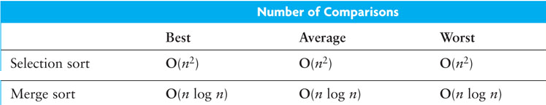
**Mergesort versus Selection sort**

  
For the data of all trials see the end of the report.

For my sorting analysis I used mergesort and selection sort. Mergesort is theoretically log-linear, while selection sort is a quadratic sorting algorithm. Mergesort ran so quickly on my computer that using System.currentTimeMillis() would reach results of 0ms on several sorts, so I did 10 runs for each file using System.nanoTime(). As seen below in my trials table, mergesort vastly out preforms selection sort in pretty much every case. The size of the data to sort dramatically increases the time it takes to sort the data for selection sort. Meanwhile, the size of data does affect mergesort, but not as significantly. As expected the order of the data seldomly affects the speed of both sorting methods. The results are slightly different for the different orders but are still within the same order of magnitude as suggested by the fact that these algorithms both just as good as their worst case in all cases.



As can be seen by this graph, the different orders only very so slightly affect the time, while the file size is the main determinant of the runtime. Selection sort is clearly a quadratic algorithm, but with this chart it appears that mergesort is linearly.

By looking at these two figures we can see that mergesort does curve upwards, but not as dramatically as selection sort. This, along with the divide and conquer nature of the code, suggests that the algorithm is log-linear.

In all it is clear that mergesort runs quicker than selection sort.

All of these trials are in nanoseconds. The averages at the top of the report were converted to milliseconds.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mergesort | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 |
| Ascending 5000 | 186252 | 184463 | 184207 | 186507 | 184463 | 186506 | 183697 | 183441 | 559777 | 184719 |
| Ascending 10000 | 378379 | 788439 | 380934 | 388344 | 377613 | 376591 | 379401 | 705405 | 427177 | 376335 |
| Ascending 20000 | 807090 | 807601 | 1190834 | 808367 | 832128 | 1138459 | 803258 | 1166052 | 970092 | 833916 |
| Ascending 50000 | 2482331 | 2429445 | 2389588 | 2390866 | 2334914 | 2358930 | 2328782 | 2412327 | 2384223 | 2423568 |
|  |  |  |  |  |  |  |  |  |  |  |
| Descending 5000 | 1056192 | 184719 | 200559 | 201326 | 229429 | 200048 | 191872 | 667848 | 182674 | 184463 |
| Descending 10000 | 1631297 | 394985 | 412615 | 413892 | 377102 | 376080 | 723290 | 381189 | 379401 | 377357 |
| Descending 20000 | 1659912 | 1427161 | 865342 | 819353 | 1307337 | 1132583 | 1104734 | 1198754 | 820886 | 804279 |
| Descending 50000 | 3553086 | 3071233 | 2636390 | 2981557 | 2506347 | 2392399 | 2573285 | 2696687 | 2371960 | 2325716 |
|  |  |  |  |  |  |  |  |  |  |  |
| Random 5000 | 399074 | 393198 | 392942 | 390132 | 391920 | 393709 | 393709 | 393964 | 390132 | 392687 |
| Random 10000 | 848479 | 855122 | 1279488 | 837748 | 833660 | 834683 | 834938 | 829572 | 1108311 | 832128 |
| Random 20000 | 2206914 | 1782036 | 2087600 | 1781014 | 1779481 | 2069205 | 1779736 | 1810906 | 2139976 | 1786124 |
| Random 50000 | 5223217 | 5124853 | 5144015 | 5137883 | 5156535 | 5356838 | 5104414 | 5042842 | 5097772 | 5086275 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Selection sort | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 |
| Ascending 5000 | 10023855 | 10026921 | 10029731 | 10023344 | 10016701 | 10048382 | 10174338 | 10058091 | 10030242 | 10066266 |
| Ascending 10000 | 41202199 | 40105128 | 39938294 | 40287548 | 41429839 | 40747684 | 39938294 | 40018518 | 39980960 | 39951068 |
| Ascending 20000 | 159342606 | 159146391 | 159886287 | 159655325 | 159186758 | 159268003 | 159226359 | 159040618 | 159183181 | 159142814 |
| Ascending 50000 | 985676520 | 987972856 | 986083770 | 987035212 | 999704144 | 991778875 | 987329279 | 987744194 | 987830293 | 987207666 |
|  |  |  |  |  |  |  |  |  |  |  |
| Descending 5000 | 9271696 | 8686114 | 7806722 | 7775552 | 8037684 | 7774530 | 7786282 | 7777340 | 7907129 | 7826650 |
| Descending 10000 | 35420227 | 34155301 | 31377369 | 31416714 | 32260084 | 31395509 | 31404451 | 31428211 | 31380946 | 31353609 |
| Descending 20000 | 136413747 | 136307464 | 125223840 | 125189350 | 125170188 | 125177853 | 125249900 | 125742994 | 126101190 | 125621381 |
| Descending 50000 | 861244696 | 858921279 | 791243779 | 781519868 | 781602647 | 775949186 | 781489976 | 777502048 | 779235286 | 780917170 |
|  |  |  |  |  |  |  |  |  |  |  |
| Random 5000 | 9938522 | 9973268 | 9957684 | 9953084 | 9987831 | 9948231 | 9925747 | 9975824 | 9946697 | 9958450 |
| Random 10000 | 40522086 | 39276833 | 38999883 | 39065033 | 39010359 | 39270701 | 39175149 | 39138359 | 39056601 | 39148066 |
| Random 20000 | 153209849 | 153271677 | 153766559 | 155972706 | 154848555 | 156279804 | 155108387 | 153164883 | 153262224 | 153350112 |
| Random 50000 | 937118028 | 939072264 | 937589150 | 940614651 | 938377333 | 938921525 | 937494618 | 943169540 | 949317883 | 938401604 |