort

The improved bubble sort is the same as the regular bubble sort but it has a flag to check whether the list is sorted already before doing another iteration. The worst and average cases are still $O(n^2)$ but for the best case, a list in ascending order, the improved bubble sort will be $O(n)$. This is because it runs through all the values in the list once and if no swaps have been made then it knows the list is sorted.

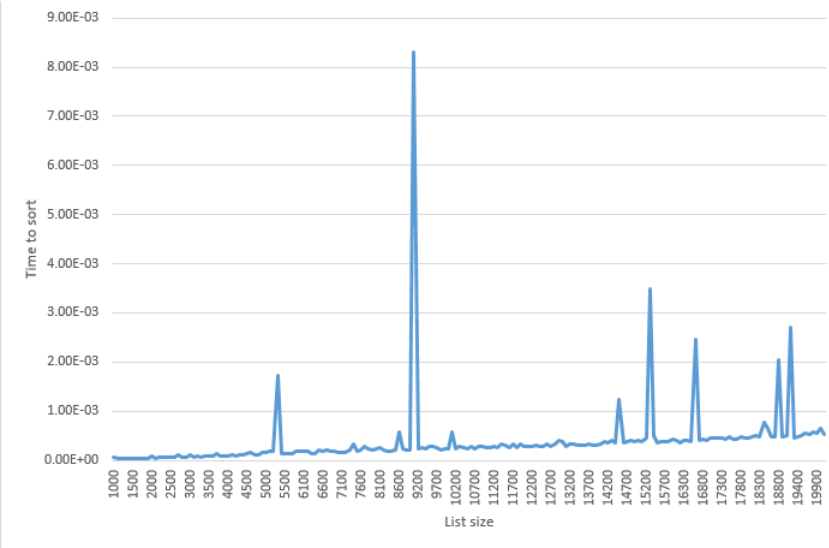

Figure 7: Improved bubble sort best case

It is clear from the graph that the improved bubble sort is $O(n)$ in the best case.