|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sort: | Insertion | Selection | HeapSort | MergeSort | QuickSort | BucketSort |
| 100 | 0 | 0 | .333 | 0 | 0 | .667 |
| 1000 | 2.333 | 2.667 | .333 | 0 | .333 | 1.333 |
| 10000 | 14.333 | 34.333 | 1.333 | 1.333 | .667 | 3.333 |
| 100000 | 1243 | 3418 | 12.667 | 15.333 | 8 | 21 |
| Worst-case | O(n2) | O(n2) | O(n logn) | O(n logn) | O(n2) | O(n2) |
| Avg-case | O(n2) | O(n2) | O(n logn) | O(n logn) | O(n logn) | O(n+k) |
| Best-case | O(n) | O(n2) | O(n logn) | O(n logn) | O(n logn) | O(n+k) |
| Stable | Yes | No | No | Yes | No | Yes |

Overall on all types of data set quicksort is consistently one of the fastest in the small data sets, and the fastest in large sets. The swapping and comparison based algorithms are very slow when it comes to larger data sets. The divide and conquer methods reign supreme in the larger sets. I expected bucket sort to be faster in the larger data sets, so I was surprised to see that it was slightly slower than mergesort.

Results:

\_\_\_\_\_\_\_\_\_\_\_\_INPUT 100\_\_\_\_\_\_\_\_\_\_\_\_\_

InsertionSort mean runtime over 3 runs is 0.0

SelectionSort mean runtime over 3 runs is 0.0

HeapSort mean runtime over 3 runs is 0.3333333333333333

MergeSort mean runtime over 3 runs is 0.0

QuickSort mean runtime over 3 runs is 0.0

BucketSort mean runtime over 3 runs is 0.6666666666666666

\_\_\_\_\_\_\_\_\_\_\_\_\_INPUT 1000\_\_\_\_\_\_\_\_\_\_\_\_\_

InsertionSort mean runtime over 3 runs is 2.3333333333333335

SelectionSort mean runtime over 3 runs is 2.6666666666666665

HeapSort mean runtime over 3 runs is 0.3333333333333333

MergeSort mean runtime over 3 runs is 0.0

QuickSort mean runtime over 3 runs is 0.3333333333333333

BucketSort mean runtime over 3 runs is 1.3333333333333333

\_\_\_\_\_\_\_\_\_\_\_\_\_INPUT 10000\_\_\_\_\_\_\_\_\_\_\_\_\_

InsertionSort mean runtime over 3 runs is 14.333333333333334

SelectionSort mean runtime over 3 runs is 34.333333333333336

HeapSort mean runtime over 3 runs is 1.3333333333333333

MergeSort mean runtime over 3 runs is 1.3333333333333333

QuickSort mean runtime over 3 runs is 0.6666666666666666

BucketSort mean runtime over 3 runs is 3.3333333333333335

\_\_\_\_\_\_\_\_\_\_\_\_\_INPUT 100000\_\_\_\_\_\_\_\_\_\_\_\_\_

InsertionSort mean runtime over 3 runs is 1243.0

SelectionSort mean runtime over 3 runs is 3418.0

HeapSort mean runtime over 3 runs is 12.666666666666666

MergeSort mean runtime over 3 runs is 15.333333333333334

QuickSort mean runtime over 3 runs is 8.0

BucketSort mean runtime over 3 runs is 21.0