October 18, 2015

Summary:

Minimal improvement was observed when testing merge sort versus insertion sort with arrays of length 20 through 216. For the majority of the tests ran (in our case we ran about 20 or so tests), merge sort outperformed or performed equally as well as insertion sort for the 2i arrays. In certain test cases, particularly the ones I’ve selected for examples, we see just a slight improvement of 1 millisecond using insertion sort over merge sort for only the particular arrays of length 26 and 27. It is worth noting that these results did not occur very often on my computer, but if we were to run this code on a lower-end computer then we could possibly see more improvement in time on these specific arrays. Most of the time insertion sort and merge sort both took 0 milliseconds to complete, as seen in test case 4, until insertion sort eventually started taking more time to complete on the arrays of length greater than 27.

However since we noticed a slight improvement when we reached a threshold of 2k where k was either 6 or 7, we would choose the array length of 28 as the crossover point to switch from insertion sort to merge sort. This will ensure that our hybrid sort performs insertion sort on all arrays with lengths 20 through 27 and then will switch to merge sort when the array length reaches 28 or more. The improvements come down to a fraction of a millisecond, but they are improvements nonetheless.

Test 1 Example:

Ï«Ï ----jGRASP exec: java SortingTest  
ÏÏ§Ï  
ÏÏ§ÏBasic Sort Test: Sort = MergeSort *(Proof that MergeSort works)*  
ÏÏ§Ï 1 4 2 3 5  
ÏÏ§Ï 1 2 3 4 5  
ÏÏ§ÏSorted?:true  
 §  
ÏÏ§ÏBasic Sort Test: Sort = InsertionSort *(Proof that InsertionSort works)*  
ÏÏ§Ï 1 4 2 3 5  
ÏÏ§Ï 1 2 3 4 5  
ÏÏ§ÏSorted?:true  
ÏÏ§Ï  
ÏÏ§ÏTimed Sort Test: Sort = MergeSort  
ÏÏ§Ï# of values Time(ms) Sorted?  
ÏÏ§Ï 1 0 true  
ÏÏ§Ï 2 0 true  
ÏÏ§Ï 4 0 true  
ÏÏ§Ï 8 0 true  
ÏÏ§Ï 16 0 true  
ÏÏ§Ï 32 0 true  
ÏÏ§Ï 64 1 true  
ÏÏ§Ï 128 0 true  
ÏÏ§Ï 256 0 true  
ÏÏ§Ï 512 1 true  
ÏÏ§Ï 1024 0 true  
ÏÏ§Ï 2048 0 true  
ÏÏ§Ï 4096 0 true  
ÏÏ§Ï 8192 1 true  
ÏÏ§Ï 16384 3 true  
ÏÏ§Ï 32768 10 true  
ÏÏ§Ï 65536 11 true  
ÏÏ§ÏTimed Sort Test: Sort = InsertionSort  
ÏÏ§Ï# of values Time(ms) Sorted?  
ÏÏ§Ï 1 0 true  
ÏÏ§Ï 2 0 true  
ÏÏ§Ï 4 0 true  
ÏÏ§Ï 8 0 true  
ÏÏ§Ï 16 0 true  
ÏÏ§Ï 32 0 true  
ÏÏ§Ï 64 0 true  
ÏÏ§Ï 128 0 true  
ÏÏ§Ï 256 1 true  
ÏÏ§Ï 512 1 true  
ÏÏ§Ï 1024 2 true  
ÏÏ§Ï 2048 7 true  
ÏÏ§Ï 4096 5 true  
ÏÏ§Ï 8192 22 true  
ÏÏ§Ï 16384 87 true  
ÏÏ§Ï 32768 359 true  
ÏÏ§Ï 65536 1400 true  
ÏÏ§Ï  
ÏÏ©Ï ----jGRASP: operation complete.

Test 2 Example:

Ï«Ï ----jGRASP exec: java SortingTest  
ÏÏ§Ï  
ÏÏ§ÏTimed Sort Test: Sort = MergeSort  
ÏÏ§Ï# of values Time(ms) Sorted?  
ÏÏ§Ï 1 0 true  
ÏÏ§Ï 2 0 true  
ÏÏ§Ï 4 0 true  
ÏÏ§Ï 8 0 true  
ÏÏ§Ï 16 0 true  
ÏÏ§Ï 32 0 true  
ÏÏ§Ï 64 1 true  
ÏÏ§Ï 128 1 true  
ÏÏ§Ï 256 0 true  
ÏÏ§Ï 512 0 true  
ÏÏ§Ï 1024 0 true  
ÏÏ§Ï 2048 0 true  
ÏÏ§Ï 4096 0 true  
ÏÏ§Ï 8192 1 true  
ÏÏ§Ï 16384 1 true  
ÏÏ§Ï 32768 13 true  
ÏÏ§Ï 65536 11 true  
ÏÏ§ÏTimed Sort Test: Sort = InsertionSort  
ÏÏ§Ï# of values Time(ms) Sorted?  
ÏÏ§Ï 1 0 true  
ÏÏ§Ï 2 0 true  
ÏÏ§Ï 4 0 true  
ÏÏ§Ï 8 0 true  
ÏÏ§Ï 16 0 true  
ÏÏ§Ï 32 0 true  
ÏÏ§Ï 64 0 true  
ÏÏ§Ï 128 0 true  
ÏÏ§Ï 256 1 true  
ÏÏ§Ï 512 1 true  
ÏÏ§Ï 1024 2 true  
ÏÏ§Ï 2048 9 true  
ÏÏ§Ï 4096 2 true  
ÏÏ§Ï 8192 21 true  
ÏÏ§Ï 16384 85 true  
ÏÏ§Ï 32768 339 true  
ÏÏ§Ï 65536 1429 true  
ÏÏ§Ï  
ÏÏ©Ï ----jGRASP: operation complete.  
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Test 3 Example:

