Program Structures and Algorithms

Spring 2023(SEC –01)

Assignment-6

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Problem Statement

In this assignment, your task is to determine--for sorting algorithms--what is the best predictor of total execution time: comparisons, swaps/copies, hits (array accesses), or something else.

You will run the benchmarks for merge sort, (dual-pivot) quick sort, and heap sort. You will sort randomly generated arrays of between 10,000 and 256,000 elements (doubling the size each time). If you use the *SortBenchmark*, as I expect, the number of runs is chosen for you. So, you can ignore the instructions about setting the number of runs.

For each experiment (a sort method of a given size), you will run it twice: once for the instrumentation, and once (without instrumentation) for the timing.

Of course, you will be using the *Benchmark* and/or *Timer* classes, as you did in a previous assignment.

You must support your (clearly stated) conclusions with evidence from the benchmarks (you should provide log/log charts and spreadsheets typically).

Conclusion

In the case of the Dual Pivot Quick Sort algorithm, the number of comparisons made during the sorting process is the most critical factor affecting its runtime. While other metrics such as swaps, hits, and copies also play a role, their impact is not as significant as the number of comparisons. This means that reducing the number of comparisons can greatly improve the algorithm's efficiency.

As for the Merge Sort algorithm, its runtime is impacted by the number of temporary arrays required, which increases with the input size. This results in a rise in the number of copies and hits. Therefore, the number of copies and hits can be considered reliable predictors of the Merge Sort algorithm's runtime. To optimize the algorithm's efficiency, minimizing the number of temporary arrays and copies is crucial.

For the Heap Sort algorithm, the number of comparisons made during the sorting process is the most crucial factor impacting its runtime. While other metrics such as swaps, hits, and copies also increase slightly with the input size, their impact on the overall execution time is not as significant as the number of comparisons. Therefore, to improve the efficiency of the Heap Sort algorithm, reducing the number of comparisons is essential. The normalized time, which measures the total execution time, can also be used as a reliable metric to forecast the algorithm's performance.

Output

Merge Sort

Values	RawTime	NormalizedTime	Compares	Swaps	Hits
15k	4.3	3.86	1.33	0.12	2.87
30k	8.3	3.43	1.36	0.12	2.87
60k	17.84	3.39	1.365	0.112	2.875
120k	37.89	3.41	1.355	0.106	2.877
240k	84.64	3.58	1.36	0.1	2.877
480k	174.92	3.48	1.364	0.094	2.878

Quick Sort

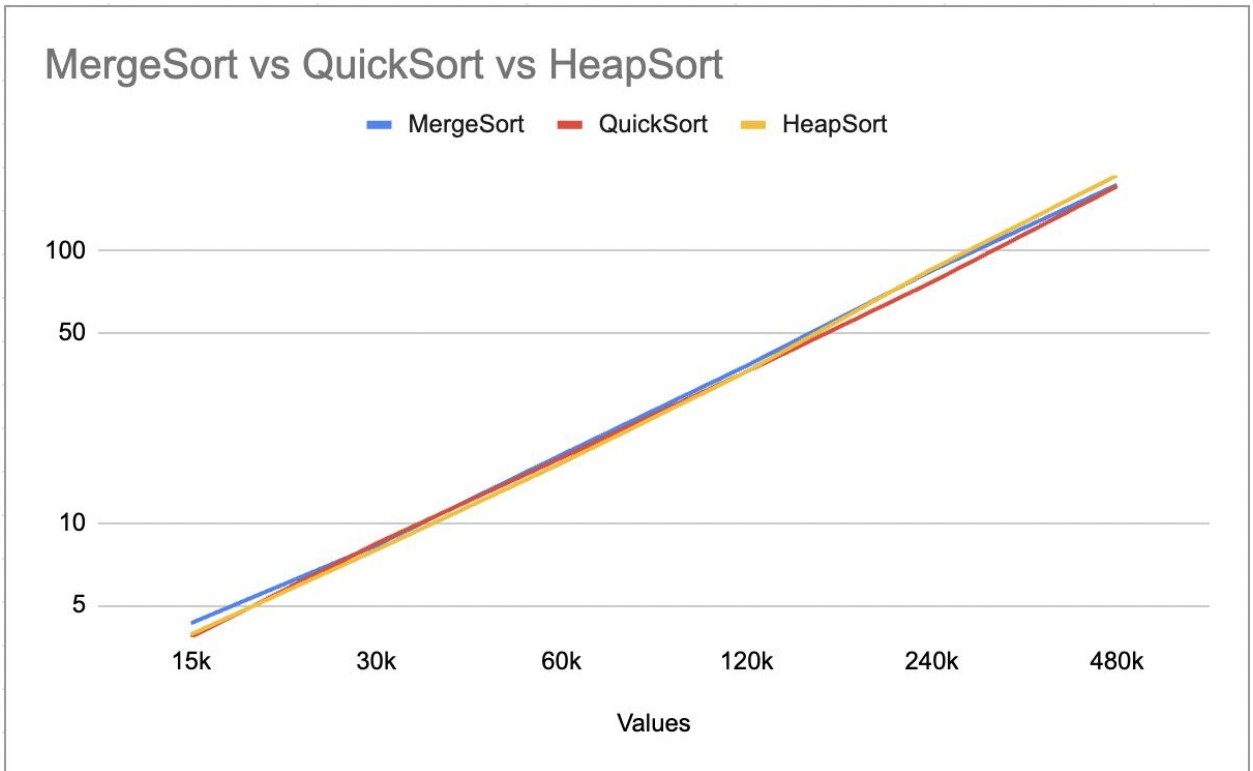
Values	RawTime	NormalizedTime	Compares	Swaps	Hits
15k	3.82	3.42	1.354	0.128	1.181
30k	8.43	3.49	1.36	0.12	1.198
60k	17.39	3.35	1.365	0.112	2.908
120k	36.04	3.24	1.752	0.726	4.617

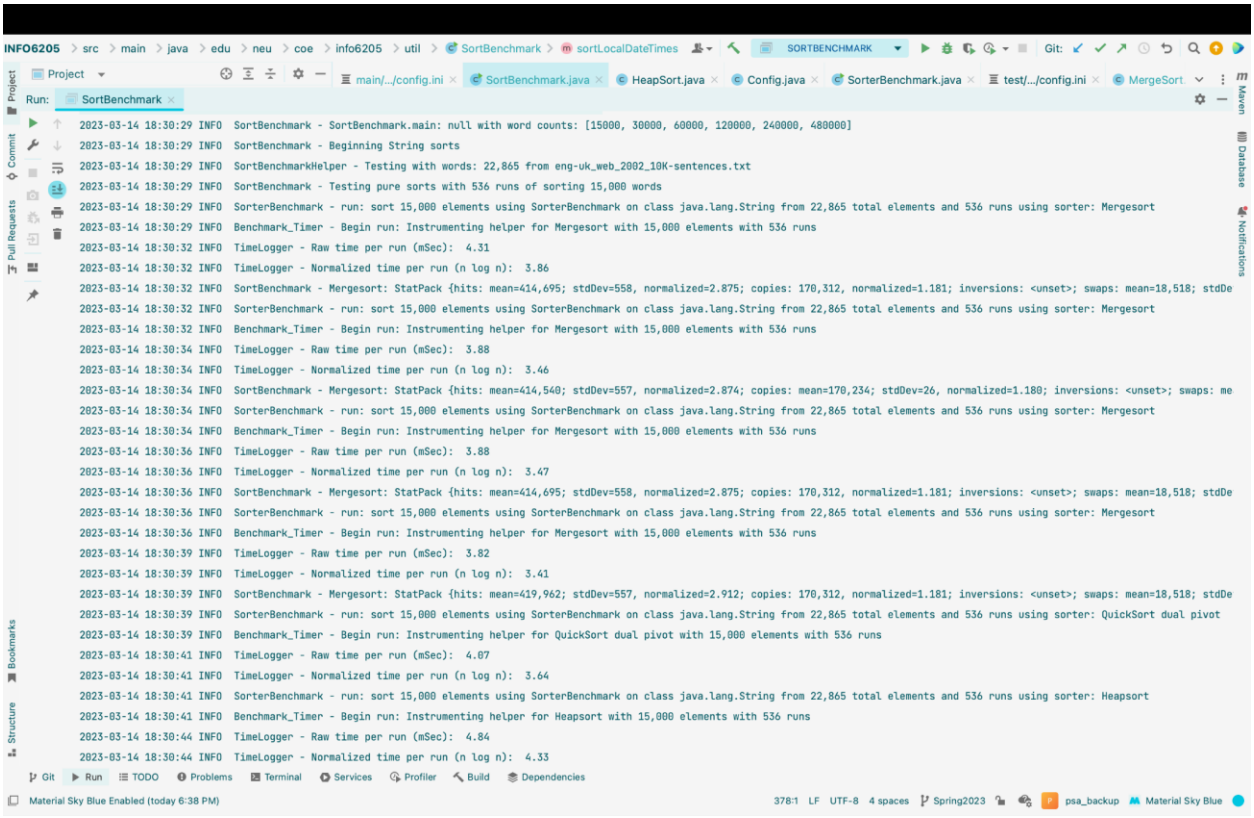
240k	76.8	3.25	1.764	0.727	4.634
480k	172.58	3.44	1.795	0.729	4.683

