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CSE 13s

Writeup

The worst case and average time complexity for bubble sort is O(n^2), the time complexity of shell sort depends on the gap sequence but is generally around O(nlog2n), and the time complexity of quick sort is O(nlogn) during best cast and O(n^2) during worst case.

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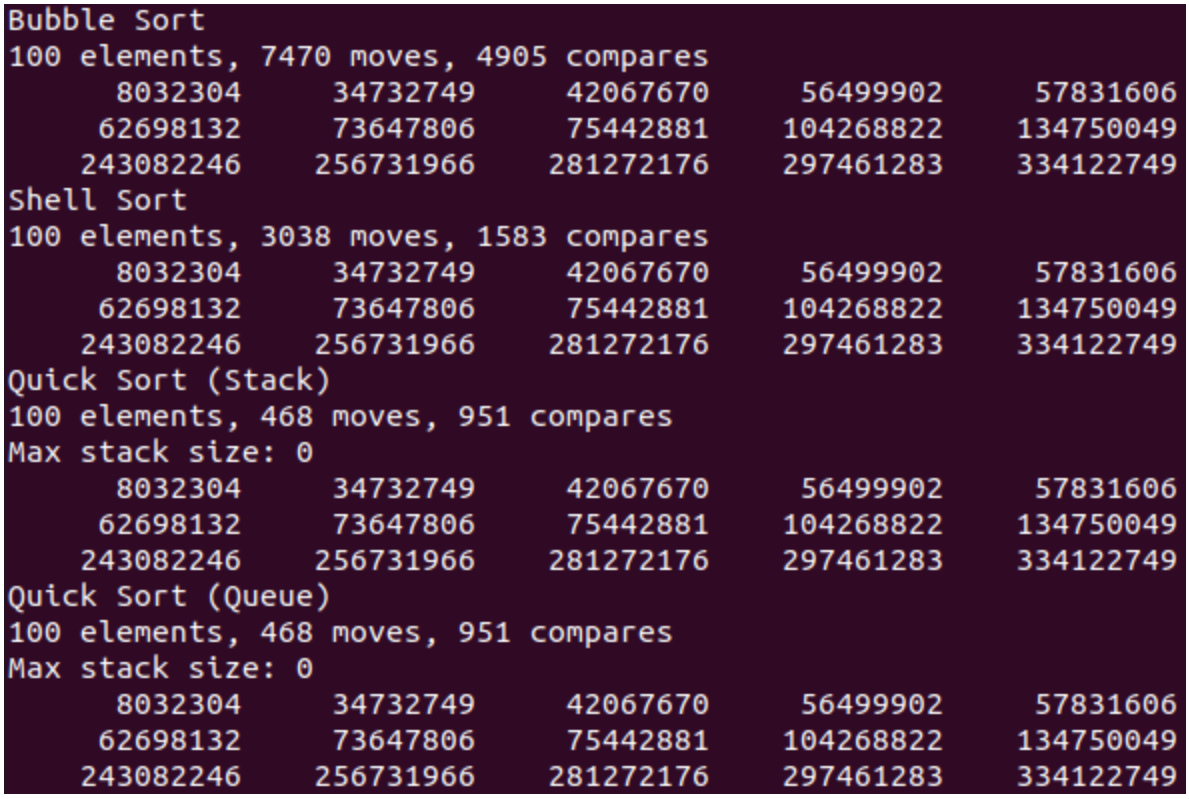
Bubble Sort
15 elements, 138 moves, 90 compares
     34732749     42067670    104268822    134750049    989854347
   1128740088   1176217884   1256702424   1611961436   1703689917
   1857327504   2028658157   2040620901   2068323909   2146508390
Shell Sort
15 elements, 162 moves, 82 compares
     34732749     42067670    104268822    134750049    989854347
   1128740088   1176217884   1256702424   1611961436   1703689917
   1857327504   2028658157   2040620901   2068323909   2146508390
Quick Sort (Stack)
15 elements, 42 moves, 113 compares
Max stack size: 0
     34732749     42067670    104268822    134750049    989854347
   1128740088   1176217884   1256702424   1611961436   1703689917
   1857327504   2028658157   2040620901   2068323909   2146508390
Quick Sort (Queue)
15 elements, 42 moves, 113 compares
Max stack size: 0
     34732749     42067670    104268822    134750049    989854347
   1128740088   1176217884   1256702424   1611961436   1703689917
   1857327504   2028658157   2040620901   2068323909   2146508390
```

This is somewhat reflected in this image because the quick sorts have a lot fewer moves than shell and bubble which makes sense because its best case time complexity is better as well although there are more comparisons.



If we increase the amount of elements in the array as shown in the image above the quick sort makes drastically fewer moves and comparisons to the bubble and shell sort which shows how the algorithm affects the time complexity. This also shows how if you have an array with not many elements it could be just as fast to use shell or bubble sort, but if you have a large array then quick sort is more efficient in terms of moves and comparisons. Regrettably this program was started very last minute and it is reflected in the quality of this writeup which is being submitted mere minutes before the deadline, lesson learned.