Ï«Ï ----jGRASP exec: java SortingTest  
ÏÏ§Ï  
ÏÏ§ÏTimed Sort Test: Sort = MergeSort  
ÏÏ§Ï# of values Time(ms) Sorted?  
ÏÏ§Ï 1 0 true  
ÏÏ§Ï 2 0 true  
ÏÏ§Ï 4 0 true  
ÏÏ§Ï 8 0 true  
ÏÏ§Ï 16 0 true  
ÏÏ§Ï 32 0 true  
ÏÏ§Ï 64 0 true  
ÏÏ§Ï 128 1 true  
ÏÏ§Ï 256 0 true  
ÏÏ§Ï 512 1 true  
ÏÏ§Ï 1024 0 true  
ÏÏ§Ï 2048 0 true  
ÏÏ§Ï 4096 0 true  
ÏÏ§Ï 8192 1 true  
ÏÏ§Ï 16384 2 true  
ÏÏ§Ï 32768 8 true  
ÏÏ§Ï 65536 11 true  
ÏÏ§ÏTimed Sort Test: Sort = InsertionSort  
ÏÏ§Ï# of values Time(ms) Sorted?  
ÏÏ§Ï 1 0 true  
ÏÏ§Ï 2 0 true  
ÏÏ§Ï 4 0 true  
ÏÏ§Ï 8 0 true  
ÏÏ§Ï 16 0 true  
ÏÏ§Ï 32 0 true  
ÏÏ§Ï 64 0 true  
ÏÏ§Ï 128 0 true  
ÏÏ§Ï 256 1 true  
ÏÏ§Ï 512 1 true  
ÏÏ§Ï 1024 2 true  
ÏÏ§Ï 2048 1 true  
ÏÏ§Ï 4096 2 true  
ÏÏ§Ï 8192 22 true  
ÏÏ§Ï 16384 82 true  
ÏÏ§Ï 32768 354 true  
ÏÏ§Ï 65536 1332 true  
ÏÏ§Ï  
ÏÏ©Ï ----jGRASP: operation complete.  
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Ï Test 4 Example (No improvements observed):

Ï«Ï ----jGRASP exec: java SortingTest  
ÏÏ§Ï  
ÏÏ§ÏTimed Sort Test: Sort = MergeSort  
ÏÏ§Ï# of values Time(ms) Sorted?  
ÏÏ§Ï 1 0 true  
ÏÏ§Ï 2 0 true  
ÏÏ§Ï 4 0 true  
ÏÏ§Ï 8 0 true  
ÏÏ§Ï 16 0 true  
ÏÏ§Ï 32 0 true  
ÏÏ§Ï 64 0 true  
ÏÏ§Ï 128 0 true  
ÏÏ§Ï 256 0 true  
ÏÏ§Ï 512 0 true  
ÏÏ§Ï 1024 0 true  
ÏÏ§Ï 2048 0 true  
ÏÏ§Ï 4096 1 true  
ÏÏ§Ï 8192 1 true  
ÏÏ§Ï 16384 3 true  
ÏÏ§Ï 32768 9 true  
ÏÏ§Ï 65536 16 true  
ÏÏ§ÏTimed Sort Test: Sort = InsertionSort  
ÏÏ§Ï# of values Time(ms) Sorted?  
ÏÏ§Ï 1 0 true  
ÏÏ§Ï 2 0 true  
ÏÏ§Ï 4 0 true  
ÏÏ§Ï 8 0 true  
ÏÏ§Ï 16 0 true  
ÏÏ§Ï 32 0 true  
ÏÏ§Ï 64 0 true  
ÏÏ§Ï 128 0 true  
ÏÏ§Ï 256 1 true  
ÏÏ§Ï 512 2 true  
ÏÏ§Ï 1024 2 true  
ÏÏ§Ï 2048 5 true  
ÏÏ§Ï 4096 6 true  
ÏÏ§Ï 8192 24 true  
ÏÏ§Ï 16384 94 true  
ÏÏ§Ï 32768 377 true  
ÏÏ§Ï 65536 1500 true  
ÏÏ§Ï  
ÏÏ©Ï ----jGRASP: operation complete.