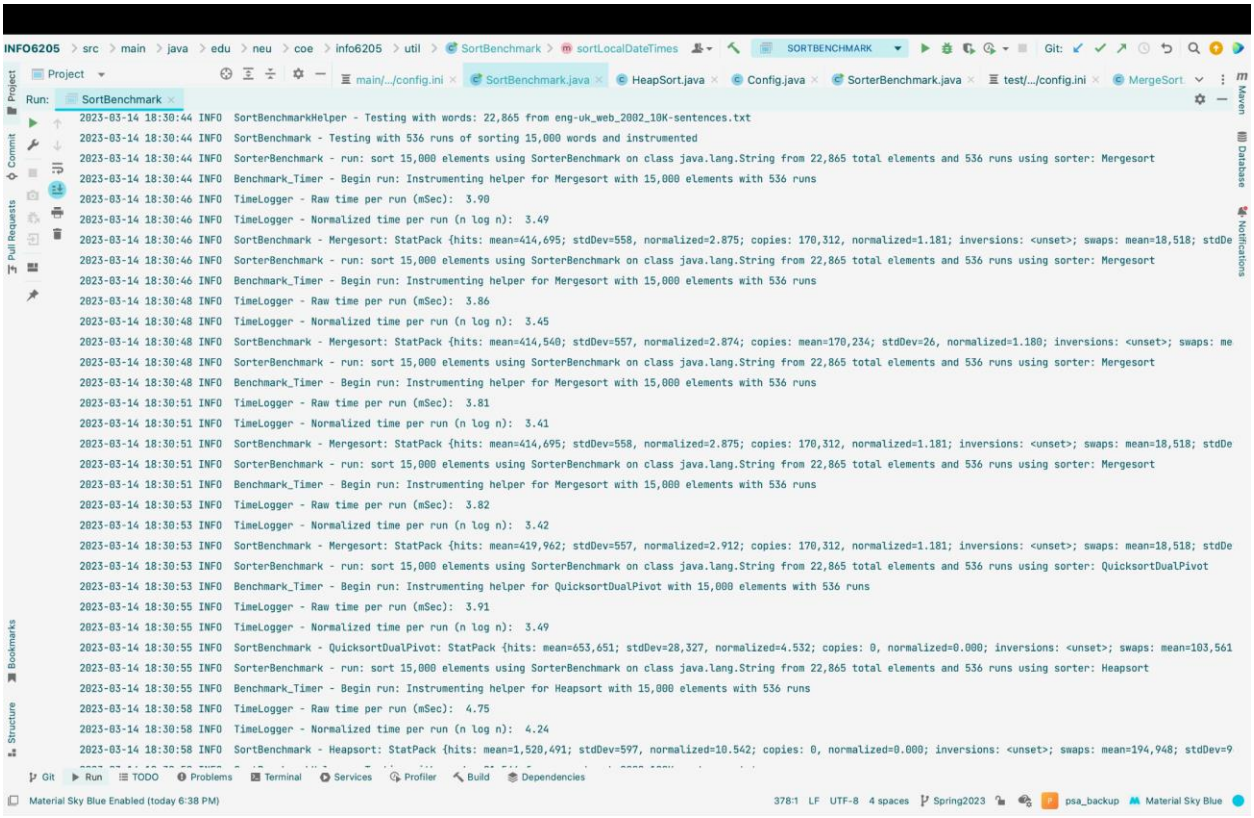
Heap Sort

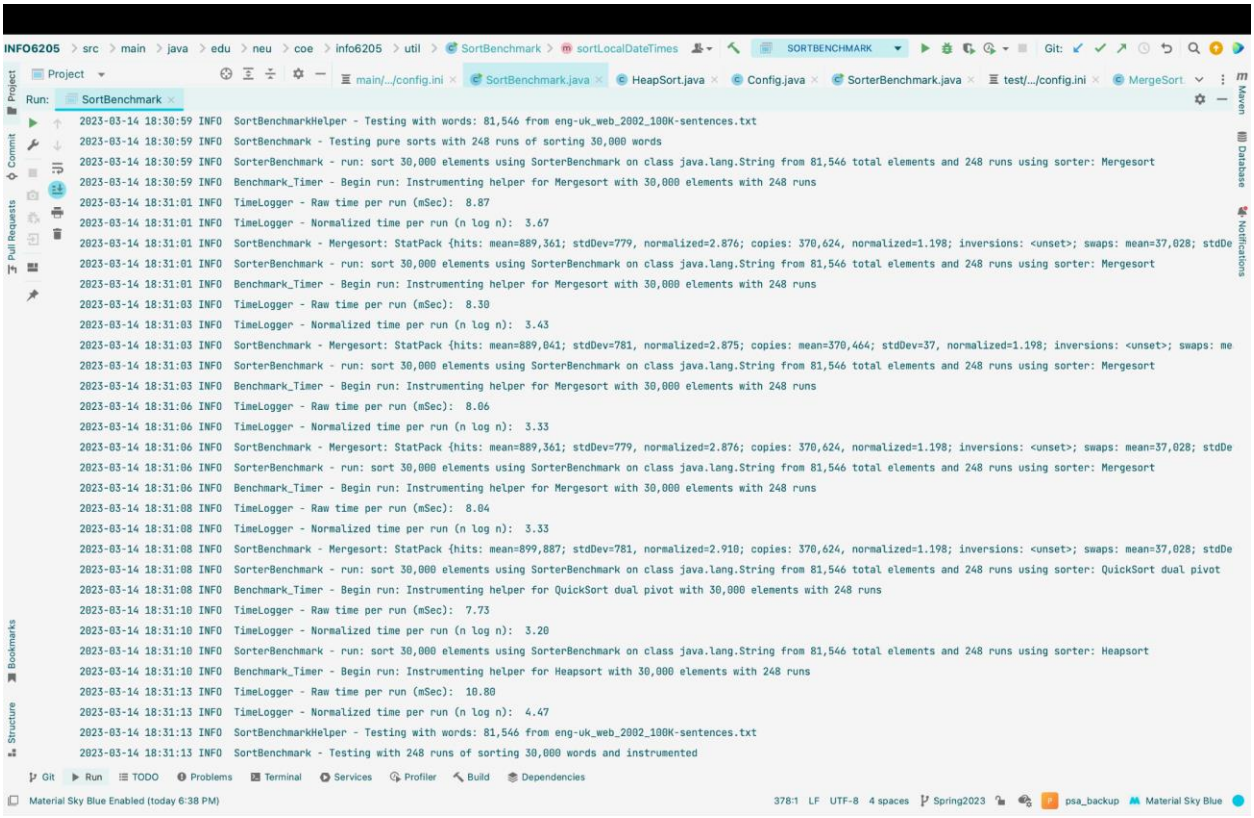
Values	RawTime	NormalizedTime	Compares	Swaps	Hits
15k	3.91	3.49	1.707	0.718	4.532
30k	7.99	3.3	1.721	0.731	4.599
60k	16.63	3.2	0.726	1.734	4.595
120k	36.04	3.24	0.726	1.752	4.617
240k	76.8	3.25	1.764	0.727	4.634
480k	172.58	3.44	1.795	0.729	4.683

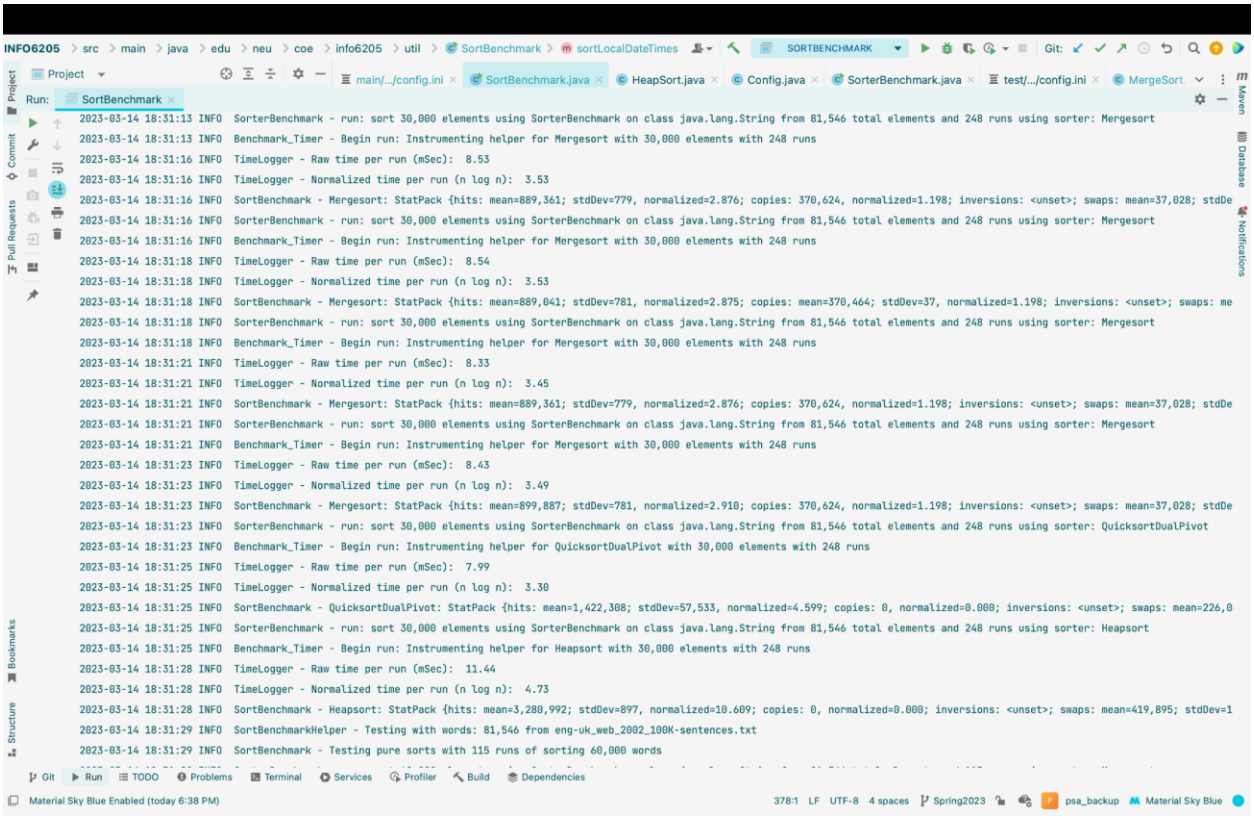
Values	MergeSort	QuickSort	HeapSort
15k	4.3	3.82	3.91
30k	8.3	8.43	7.99
60k	17.84	17.39	16.63
120k	37.89	36.04	36.04
240k	84.64	76.8	85.8
480k	174.92	172.58	189.58




INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
Run: SortBenchmark
2023-03-14 18:30:29 INFO SortBenchmark - SortBenchmark.main: null with word counts: [15000, 30000, 60000, 120000, 240000, 480000]
2023-03-14 18:30:29 INFO SortBenchmark - Beginning String sorts
2023-03-14 18:30:29 INFO SortBenchmarkHelper - Testing with words: 22,865 from eng-uk_web_2002_10K-sentences.txt
2023-03-14 18:30:29 INFO SortBenchmark - Testing pure sorts with 536 runs of sorting 15,000 words
2023-03-14 18:30:29 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: Mergesort
2023-03-14 18:30:29 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 15,000 elements with 536 runs
2023-03-14 18:30:32 INFO TimeLogger - Raw time per run (mSec): 4.31
2023-03-14 18:30:32 INFO TimeLogger - Normalized time per run (n log n): 3.86
2023-03-14 18:30:32 INFO SortBenchmark - Mergesort: StatPack {hits: mean=414,695; stdDev=558, normalized=2.875; copies: 170,312, normalized=1.181; inversions: <unset>; swaps: mean=18,518; stdDe
2023-03-14 18:30:32 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: Mergesort
2023-03-14 18:30:32 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 15,000 elements with 536 runs
2023-03-14 18:30:34 INFO TimeLogger - Raw time per run (mSec): 3.88
2023-03-14 18:30:34 INFO TimeLogger - Normalized time per run (n log n): 3.46
2023-03-14 18:30:34 INFO SortBenchmark - Mergesort: StatPack {hits: mean=414,540; stdDev=557, normalized=2.874; copies: mean=170,234; stdDev=26, normalized=1.180; inversions: <unset>; swaps: me
2023-03-14 18:30:34 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: Mergesort
2023-03-14 18:30:34 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 15,000 elements with 536 runs
2023-03-14 18:30:36 INFO TimeLogger - Raw time per run (mSec): 3.88
2023-03-14 18:30:36 INFO TimeLogger - Normalized time per run (n log n): 3.47
2023-03-14 18:30:36 INFO SortBenchmark - Mergesort: StatPack {hits: mean=414,695; stdDev=558, normalized=2.875; copies: 170,312, normalized=1.181; inversions: <unset>; swaps: mean=18,518; stdDe
2023-03-14 18:30:36 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: Mergesort
2023-03-14 18:30:36 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 15,000 elements with 536 runs
2023-03-14 18:30:39 INFO TimeLogger - Raw time per run (mSec): 3.82
2023-03-14 18:30:39 INFO TimeLogger - Normalized time per run (n log n): 3.41
2023-03-14 18:30:39 INFO SortBenchmark - Mergesort: StatPack {hits: mean=419,962; stdDev=557, normalized=2.912; copies: 170,312, normalized=1.181; inversions: <unset>; swaps: mean=18,518; stdDe
2023-03-14 18:30:39 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: QuickSort dual pivot
2023-03-14 18:30:39 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuickSort dual pivot with 15,000 elements with 536 runs
2023-03-14 18:30:41 INFO TimeLogger - Raw time per run (mSec): 4.07
2023-03-14 18:30:41 INFO TimeLogger - Normalized time per run (n log n): 3.64
2023-03-14 18:30:41 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: Heapsort
2023-03-14 18:30:41 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 15,000 elements with 536 runs
2023-03-14 18:30:44 INFO TimeLogger - Raw time per run (mSec): 4.84
2023-03-14 18:30:44 INFO TimeLogger - Normalized time per run (n log n): 4.33
Git
Run
TODO
Problems
Terminal
Services
Profiler
Build
Dependencies
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023
psa_backup
Material Sky Blue
Project
Commit
Pull Requests
Bookmarks
Structure
Maven
Database
Notifications


INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
Run: SortBenchmark
2023-03-14 18:30:44 INFO SortBenchmarkHelper - Testing with words: 22,865 from eng-uk_web_2002_10K-sentences.txt
2023-03-14 18:30:44 INFO SortBenchmark - Testing with 536 runs of sorting 15,000 words and instrumented
2023-03-14 18:30:44 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: Mergesort
2023-03-14 18:30:44 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 15,000 elements with 536 runs
2023-03-14 18:30:46 INFO TimeLogger - Raw time per run (mSec): 3.90
2023-03-14 18:30:46 INFO TimeLogger - Normalized time per run (n log n): 3.49
2023-03-14 18:30:46 INFO SortBenchmark - Mergesort: StatPack {hits: mean=414,695; stdDev=558, normalized=2.875; copies: 170,312, normalized=1.181; inversions: <unset>; swaps: mean=18,518; stdDe
2023-03-14 18:30:46 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: Mergesort
2023-03-14 18:30:46 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 15,000 elements with 536 runs
2023-03-14 18:30:48 INFO TimeLogger - Raw time per run (mSec): 3.86
2023-03-14 18:30:48 INFO TimeLogger - Normalized time per run (n log n): 3.45
2023-03-14 18:30:48 INFO SortBenchmark - Mergesort: StatPack {hits: mean=414,540; stdDev=557, normalized=2.874; copies: mean=170,234; stdDev=26, normalized=1.180; inversions: <unset>; swaps: me
2023-03-14 18:30:48 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: Mergesort
2023-03-14 18:30:48 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 15,000 elements with 536 runs
2023-03-14 18:30:51 INFO TimeLogger - Raw time per run (mSec): 3.81
2023-03-14 18:30:51 INFO TimeLogger - Normalized time per run (n log n): 3.41
2023-03-14 18:30:51 INFO SortBenchmark - Mergesort: StatPack {hits: mean=414,695; stdDev=558, normalized=2.875; copies: 170,312, normalized=1.181; inversions: <unset>; swaps: mean=18,518; stdDe
2023-03-14 18:30:51 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: Mergesort
2023-03-14 18:30:51 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 15,000 elements with 536 runs
2023-03-14 18:30:53 INFO TimeLogger - Raw time per run (mSec): 3.82
2023-03-14 18:30:53 INFO TimeLogger - Normalized time per run (n log n): 3.42
2023-03-14 18:30:53 INFO SortBenchmark - Mergesort: StatPack {hits: mean=419,962; stdDev=557, normalized=2.912; copies: 170,312, normalized=1.181; inversions: <unset>; swaps: mean=18,518; stdDe
2023-03-14 18:30:53 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: QuicksortDualPivot
2023-03-14 18:30:53 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuicksortDualPivot with 15,000 elements with 536 runs
2023-03-14 18:30:55 INFO TimeLogger - Raw time per run (mSec): 3.91
2023-03-14 18:30:55 INFO TimeLogger - Normalized time per run (n log n): 3.49
2023-03-14 18:30:55 INFO SortBenchmark - QuicksortDualPivot: StatPack {hits: mean=653,651; stdDev=28,327, normalized=4.532; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=103,561
2023-03-14 18:30:55 INFO SorterBenchmark - run: sort 15,000 elements using SorterBenchmark on class java.lang.String from 22,865 total elements and 536 runs using sorter: Heapsort
2023-03-14 18:30:55 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 15,000 elements with 536 runs
2023-03-14 18:30:58 INFO TimeLogger - Raw time per run (mSec): 4.75
2023-03-14 18:30:58 INFO TimeLogger - Normalized time per run (n log n): 4.24
2023-03-14 18:30:58 INFO SortBenchmark - Heapsort: StatPack {hits: mean=1,520,491; stdDev=597, normalized=10.542; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=194,948; stdDev=9
Git
Run
TODO
Problems
Terminal
Services
Profiler
Build
Dependencies
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023
psa_backup
Material Sky Blue
Project
Commit
Pull Requests
Bookmarks
Structure
Maven
Database
Notifications


INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
Run: SortBenchmark
2023-03-14 18:30:59 INFO SortBenchmarkHelper - Testing with words: 81,546 from eng-uk_web_2002_100K-sentences.txt
2023-03-14 18:30:59 INFO SortBenchmark - Testing pure sorts with 248 runs of sorting 30,000 words
2023-03-14 18:30:59 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: Mergesort
2023-03-14 18:30:59 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 30,000 elements with 248 runs
2023-03-14 18:31:01 INFO TimeLogger - Raw time per run (mSec): 8.87
2023-03-14 18:31:01 INFO TimeLogger - Normalized time per run (n log n): 3.67
2023-03-14 18:31:01 INFO SortBenchmark - Mergesort: StatPack {hits: mean=889,361; stdDev=779, normalized=2.876; copies: 370,624, normalized=1.198; inversions: <unset>; swaps: mean=37,028; stdDe
2023-03-14 18:31:01 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: Mergesort
2023-03-14 18:31:01 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 30,000 elements with 248 runs
2023-03-14 18:31:03 INFO TimeLogger - Raw time per run (mSec): 8.30
2023-03-14 18:31:03 INFO TimeLogger - Normalized time per run (n log n): 3.43
2023-03-14 18:31:03 INFO SortBenchmark - Mergesort: StatPack {hits: mean=889,041; stdDev=781, normalized=2.875; copies: mean=370,464; stdDev=37, normalized=1.198; inversions: <unset>; swaps: me
2023-03-14 18:31:03 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: Mergesort
2023-03-14 18:31:03 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 30,000 elements with 248 runs
2023-03-14 18:31:06 INFO TimeLogger - Raw time per run (mSec): 8.06
2023-03-14 18:31:06 INFO TimeLogger - Normalized time per run (n log n): 3.33
2023-03-14 18:31:06 INFO SortBenchmark - Mergesort: StatPack {hits: mean=889,361; stdDev=779, normalized=2.876; copies: 370,624, normalized=1.198; inversions: <unset>; swaps: mean=37,028; stdDe
2023-03-14 18:31:06 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: Mergesort
2023-03-14 18:31:06 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 30,000 elements with 248 runs
2023-03-14 18:31:08 INFO TimeLogger - Raw time per run (mSec): 8.04
2023-03-14 18:31:08 INFO TimeLogger - Normalized time per run (n log n): 3.33
2023-03-14 18:31:08 INFO SortBenchmark - Mergesort: StatPack {hits: mean=899,887; stdDev=781, normalized=2.910; copies: 370,624, normalized=1.198; inversions: <unset>; swaps: mean=37,028; stdDe
2023-03-14 18:31:08 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: QuickSort dual pivot
2023-03-14 18:31:08 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuickSort dual pivot with 30,000 elements with 248 runs
2023-03-14 18:31:10 INFO TimeLogger - Raw time per run (mSec): 7.73
2023-03-14 18:31:10 INFO TimeLogger - Normalized time per run (n log n): 3.20
2023-03-14 18:31:10 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: Heapsort
2023-03-14 18:31:10 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 30,000 elements with 248 runs
2023-03-14 18:31:13 INFO TimeLogger - Raw time per run (mSec): 10.80
2023-03-14 18:31:13 INFO TimeLogger - Normalized time per run (n log n): 4.47
2023-03-14 18:31:13 INFO SortBenchmarkHelper - Testing with words: 81,546 from eng-uk_web_2002_100K-sentences.txt
2023-03-14 18:31:13 INFO SortBenchmark - Testing with 248 runs of sorting 30,000 words and instrumented
Git
Run
TODO
Problems
Terminal
Services
Profiler
Build
Dependencies
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023 psa_backup Material Sky Blue


INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
Run: SortBenchmark
2023-03-14 18:31:13 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: Mergesort
2023-03-14 18:31:13 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 30,000 elements with 248 runs
2023-03-14 18:31:16 INFO TimeLogger - Raw time per run (mSec): 8.53
2023-03-14 18:31:16 INFO TimeLogger - Normalized time per run (n log n): 3.53
2023-03-14 18:31:16 INFO SortBenchmark - Mergesort: StatPack {hits: mean=889,361; stdDev=779, normalized=2.876; copies: 370,624, normalized=1.198; inversions: <unset>; swaps: mean=37,028; stdDe
2023-03-14 18:31:16 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: Mergesort
2023-03-14 18:31:16 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 30,000 elements with 248 runs
2023-03-14 18:31:18 INFO TimeLogger - Raw time per run (mSec): 8.54
2023-03-14 18:31:18 INFO TimeLogger - Normalized time per run (n log n): 3.53
2023-03-14 18:31:18 INFO SortBenchmark - Mergesort: StatPack {hits: mean=889,041; stdDev=781, normalized=2.875; copies: mean=370,464; stdDev=37, normalized=1.198; inversions: <unset>; swaps: me
2023-03-14 18:31:18 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: Mergesort
2023-03-14 18:31:18 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 30,000 elements with 248 runs
2023-03-14 18:31:21 INFO TimeLogger - Raw time per run (mSec): 8.33
2023-03-14 18:31:21 INFO TimeLogger - Normalized time per run (n log n): 3.45
2023-03-14 18:31:21 INFO SortBenchmark - Mergesort: StatPack {hits: mean=889,361; stdDev=779, normalized=2.876; copies: 370,624, normalized=1.198; inversions: <unset>; swaps: mean=37,028; stdDe
2023-03-14 18:31:21 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: Mergesort
2023-03-14 18:31:21 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 30,000 elements with 248 runs
2023-03-14 18:31:23 INFO TimeLogger - Raw time per run (mSec): 8.43
2023-03-14 18:31:23 INFO TimeLogger - Normalized time per run (n log n): 3.49
2023-03-14 18:31:23 INFO SortBenchmark - Mergesort: StatPack {hits: mean=899,887; stdDev=781, normalized=2.910; copies: 370,624, normalized=1.198; inversions: <unset>; swaps: mean=37,028; stdDe
2023-03-14 18:31:23 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: QuicksortDualPivot
2023-03-14 18:31:23 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuicksortDualPivot with 30,000 elements with 248 runs
2023-03-14 18:31:25 INFO TimeLogger - Raw time per run (mSec): 7.99
2023-03-14 18:31:25 INFO TimeLogger - Normalized time per run (n log n): 3.30
2023-03-14 18:31:25 INFO SortBenchmark - QuicksortDualPivot: StatPack {hits: mean=1,422,308; stdDev=57,533, normalized=4.599; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=226,0
2023-03-14 18:31:25 INFO SorterBenchmark - run: sort 30,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 248 runs using sorter: Heapsort
2023-03-14 18:31:25 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 30,000 elements with 248 runs
2023-03-14 18:31:28 INFO TimeLogger - Raw time per run (mSec): 11.44
2023-03-14 18:31:28 INFO TimeLogger - Normalized time per run (n log n): 4.73
2023-03-14 18:31:28 INFO SortBenchmark - Heapsort: StatPack {hits: mean=3,280,992; stdDev=897, normalized=10.609; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=419,895; stdDev=1
2023-03-14 18:31:29 INFO SortBenchmarkHelper - Testing with words: 81,546 from eng-uk_web_2002_100K-sentences.txt
2023-03-14 18:31:29 INFO SortBenchmark - Testing pure sorts with 115 runs of sorting 60,000 words
Git
Run
TODO
Problems
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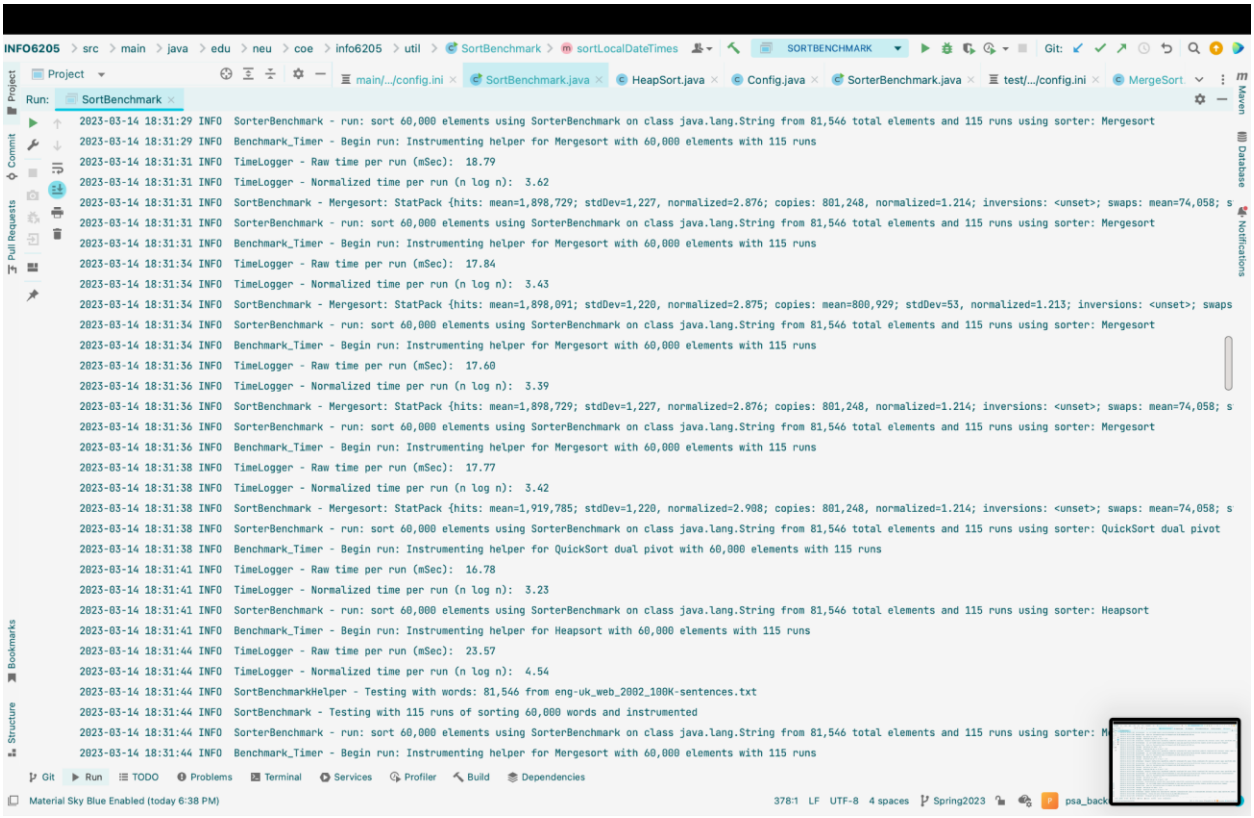
Services
Profiler
Build
Dependencies
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023 psa_backup Material Sky Blue


INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
Run: SortBenchmark
2023-03-14 18:31:29 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter: Mergesort
2023-03-14 18:31:29 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 60,000 elements with 115 runs
2023-03-14 18:31:31 INFO TimeLogger - Raw time per run (mSec): 18.79
2023-03-14 18:31:31 INFO TimeLogger - Normalized time per run (n log n): 3.62
2023-03-14 18:31:31 INFO SortBenchmark - Mergesort: StatPack {hits: mean=1,898,729; stdDev=1,227, normalized=2.876; copies: 801,248, normalized=1.214; inversions: <unset>; swaps: mean=74,058; s
2023-03-14 18:31:31 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter: Mergesort
2023-03-14 18:31:31 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 60,000 elements with 115 runs
2023-03-14 18:31:34 INFO TimeLogger - Raw time per run (mSec): 17.84
2023-03-14 18:31:34 INFO TimeLogger - Normalized time per run (n log n): 3.43
2023-03-14 18:31:34 INFO SortBenchmark - Mergesort: StatPack {hits: mean=1,898,091; stdDev=1,220, normalized=2.875; copies: mean=800,929; stdDev=53, normalized=1.213; inversions: <unset>; swaps
2023-03-14 18:31:34 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter: Mergesort
2023-03-14 18:31:34 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 60,000 elements with 115 runs
2023-03-14 18:31:36 INFO TimeLogger - Raw time per run (mSec): 17.60
2023-03-14 18:31:36 INFO TimeLogger - Normalized time per run (n log n): 3.39
2023-03-14 18:31:36 INFO SortBenchmark - Mergesort: StatPack {hits: mean=1,898,729; stdDev=1,227, normalized=2.876; copies: 801,248, normalized=1.214; inversions: <unset>; swaps: mean=74,058; s
2023-03-14 18:31:36 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter: Mergesort
2023-03-14 18:31:36 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 60,000 elements with 115 runs
2023-03-14 18:31:38 INFO TimeLogger - Raw time per run (mSec): 17.77
2023-03-14 18:31:38 INFO TimeLogger - Normalized time per run (n log n): 3.42
2023-03-14 18:31:38 INFO SortBenchmark - Mergesort: StatPack {hits: mean=1,919,785; stdDev=1,220, normalized=2.908; copies: 801,248, normalized=1.214; inversions: <unset>; swaps: mean=74,058; s
2023-03-14 18:31:38 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter: QuickSort dual pivot
2023-03-14 18:31:38 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuickSort dual pivot with 60,000 elements with 115 runs
2023-03-14 18:31:41 INFO TimeLogger - Raw time per run (mSec): 16.78
2023-03-14 18:31:41 INFO TimeLogger - Normalized time per run (n log n): 3.23
2023-03-14 18:31:41 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter: Heapsort
2023-03-14 18:31:41 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 60,000 elements with 115 runs
2023-03-14 18:31:44 INFO TimeLogger - Raw time per run (mSec): 23.57
2023-03-14 18:31:44 INFO TimeLogger - Normalized time per run (n log n): 4.54
2023-03-14 18:31:44 INFO SortBenchmarkHelper - Testing with words: 81,546 from eng-uk_web_2002_100K-sentences.txt
2023-03-14 18:31:44 INFO SortBenchmark - Testing with 115 runs of sorting 60,000 words and instrumented
2023-03-14 18:31:44 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter:
2023-03-14 18:31:44 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 60,000 elements with 115 runs
Git
Run
TODO
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Terminal
Services
Profiler
Build
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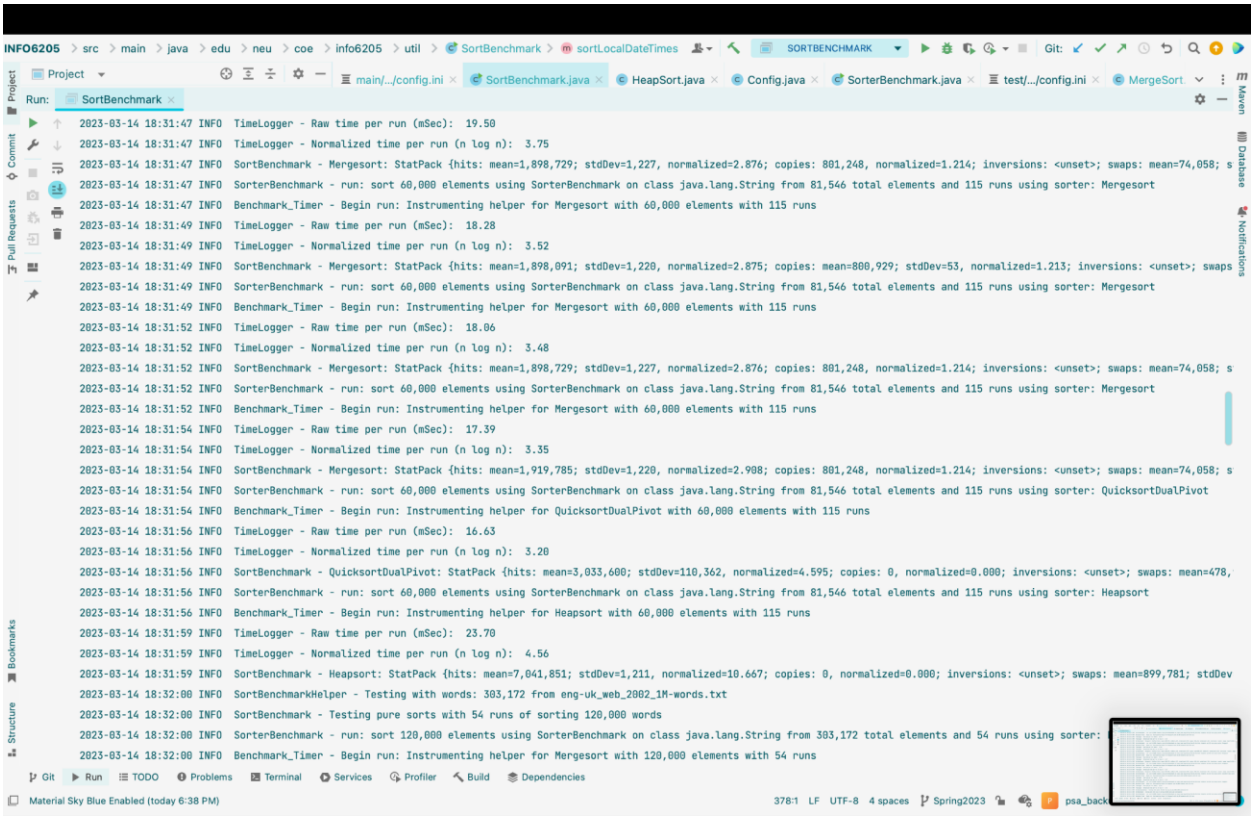
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023


INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
Run: SortBenchmark
2023-03-14 18:31:47 INFO TimeLogger - Raw time per run (mSec): 19.50
2023-03-14 18:31:47 INFO TimeLogger - Normalized time per run (n log n): 3.75
2023-03-14 18:31:47 INFO SortBenchmark - Mergesort: StatPack {hits: mean=1,898,729; stdDev=1,227, normalized=2.876; copies: 801,248, normalized=1.214; inversions: <unset>; swaps: mean=74,058; s
2023-03-14 18:31:47 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter: Mergesort
2023-03-14 18:31:47 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 60,000 elements with 115 runs
2023-03-14 18:31:49 INFO TimeLogger - Raw time per run (mSec): 18.28
2023-03-14 18:31:49 INFO TimeLogger - Normalized time per run (n log n): 3.52
2023-03-14 18:31:49 INFO SortBenchmark - Mergesort: StatPack {hits: mean=1,898,091; stdDev=1,220, normalized=2.875; copies: mean=800,929; stdDev=53, normalized=1.213; inversions: <unset>; swaps
2023-03-14 18:31:49 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter: Mergesort
2023-03-14 18:31:49 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 60,000 elements with 115 runs
2023-03-14 18:31:52 INFO TimeLogger - Raw time per run (mSec): 18.06
2023-03-14 18:31:52 INFO TimeLogger - Normalized time per run (n log n): 3.48
2023-03-14 18:31:52 INFO SortBenchmark - Mergesort: StatPack {hits: mean=1,898,729; stdDev=1,227, normalized=2.876; copies: 801,248, normalized=1.214; inversions: <unset>; swaps: mean=74,058; s
2023-03-14 18:31:52 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter: Mergesort
2023-03-14 18:31:52 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 60,000 elements with 115 runs
2023-03-14 18:31:54 INFO TimeLogger - Raw time per run (mSec): 17.39
2023-03-14 18:31:54 INFO TimeLogger - Normalized time per run (n log n): 3.35
2023-03-14 18:31:54 INFO SortBenchmark - Mergesort: StatPack {hits: mean=1,919,785; stdDev=1,220, normalized=2.908; copies: 801,248, normalized=1.214; inversions: <unset>; swaps: mean=74,058; s
2023-03-14 18:31:54 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter: QuicksortDualPivot
2023-03-14 18:31:54 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuicksortDualPivot with 60,000 elements with 115 runs
2023-03-14 18:31:56 INFO TimeLogger - Raw time per run (mSec): 16.63
2023-03-14 18:31:56 INFO TimeLogger - Normalized time per run (n log n): 3.20
2023-03-14 18:31:56 INFO SortBenchmark - QuicksortDualPivot: StatPack {hits: mean=3,033,600; stdDev=110,362, normalized=4.595; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=478,
2023-03-14 18:31:56 INFO SorterBenchmark - run: sort 60,000 elements using SorterBenchmark on class java.lang.String from 81,546 total elements and 115 runs using sorter: Heapsort
2023-03-14 18:31:56 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 60,000 elements with 115 runs
2023-03-14 18:31:59 INFO TimeLogger - Raw time per run (mSec): 23.70
2023-03-14 18:31:59 INFO TimeLogger - Normalized time per run (n log n): 4.56
2023-03-14 18:31:59 INFO SortBenchmark - Heapsort: StatPack {hits: mean=7,041,851; stdDev=1,211, normalized=10.667; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=899,781; stdDev
2023-03-14 18:32:00 INFO SortBenchmarkHelper - Testing with words: 303,172 from eng-uk_web_2002_1M-words.txt
2023-03-14 18:32:00 INFO SortBenchmark - Testing pure sorts with 54 runs of sorting 120,000 words
2023-03-14 18:32:00 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter:
2023-03-14 18:32:00 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 120,000 elements with 54 runs
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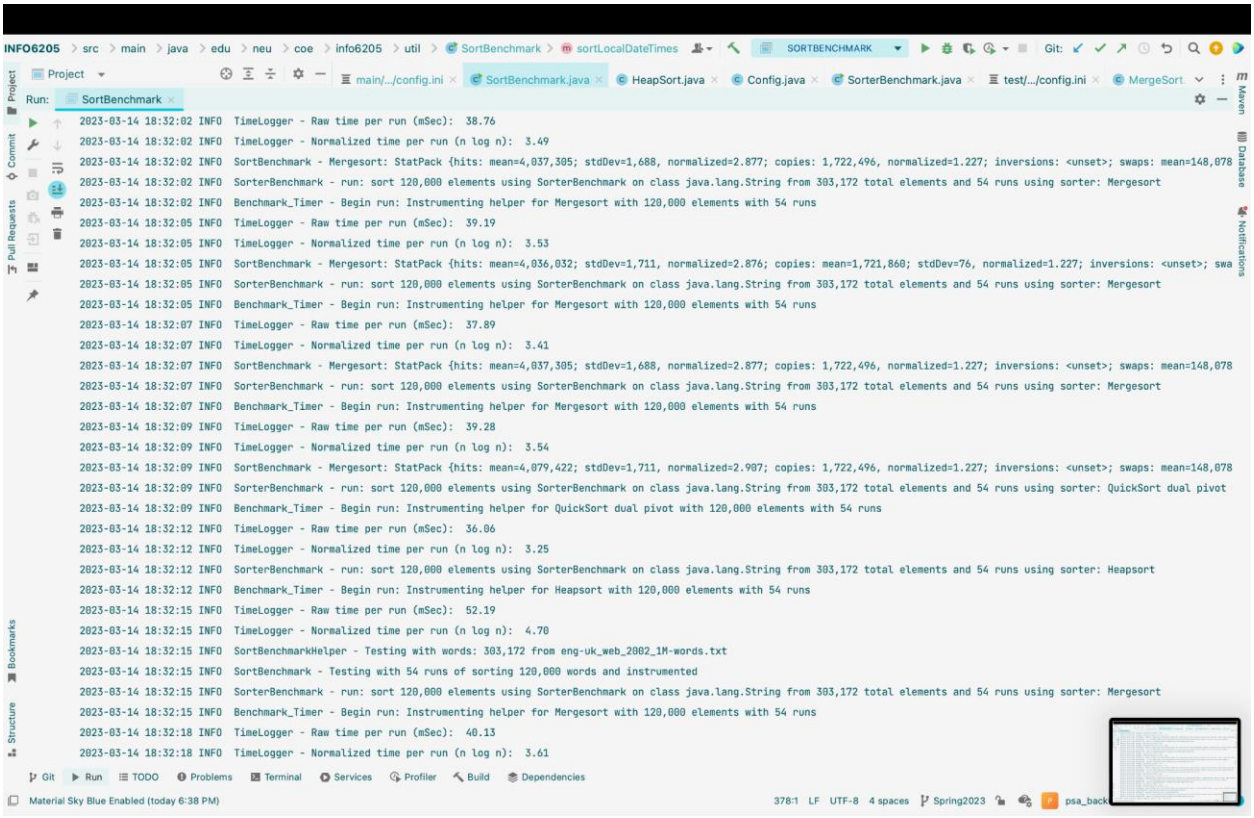
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023


INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
Run: SortBenchmark
2023-03-14 18:32:02 INFO TimeLogger - Raw time per run (mSec): 38.76
2023-03-14 18:32:02 INFO TimeLogger - Normalized time per run (n log n): 3.49
2023-03-14 18:32:02 INFO SortBenchmark - Mergesort: StatPack {hits: mean=4,037,305; stdDev=1,688, normalized=2.877; copies: 1,722,496, normalized=1.227; inversions: <unset>; swaps: mean=148,078
2023-03-14 18:32:02 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter: Mergesort
2023-03-14 18:32:02 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 120,000 elements with 54 runs
2023-03-14 18:32:05 INFO TimeLogger - Raw time per run (mSec): 39.19
2023-03-14 18:32:05 INFO TimeLogger - Normalized time per run (n log n): 3.53
2023-03-14 18:32:05 INFO SortBenchmark - Mergesort: StatPack {hits: mean=4,036,032; stdDev=1,711, normalized=2.876; copies: mean=1,721,860; stdDev=76, normalized=1.227; inversions: <unset>; swa
2023-03-14 18:32:05 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter: Mergesort
2023-03-14 18:32:05 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 120,000 elements with 54 runs
2023-03-14 18:32:07 INFO TimeLogger - Raw time per run (mSec): 37.89
2023-03-14 18:32:07 INFO TimeLogger - Normalized time per run (n log n): 3.41
2023-03-14 18:32:07 INFO SortBenchmark - Mergesort: StatPack {hits: mean=4,037,305; stdDev=1,688, normalized=2.877; copies: 1,722,496, normalized=1.227; inversions: <unset>; swaps: mean=148,078
2023-03-14 18:32:07 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter: Mergesort
2023-03-14 18:32:07 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 120,000 elements with 54 runs
2023-03-14 18:32:09 INFO TimeLogger - Raw time per run (mSec): 39.28
2023-03-14 18:32:09 INFO TimeLogger - Normalized time per run (n log n): 3.54
2023-03-14 18:32:09 INFO SortBenchmark - Mergesort: StatPack {hits: mean=4,079,422; stdDev=1,711, normalized=2.907; copies: 1,722,496, normalized=1.227; inversions: <unset>; swaps: mean=148,078
2023-03-14 18:32:09 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter: QuickSort dual pivot
2023-03-14 18:32:09 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuickSort dual pivot with 120,000 elements with 54 runs
2023-03-14 18:32:12 INFO TimeLogger - Raw time per run (mSec): 36.06
2023-03-14 18:32:12 INFO TimeLogger - Normalized time per run (n log n): 3.25
2023-03-14 18:32:12 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter: Heapsort
2023-03-14 18:32:12 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 120,000 elements with 54 runs
2023-03-14 18:32:15 INFO TimeLogger - Raw time per run (mSec): 52.19
2023-03-14 18:32:15 INFO TimeLogger - Normalized time per run (n log n): 4.70
2023-03-14 18:32:15 INFO SortBenchmarkHelper - Testing with words: 303,172 from eng-uk_web_2002_1M-words.txt
2023-03-14 18:32:15 INFO SortBenchmark - Testing with 54 runs of sorting 120,000 words and instrumented
2023-03-14 18:32:15 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter: Mergesort
2023-03-14 18:32:15 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 120,000 elements with 54 runs
2023-03-14 18:32:18 INFO TimeLogger - Raw time per run (mSec): 40.13
2023-03-14 18:32:18 INFO TimeLogger - Normalized time per run (n log n): 3.61
Git
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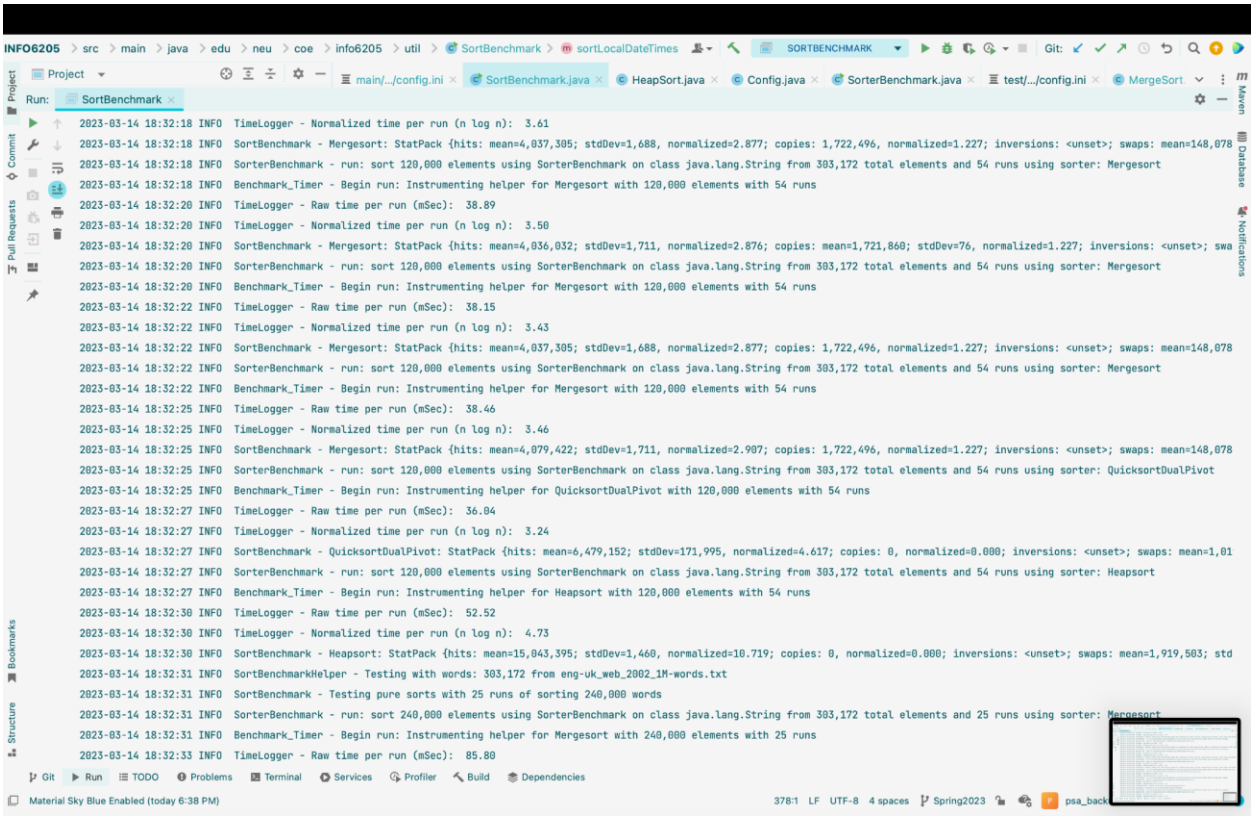
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023


INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
Run: SortBenchmark
2023-03-14 18:32:18 INFO TimeLogger - Normalized time per run (n log n): 3.61
2023-03-14 18:32:18 INFO SortBenchmark - Mergesort: StatPack {hits: mean=4,037,305; stdDev=1,688, normalized=2.877; copies: 1,722,496, normalized=1.227; inversions: <unset>; swaps: mean=148,078
2023-03-14 18:32:18 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter: Mergesort
2023-03-14 18:32:18 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 120,000 elements with 54 runs
2023-03-14 18:32:20 INFO TimeLogger - Raw time per run (mSec): 38.89
2023-03-14 18:32:20 INFO TimeLogger - Normalized time per run (n log n): 3.50
2023-03-14 18:32:20 INFO SortBenchmark - Mergesort: StatPack {hits: mean=4,036,032; stdDev=1,711, normalized=2.876; copies: mean=1,721,860; stdDev=76, normalized=1.227; inversions: <unset>; swa
2023-03-14 18:32:20 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter: Mergesort
2023-03-14 18:32:20 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 120,000 elements with 54 runs
2023-03-14 18:32:22 INFO TimeLogger - Raw time per run (mSec): 38.15
2023-03-14 18:32:22 INFO TimeLogger - Normalized time per run (n log n): 3.43
2023-03-14 18:32:22 INFO SortBenchmark - Mergesort: StatPack {hits: mean=4,037,305; stdDev=1,688, normalized=2.877; copies: 1,722,496, normalized=1.227; inversions: <unset>; swaps: mean=148,078
2023-03-14 18:32:22 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter: Mergesort
2023-03-14 18:32:22 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 120,000 elements with 54 runs
2023-03-14 18:32:25 INFO TimeLogger - Raw time per run (mSec): 38.46
2023-03-14 18:32:25 INFO TimeLogger - Normalized time per run (n log n): 3.46
2023-03-14 18:32:25 INFO SortBenchmark - Mergesort: StatPack {hits: mean=4,079,422; stdDev=1,711, normalized=2.907; copies: 1,722,496, normalized=1.227; inversions: <unset>; swaps: mean=148,078
2023-03-14 18:32:25 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter: QuicksortDualPivot
2023-03-14 18:32:25 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuicksortDualPivot with 120,000 elements with 54 runs
2023-03-14 18:32:27 INFO TimeLogger - Raw time per run (mSec): 36.04
2023-03-14 18:32:27 INFO TimeLogger - Normalized time per run (n log n): 3.24
2023-03-14 18:32:27 INFO SortBenchmark - QuicksortDualPivot: StatPack {hits: mean=6,479,152; stdDev=171,995, normalized=4.617; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=1,01
2023-03-14 18:32:27 INFO SorterBenchmark - run: sort 120,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 54 runs using sorter: Heapsort
2023-03-14 18:32:27 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 120,000 elements with 54 runs
2023-03-14 18:32:30 INFO TimeLogger - Raw time per run (mSec): 52.52
2023-03-14 18:32:30 INFO TimeLogger - Normalized time per run (n log n): 4.73
2023-03-14 18:32:30 INFO SortBenchmark - Heapsort: StatPack {hits: mean=15,043,395; stdDev=1,460, normalized=10.719; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=1,919,503; std
2023-03-14 18:32:31 INFO SortBenchmarkHelper - Testing with words: 303,172 from eng-uk_web_2002_1M-words.txt
2023-03-14 18:32:31 INFO SortBenchmark - Testing pure sorts with 25 runs of sorting 240,000 words
2023-03-14 18:32:31 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: Mergesort
2023-03-14 18:32:31 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 240,000 elements with 25 runs
2023-03-14 18:32:33 INFO TimeLogger - Raw time per run (mSec): 85.80
Git
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Profiler
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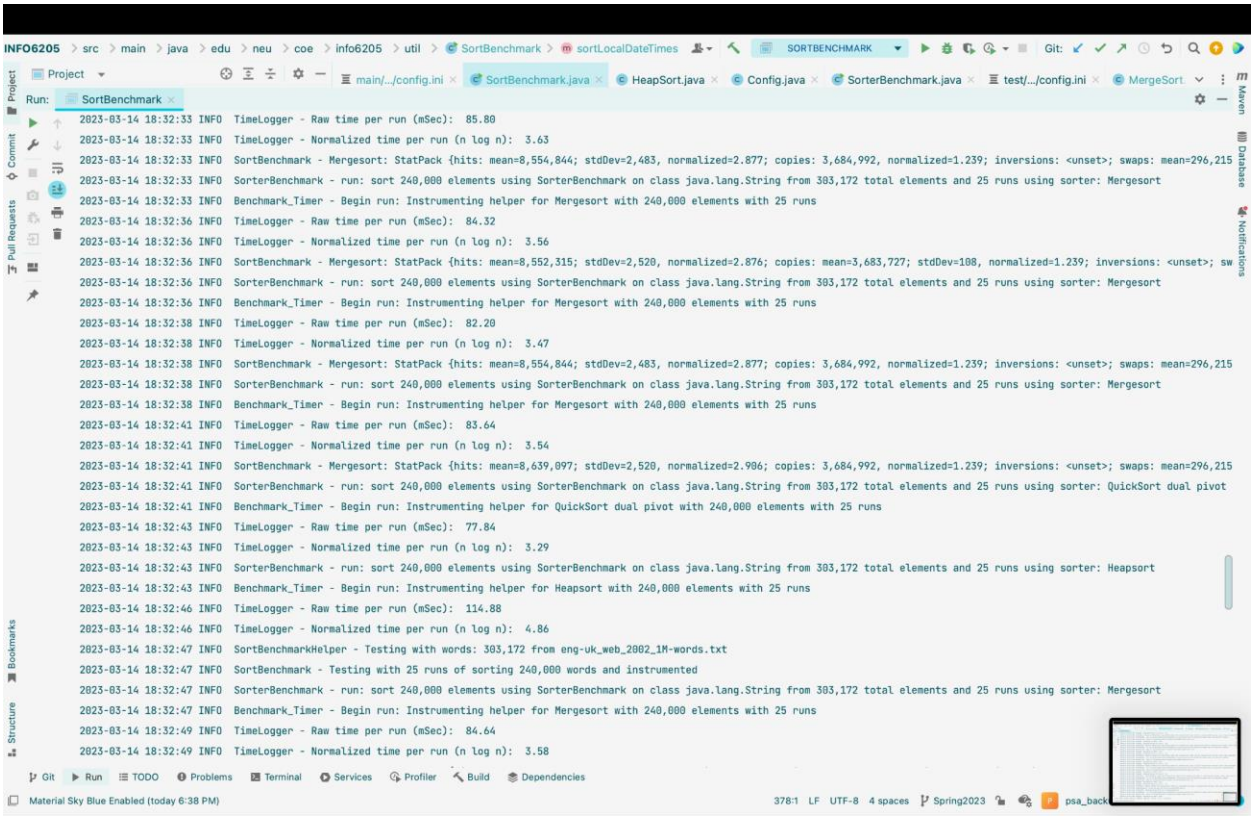
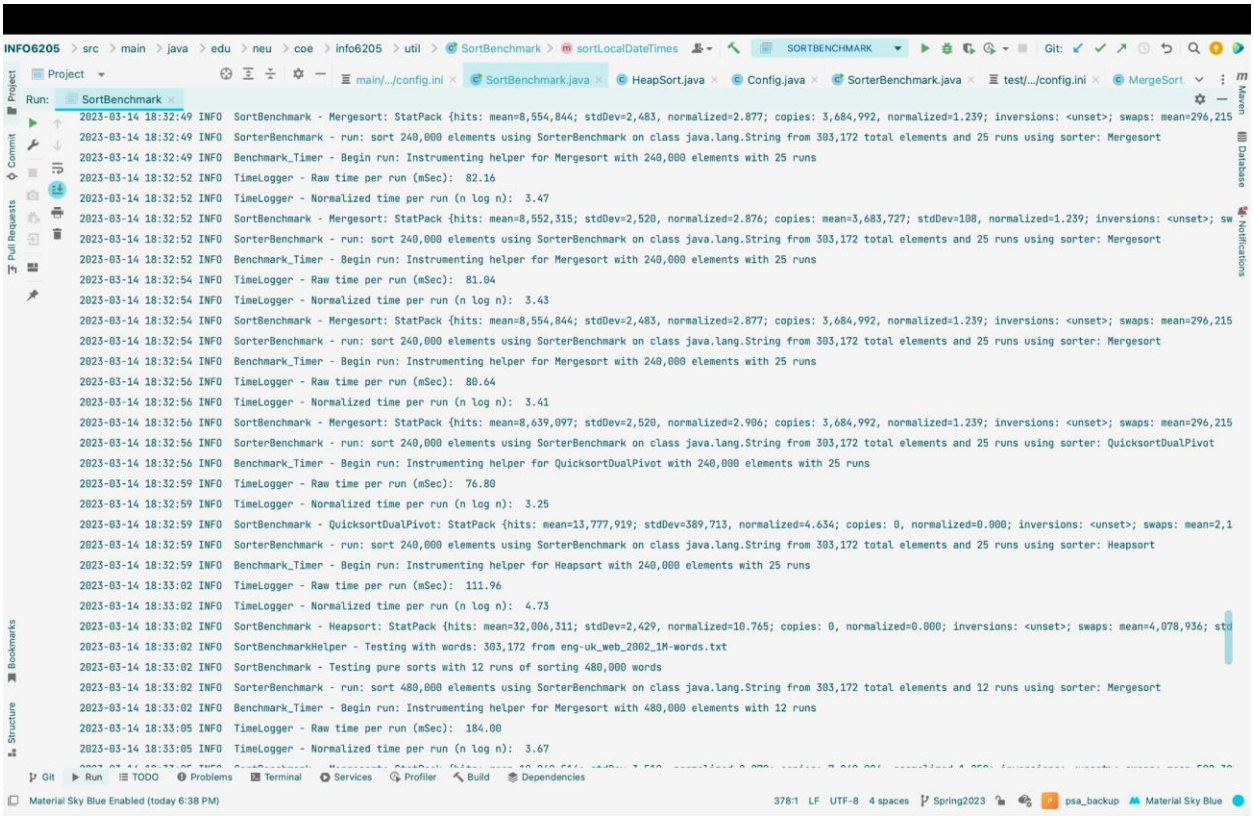
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023


INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
Run: SortBenchmark
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
2023-03-14 18:32:33 INFO TimeLogger - Raw time per run (mSec): 85.80
2023-03-14 18:32:33 INFO TimeLogger - Normalized time per run (n log n): 3.63
2023-03-14 18:32:33 INFO SortBenchmark - Mergesort: StatPack {hits: mean=8,554,844; stdDev=2,483, normalized=2.877; copies: 3,684,992, normalized=1.239; inversions: <unset>; swaps: mean=296,215
2023-03-14 18:32:33 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: Mergesort
2023-03-14 18:32:33 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 240,000 elements with 25 runs
2023-03-14 18:32:36 INFO TimeLogger - Raw time per run (mSec): 84.32
2023-03-14 18:32:36 INFO TimeLogger - Normalized time per run (n log n): 3.56
2023-03-14 18:32:36 INFO SortBenchmark - Mergesort: StatPack {hits: mean=8,552,315; stdDev=2,520, normalized=2.876; copies: mean=3,683,727; stdDev=108, normalized=1.239; inversions: <unset>; sw
2023-03-14 18:32:36 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: Mergesort
2023-03-14 18:32:36 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 240,000 elements with 25 runs
2023-03-14 18:32:38 INFO TimeLogger - Raw time per run (mSec): 82.20
2023-03-14 18:32:38 INFO TimeLogger - Normalized time per run (n log n): 3.47
2023-03-14 18:32:38 INFO SortBenchmark - Mergesort: StatPack {hits: mean=8,554,844; stdDev=2,483, normalized=2.877; copies: 3,684,992, normalized=1.239; inversions: <unset>; swaps: mean=296,215
2023-03-14 18:32:38 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: Mergesort
2023-03-14 18:32:38 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 240,000 elements with 25 runs
2023-03-14 18:32:41 INFO TimeLogger - Raw time per run (mSec): 83.64
2023-03-14 18:32:41 INFO TimeLogger - Normalized time per run (n log n): 3.54
2023-03-14 18:32:41 INFO SortBenchmark - Mergesort: StatPack {hits: mean=8,639,097; stdDev=2,520, normalized=2.906; copies: 3,684,992, normalized=1.239; inversions: <unset>; swaps: mean=296,215
2023-03-14 18:32:41 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: QuickSort dual pivot
2023-03-14 18:32:41 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuickSort dual pivot with 240,000 elements with 25 runs
2023-03-14 18:32:43 INFO TimeLogger - Raw time per run (mSec): 77.84
2023-03-14 18:32:43 INFO TimeLogger - Normalized time per run (n log n): 3.29
2023-03-14 18:32:43 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: Heapsort
2023-03-14 18:32:43 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 240,000 elements with 25 runs
2023-03-14 18:32:46 INFO TimeLogger - Raw time per run (mSec): 114.88
2023-03-14 18:32:46 INFO TimeLogger - Normalized time per run (n log n): 4.86
2023-03-14 18:32:47 INFO SortBenchmarkHelper - Testing with words: 303,172 from eng-uk_web_2002_1M-words.txt
2023-03-14 18:32:47 INFO SortBenchmark - Testing with 25 runs of sorting 240,000 words and instrumented
2023-03-14 18:32:47 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: Mergesort
2023-03-14 18:32:47 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 240,000 elements with 25 runs
2023-03-14 18:32:49 INFO TimeLogger - Raw time per run (mSec): 84.64
2023-03-14 18:32:49 INFO TimeLogger - Normalized time per run (n log n): 3.58
Git
Run
TODO
Problems
Terminal
Services
Profiler
Build
Dependencies
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023


INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
Run: SortBenchmark
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
2023-03-14 18:32:49 INFO SortBenchmark - Mergesort: StatPack {hits: mean=8,554,844; stdDev=2,483, normalized=2.877; copies: 3,684,992, normalized=1.239; inversions: <unset>; swaps: mean=296,215
2023-03-14 18:32:49 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: Mergesort
2023-03-14 18:32:49 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 240,000 elements with 25 runs
2023-03-14 18:32:52 INFO TimeLogger - Raw time per run (mSec): 82.16
2023-03-14 18:32:52 INFO TimeLogger - Normalized time per run (n log n): 3.47
2023-03-14 18:32:52 INFO SortBenchmark - Mergesort: StatPack {hits: mean=8,552,315; stdDev=2,520, normalized=2.876; copies: mean=3,683,727; stdDev=108, normalized=1.239; inversions: <unset>; sw
2023-03-14 18:32:52 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: Mergesort
2023-03-14 18:32:52 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 240,000 elements with 25 runs
2023-03-14 18:32:54 INFO TimeLogger - Raw time per run (mSec): 81.04
2023-03-14 18:32:54 INFO TimeLogger - Normalized time per run (n log n): 3.43
2023-03-14 18:32:54 INFO SortBenchmark - Mergesort: StatPack {hits: mean=8,554,844; stdDev=2,483, normalized=2.877; copies: 3,684,992, normalized=1.239; inversions: <unset>; swaps: mean=296,215
2023-03-14 18:32:54 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: Mergesort
2023-03-14 18:32:54 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 240,000 elements with 25 runs
2023-03-14 18:32:56 INFO TimeLogger - Raw time per run (mSec): 80.64
2023-03-14 18:32:56 INFO TimeLogger - Normalized time per run (n log n): 3.41
2023-03-14 18:32:56 INFO SortBenchmark - Mergesort: StatPack {hits: mean=8,639,097; stdDev=2,520, normalized=2.906; copies: 3,684,992, normalized=1.239; inversions: <unset>; swaps: mean=296,215
2023-03-14 18:32:56 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: QuicksortDualPivot
2023-03-14 18:32:56 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuicksortDualPivot with 240,000 elements with 25 runs
2023-03-14 18:32:59 INFO TimeLogger - Raw time per run (mSec): 76.80
2023-03-14 18:32:59 INFO TimeLogger - Normalized time per run (n log n): 3.25
2023-03-14 18:32:59 INFO SortBenchmark - QuicksortDualPivot: StatPack {hits: mean=13,777,919; stdDev=389,713, normalized=4.634; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=2,1
2023-03-14 18:32:59 INFO SorterBenchmark - run: sort 240,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 25 runs using sorter: Heapsort
2023-03-14 18:32:59 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 240,000 elements with 25 runs
2023-03-14 18:33:02 INFO TimeLogger - Raw time per run (mSec): 111.96
2023-03-14 18:33:02 INFO TimeLogger - Normalized time per run (n log n): 4.73
2023-03-14 18:33:02 INFO SortBenchmark - Heapsort: StatPack {hits: mean=32,006,311; stdDev=2,429, normalized=10.765; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=4,078,936; std
2023-03-14 18:33:02 INFO SortBenchmarkHelper - Testing with words: 303,172 from eng-uk_web_2002_1M-words.txt
2023-03-14 18:33:02 INFO SortBenchmark - Testing pure sorts with 12 runs of sorting 480,000 words
2023-03-14 18:33:02 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: Mergesort
2023-03-14 18:33:02 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 480,000 elements with 12 runs
2023-03-14 18:33:05 INFO TimeLogger - Raw time per run (mSec): 184.00
2023-03-14 18:33:05 INFO TimeLogger - Normalized time per run (n log n): 3.67
Git
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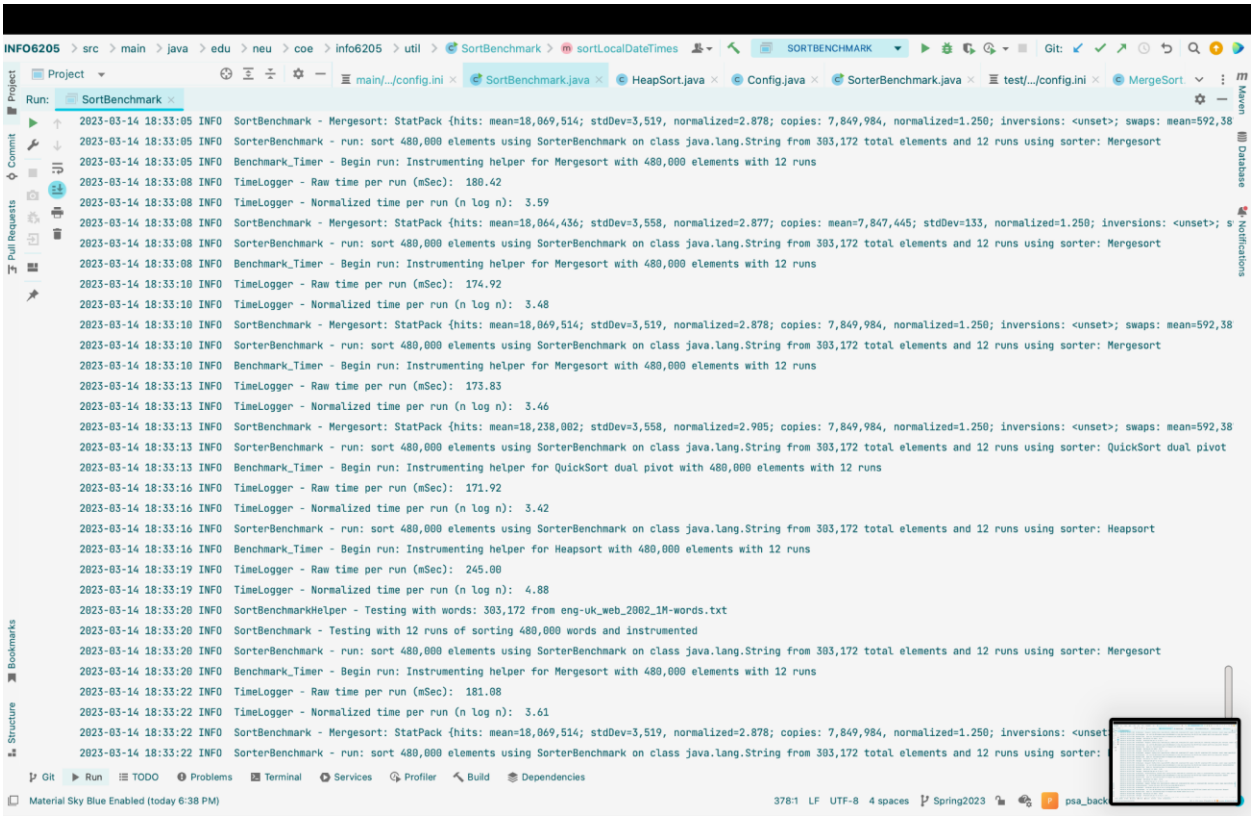
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023
psa_backup
Material Sky Blue


INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
Run: SortBenchmark
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
2023-03-14 18:33:05 INFO SortBenchmark - Mergesort: StatPack {hits: mean=18,069,514; stdDev=3,519, normalized=2.878; copies: 7,849,984, normalized=1.250; inversions: <unset>; swaps: mean=592,38
2023-03-14 18:33:05 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: Mergesort
2023-03-14 18:33:05 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 480,000 elements with 12 runs
2023-03-14 18:33:08 INFO TimeLogger - Raw time per run (mSec): 180.42
2023-03-14 18:33:08 INFO TimeLogger - Normalized time per run (n log n): 3.59
2023-03-14 18:33:08 INFO SortBenchmark - Mergesort: StatPack {hits: mean=18,064,436; stdDev=3,558, normalized=2.877; copies: mean=7,847,445; stdDev=133, normalized=1.250; inversions: <unset>; s
2023-03-14 18:33:08 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: Mergesort
2023-03-14 18:33:08 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 480,000 elements with 12 runs
2023-03-14 18:33:10 INFO TimeLogger - Raw time per run (mSec): 174.92
2023-03-14 18:33:10 INFO TimeLogger - Normalized time per run (n log n): 3.48
2023-03-14 18:33:10 INFO SortBenchmark - Mergesort: StatPack {hits: mean=18,069,514; stdDev=3,519, normalized=2.878; copies: 7,849,984, normalized=1.250; inversions: <unset>; swaps: mean=592,38
2023-03-14 18:33:10 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: Mergesort
2023-03-14 18:33:10 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 480,000 elements with 12 runs
2023-03-14 18:33:13 INFO TimeLogger - Raw time per run (mSec): 173.83
2023-03-14 18:33:13 INFO TimeLogger - Normalized time per run (n log n): 3.46
2023-03-14 18:33:13 INFO SortBenchmark - Mergesort: StatPack {hits: mean=18,238,002; stdDev=3,558, normalized=2.905; copies: 7,849,984, normalized=1.250; inversions: <unset>; swaps: mean=592,38
2023-03-14 18:33:13 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: QuickSort dual pivot
2023-03-14 18:33:13 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuickSort dual pivot with 480,000 elements with 12 runs
2023-03-14 18:33:16 INFO TimeLogger - Raw time per run (mSec): 171.92
2023-03-14 18:33:16 INFO TimeLogger - Normalized time per run (n log n): 3.42
2023-03-14 18:33:16 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: Heapsort
2023-03-14 18:33:16 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 480,000 elements with 12 runs
2023-03-14 18:33:19 INFO TimeLogger - Raw time per run (mSec): 245.00
2023-03-14 18:33:19 INFO TimeLogger - Normalized time per run (n log n): 4.88
2023-03-14 18:33:20 INFO SortBenchmarkHelper - Testing with words: 303,172 from eng-uk_web_2002_1M-words.txt
2023-03-14 18:33:20 INFO SortBenchmark - Testing with 12 runs of sorting 480,000 words and instrumented
2023-03-14 18:33:20 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: Mergesort
2023-03-14 18:33:20 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 480,000 elements with 12 runs
2023-03-14 18:33:22 INFO TimeLogger - Raw time per run (mSec): 181.08
2023-03-14 18:33:22 INFO TimeLogger - Normalized time per run (n log n): 3.61
2023-03-14 18:33:22 INFO SortBenchmark - Mergesort: StatPack {hits: mean=18,069,514; stdDev=3,519, normalized=2.878; copies: 7,849,984, normalized=1.250; inversions: <unset
2023-03-14 18:33:22 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter:
Git
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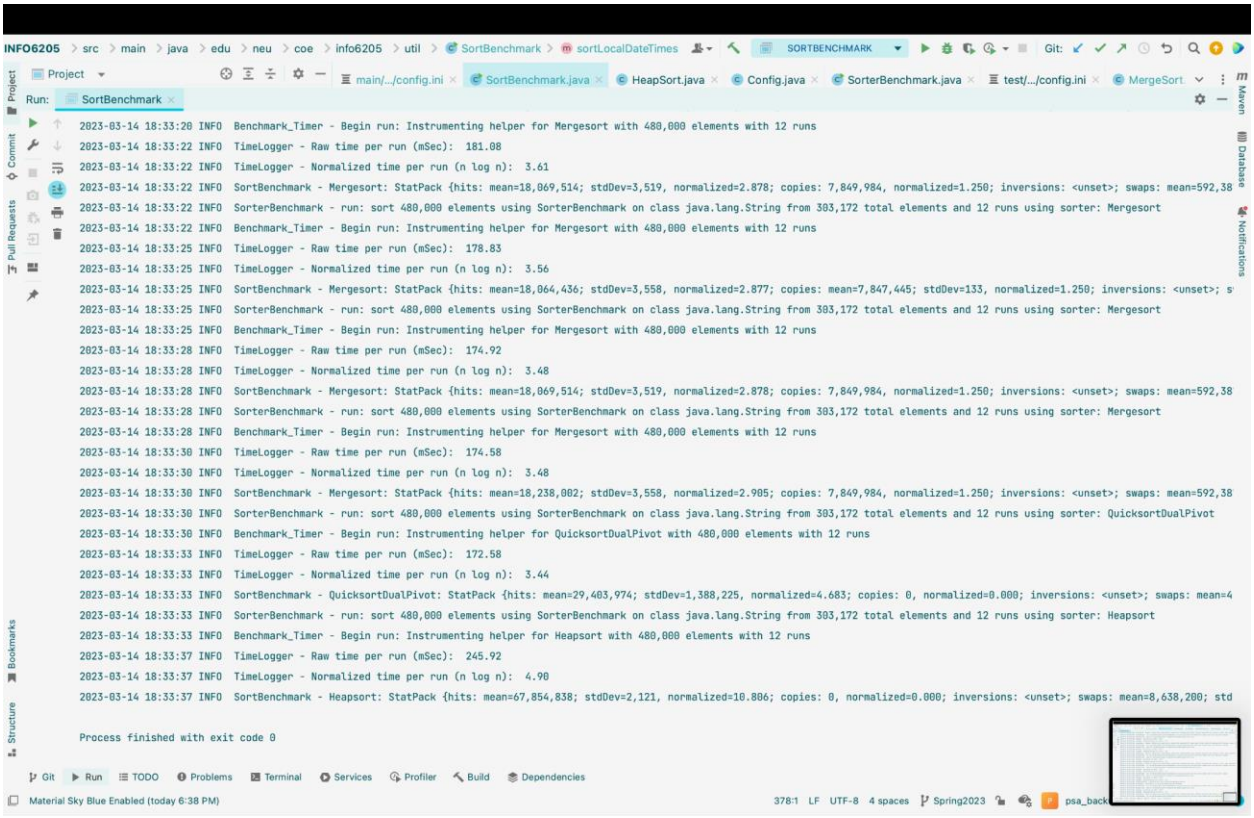
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023


INFO6205 > src > main > java > edu > neu > coe > info6205 > util > SortBenchmark > sortLocalDateTimes
SORTBENCHMARK
Git:
Project
Run: SortBenchmark
main/.../config.ini
SortBenchmark.java
HeapSort.java
Config.java
SorterBenchmark.java
test/.../config.ini
MergeSort
2023-03-14 18:33:20 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 480,000 elements with 12 runs
2023-03-14 18:33:22 INFO TimeLogger - Raw time per run (mSec): 181.08
2023-03-14 18:33:22 INFO TimeLogger - Normalized time per run (n log n): 3.61
2023-03-14 18:33:22 INFO SortBenchmark - Mergesort: StatPack {hits: mean=18,069,514; stdDev=3,519, normalized=2.878; copies: 7,849,984, normalized=1.250; inversions: <unset>; swaps: mean=592,38
2023-03-14 18:33:22 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: Mergesort
2023-03-14 18:33:22 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 480,000 elements with 12 runs
2023-03-14 18:33:25 INFO TimeLogger - Raw time per run (mSec): 178.83
2023-03-14 18:33:25 INFO TimeLogger - Normalized time per run (n log n): 3.56
2023-03-14 18:33:25 INFO SortBenchmark - Mergesort: StatPack {hits: mean=18,064,436; stdDev=3,558, normalized=2.877; copies: mean=7,847,445; stdDev=133, normalized=1.250; inversions: <unset>; s
2023-03-14 18:33:25 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: Mergesort
2023-03-14 18:33:25 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 480,000 elements with 12 runs
2023-03-14 18:33:28 INFO TimeLogger - Raw time per run (mSec): 174.92
2023-03-14 18:33:28 INFO TimeLogger - Normalized time per run (n log n): 3.48
2023-03-14 18:33:28 INFO SortBenchmark - Mergesort: StatPack {hits: mean=18,069,514; stdDev=3,519, normalized=2.878; copies: 7,849,984, normalized=1.250; inversions: <unset>; swaps: mean=592,38
2023-03-14 18:33:28 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: Mergesort
2023-03-14 18:33:28 INFO Benchmark_Timer - Begin run: Instrumenting helper for Mergesort with 480,000 elements with 12 runs
2023-03-14 18:33:30 INFO TimeLogger - Raw time per run (mSec): 174.58
2023-03-14 18:33:30 INFO TimeLogger - Normalized time per run (n log n): 3.48
2023-03-14 18:33:30 INFO SortBenchmark - Mergesort: StatPack {hits: mean=18,238,002; stdDev=3,558, normalized=2.905; copies: 7,849,984, normalized=1.250; inversions: <unset>; swaps: mean=592,38
2023-03-14 18:33:30 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: QuicksortDualPivot
2023-03-14 18:33:30 INFO Benchmark_Timer - Begin run: Instrumenting helper for QuicksortDualPivot with 480,000 elements with 12 runs
2023-03-14 18:33:33 INFO TimeLogger - Raw time per run (mSec): 172.58
2023-03-14 18:33:33 INFO TimeLogger - Normalized time per run (n log n): 3.44
2023-03-14 18:33:33 INFO SortBenchmark - QuicksortDualPivot: StatPack {hits: mean=29,403,974; stdDev=1,388,225, normalized=4.683; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=4
2023-03-14 18:33:33 INFO SorterBenchmark - run: sort 480,000 elements using SorterBenchmark on class java.lang.String from 303,172 total elements and 12 runs using sorter: Heapsort
2023-03-14 18:33:33 INFO Benchmark_Timer - Begin run: Instrumenting helper for Heapsort with 480,000 elements with 12 runs
2023-03-14 18:33:37 INFO TimeLogger - Raw time per run (mSec): 245.92
2023-03-14 18:33:37 INFO TimeLogger - Normalized time per run (n log n): 4.90
2023-03-14 18:33:37 INFO SortBenchmark - Heapsort: StatPack {hits: mean=67,854,838; stdDev=2,121, normalized=10.806; copies: 0, normalized=0.000; inversions: <unset>; swaps: mean=8,638,200; std
Process finished with exit code 0
Git
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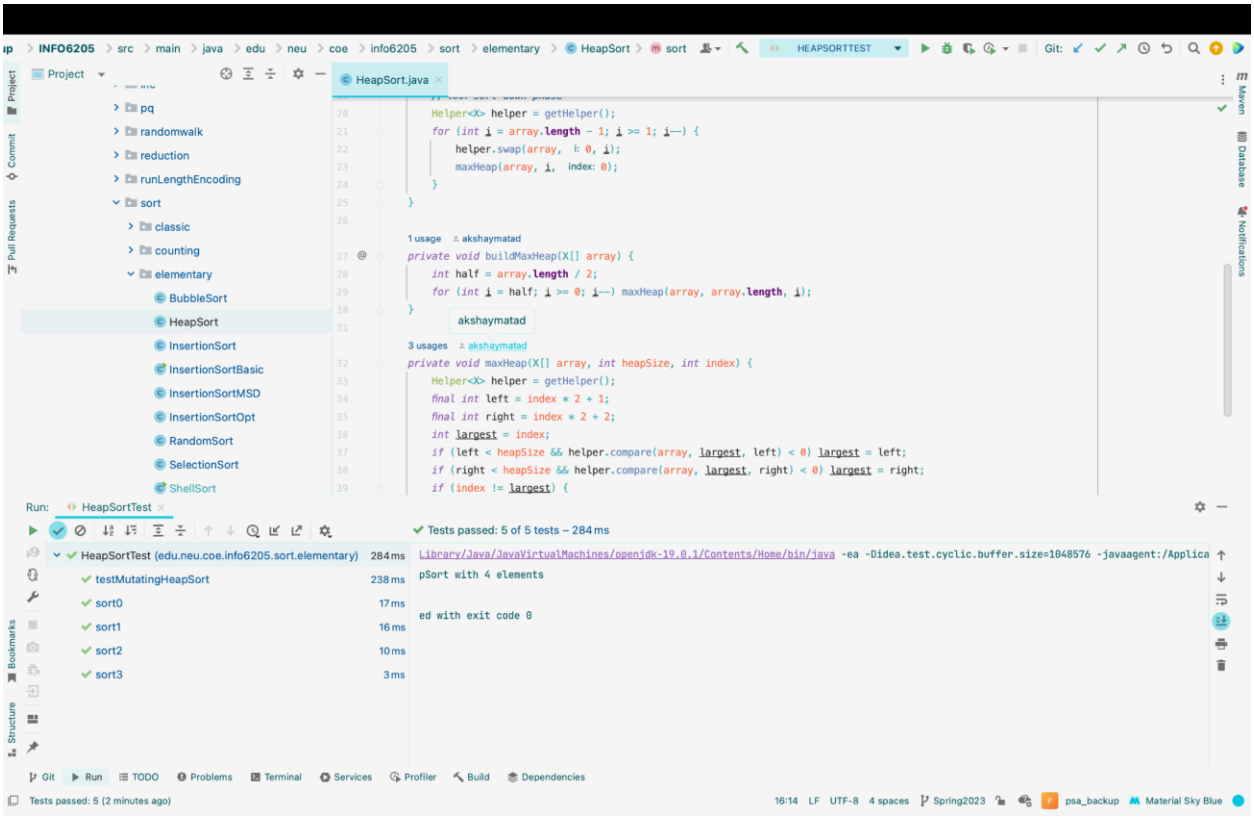
Dependencies
Material Sky Blue Enabled (today 6:38 PM)
378:1 LF UTF-8 4 spaces Spring2023

Test Cases


INFO6205 > src > main > java > edu > neu > coe > info6205 > sort > elementary > HeapSort > sort
HEAPSORTTEST
Git:
Project
HeapSort.java
pq
randomwalk
reduction
runLengthEncoding
sort
classic
counting
elementary
BubbleSort
HeapSort
InsertionSort
InsertionSortBasic
InsertionSortMSD
InsertionSortOpt
RandomSort
SelectionSort
ShellSort
Helper<X> helper = getHelper();
for (int i = array.length - 1; i >= 1; i--) {
helper.swap(array, i: 0, i);
maxHeap(array, i, index: 0);
}
}
1 usage akshaymatad
private void buildMaxHeap(X[] array) {
int half = array.length / 2;
for (int i = half; i >= 0; i--) maxHeap(array, array.length, i);
}
akshaymatad
3 usages akshaymatad
private void maxHeap(X[] array, int heapSize, int index) {
Helper<X> helper = getHelper();
final int left = index * 2 + 1;
final int right = index * 2 + 2;
int largest = index;
if (left < heapSize && helper.compare(array, largest, left) < 0) largest = left;
if (right < heapSize && helper.compare(array, largest, right) < 0) largest = right;
if (index != largest) {
Run: HeapSortTest
Tests passed: 5 of 5 tests – 284 ms
HeapSortTest (edu.neu.coe.info6205.sort.elementary) 284 ms
testMutatingHeapSort 238 ms
sort0 17 ms
sort1 16 ms
sort2 10 ms
sort3 3 ms
Library/Java/JavaVirtualMachines/openjdk-19.0.1/Contents/Home/bin/java -ea -Didea.test.cyclic.buffer.size=1048576 -javaagent:/Applica
pSort with 4 elements
ed with exit code 0
Git
Run
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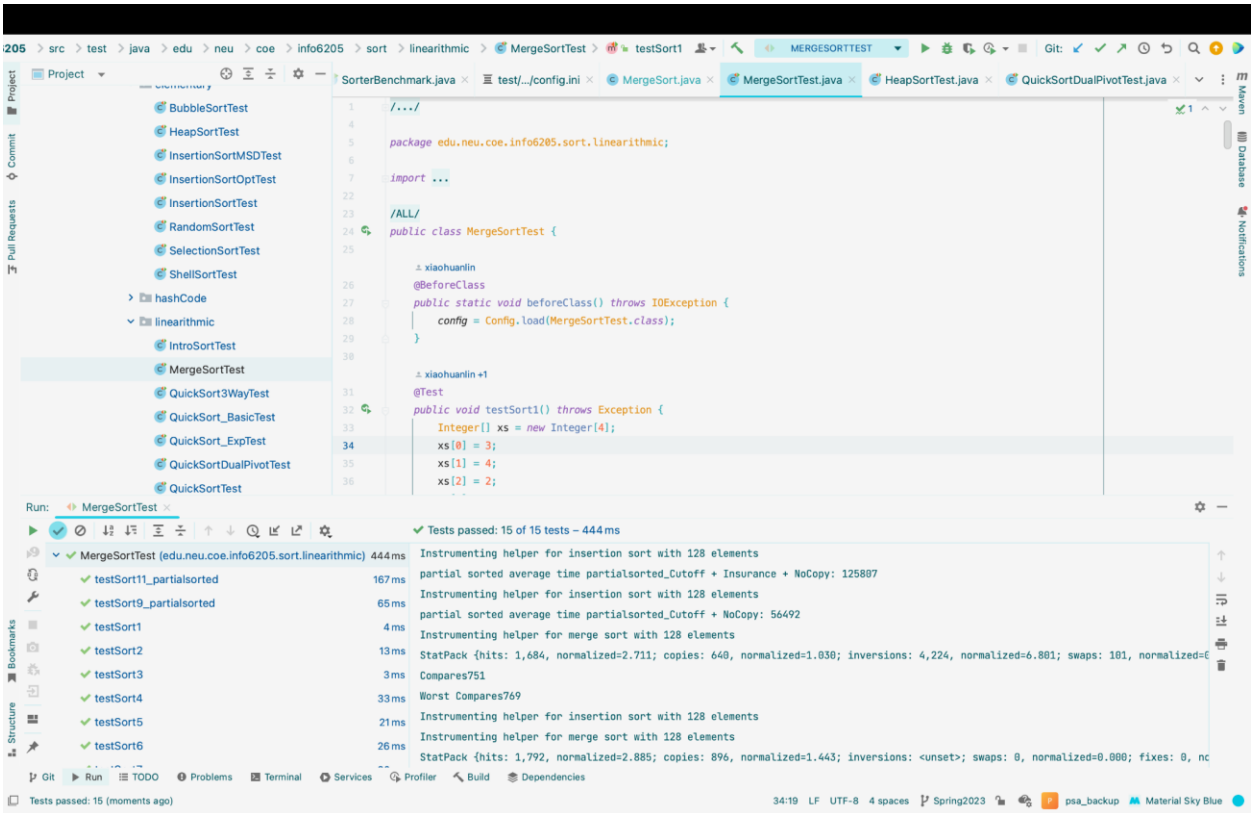
Problems
Terminal
Services
Profiler
Build
Dependencies
Tests passed: 5 (2 minutes ago)
16:14 LF UTF-8 4 spaces Spring2023 psa_backup Material Sky Blue


205 > src > test > java > edu > neu > coe > info6205 > sort > linearithmic > MergeSortTest > testSort1
MERGESORTTEST
Git:
Project
SorterBenchmark.java
test/.../config.ini
MergeSort.java
MergeSortTest.java
HeapSortTest.java
QuickSortDualPivotTest.java
BubbleSortTest
HeapSortTest
InsertionSortMSDTest
InsertionSortOptTest
InsertionSortTest
RandomSortTest
SelectionSortTest
ShellSortTest
hashCode
linearithmic
IntroSortTest
MergeSortTest
QuickSort3WayTest
QuickSort_BasicTest
QuickSort_ExpTest
QuickSortDualPivotTest
QuickSortTest
/.../
package edu.neu.coe.info6205.sort.linearithmic;
import ...
/ALL/
public class MergeSortTest {
xiaohuanlin
@BeforeClass
public static void beforeClass() throws IOException {
config = Config.load(MergeSortTest.class);
}
xiaohuanlin +1
@Test
public void testSort1() throws Exception {
Integer[] xs = new Integer[4];
xs[0] = 3;
xs[1] = 4;
xs[2] = 2;
Run: MergeSortTest
Tests passed: 15 of 15 tests – 444 ms
MergeSortTest (edu.neu.coe.info6205.sort.linearithmic) 444 ms
testSort11_partialsorted 167 ms
testSort9_partialsorted 65 ms
testSort1 4 ms
testSort2 13 ms
testSort3 3 ms
testSort4 33 ms
testSort5 21 ms
testSort6 26 ms
Instrumenting helper for insertion sort with 128 elements
partial sorted average time partialsorted_Cutoff + Insurance + NoCopy: 125807
Instrumenting helper for insertion sort with 128 elements
partial sorted average time partialsorted_Cutoff + NoCopy: 56492
Instrumenting helper for merge sort with 128 elements
StatPack {hits: 1,684, normalized=2.711; copies: 640, normalized=1.030; inversions: 4,224, normalized=6.801; swaps: 101, normalized=
Compares751
Worst Compares769
Instrumenting helper for insertion sort with 128 elements
Instrumenting helper for merge sort with 128 elements
StatPack {hits: 1,792, normalized=2.885; copies: 896, normalized=1.443; inversions: <unset>; swaps: 0, normalized=0.000; fixes: 0, nc
Git
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TODO
Problems
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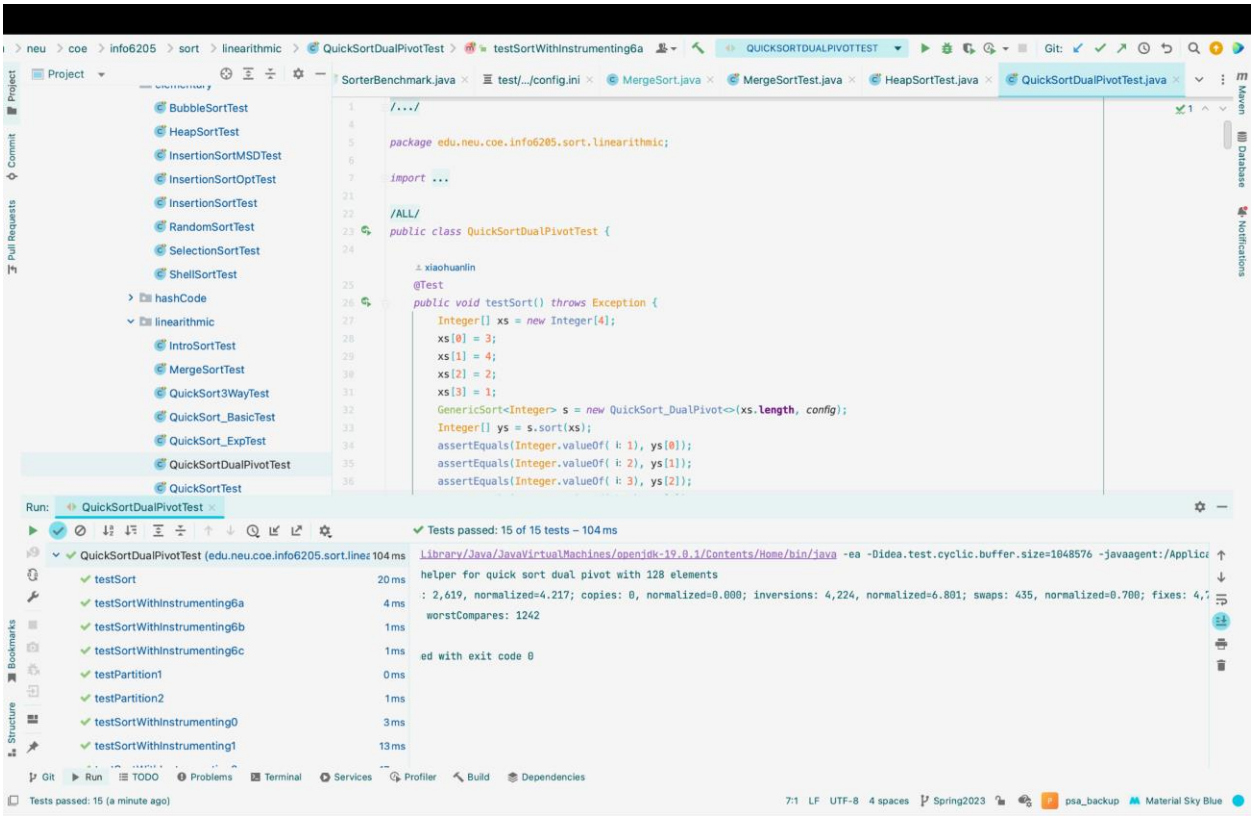
Dependencies
Tests passed: 15 (moments ago)
34:19 LF UTF-8 4 spaces Spring2023 psa_backup Material Sky Blue


neu > coe > info6205 > sort > linearithmic > QuickSortDualPivotTest > testSortWithInstrumenting6a
QUICKSORTDUALPIVOTTEST
Git:
Project
BubbleSortTest
HeapSortTest
InsertionSortMSDTest
InsertionSortOptTest
InsertionSortTest
RandomSortTest
SelectionSortTest
ShellSortTest
hashCode
linearithmic
IntroSortTest
MergeSortTest
QuickSort3WayTest
QuickSort_BasicTest
QuickSort_ExpTest
QuickSortDualPivotTest
QuickSortTest
SorterBenchmark.java
test/.../config.ini
MergeSort.java
MergeSortTest.java
HeapSortTest.java
QuickSortDualPivotTest.java
/.../
package edu.neu.coe.info6205.sort.linearithmic;
import ...
/ALL/
public class QuickSortDualPivotTest {
xiaohuanlin
@Test
public void testSort() throws Exception {
Integer[] xs = new Integer[4];
xs[0] = 3;
xs[1] = 4;
xs[2] = 2;
xs[3] = 1;
GenericSort<Integer> s = new QuickSort_DualPivot<>(xs.length, config);
Integer[] ys = s.sort(xs);
assertEquals(Integer.valueOf(i: 1), ys[0]);
assertEquals(Integer.valueOf(i: 2), ys[1]);
assertEquals(Integer.valueOf(i: 3), ys[2]);
Run:
QuickSortDualPivotTest
Tests passed: 15 of 15 tests – 104 ms
QuickSortDualPivotTest (edu.neu.coe.info6205.sort.linea 104 ms
testSort 20 ms
testSortWithInstrumenting6a 4 ms
testSortWithInstrumenting6b 1 ms
testSortWithInstrumenting6c 1 ms
testPartition1 0 ms
testPartition2 1 ms
testSortWithInstrumenting0 3 ms
testSortWithInstrumenting1 13 ms
Library/Java/JavaVirtualMachines/openjdk-19.0.1/Contents/Home/bin/java -ea -Didea.test.cyclic.buffer.size=1048576 -javaagent:/Applica
helper for quick sort dual pivot with 128 elements
: 2,619, normalized=4.217; copies: 0, normalized=0.000; inversions: 4,224, normalized=6.801; swaps: 435, normalized=0.700; fixes: 4,7
worstCompares: 1242
ed with exit code 0
Git
Run
TODO
Problems
Terminal
Services
Profiler
Build
Dependencies
Tests passed: 15 (a minute ago)
7:1 LF UTF-8 4 spaces Spring2023
psa_backup
Material Sky Blue