Program Structures and Algorithms
Spring 2023(SEC –03)

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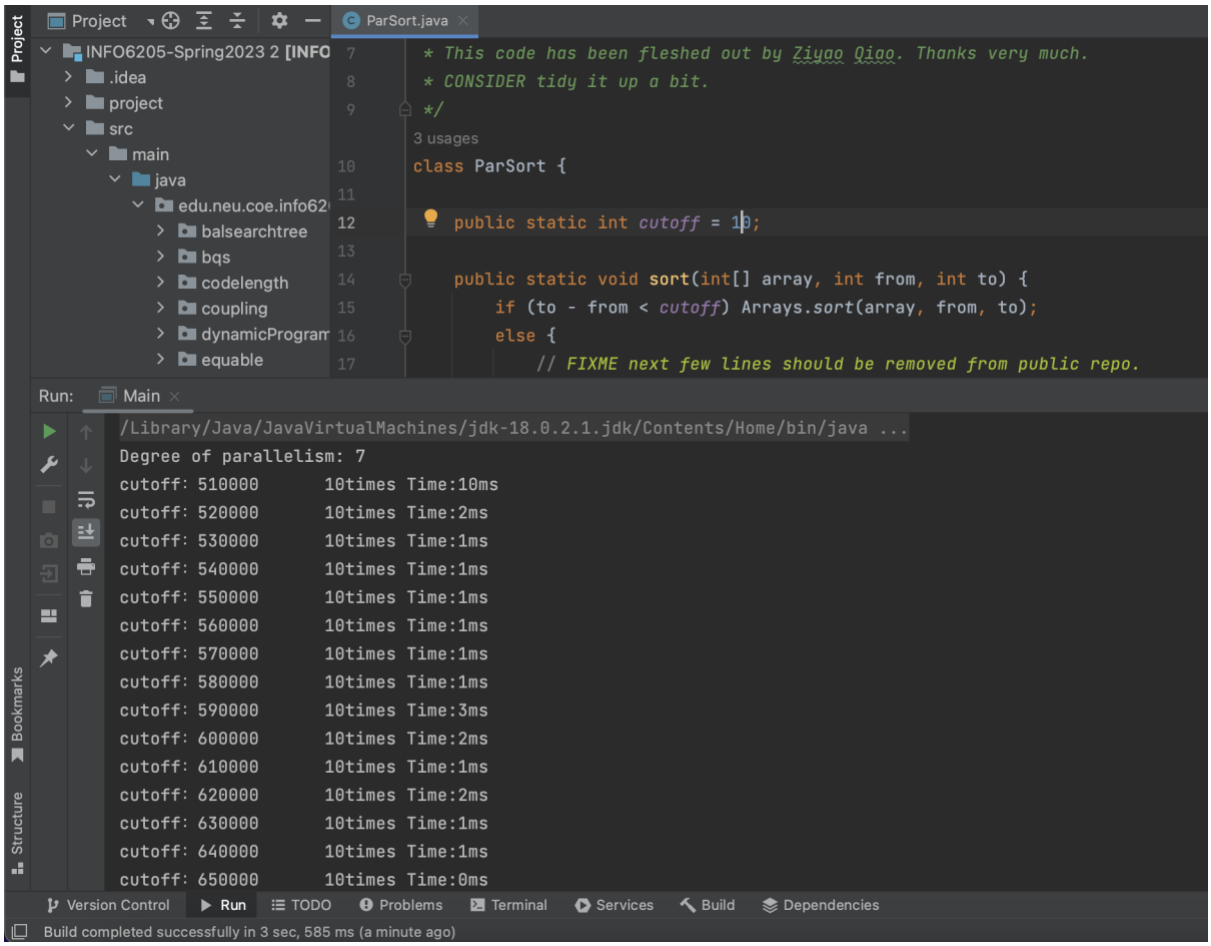
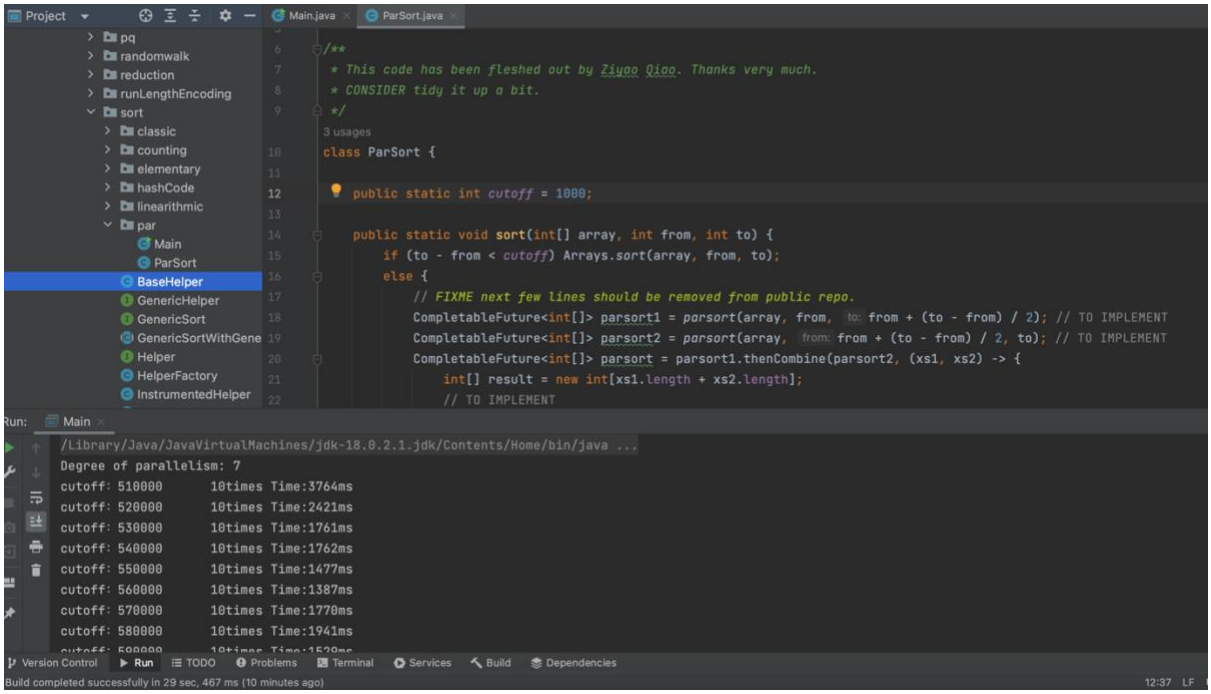
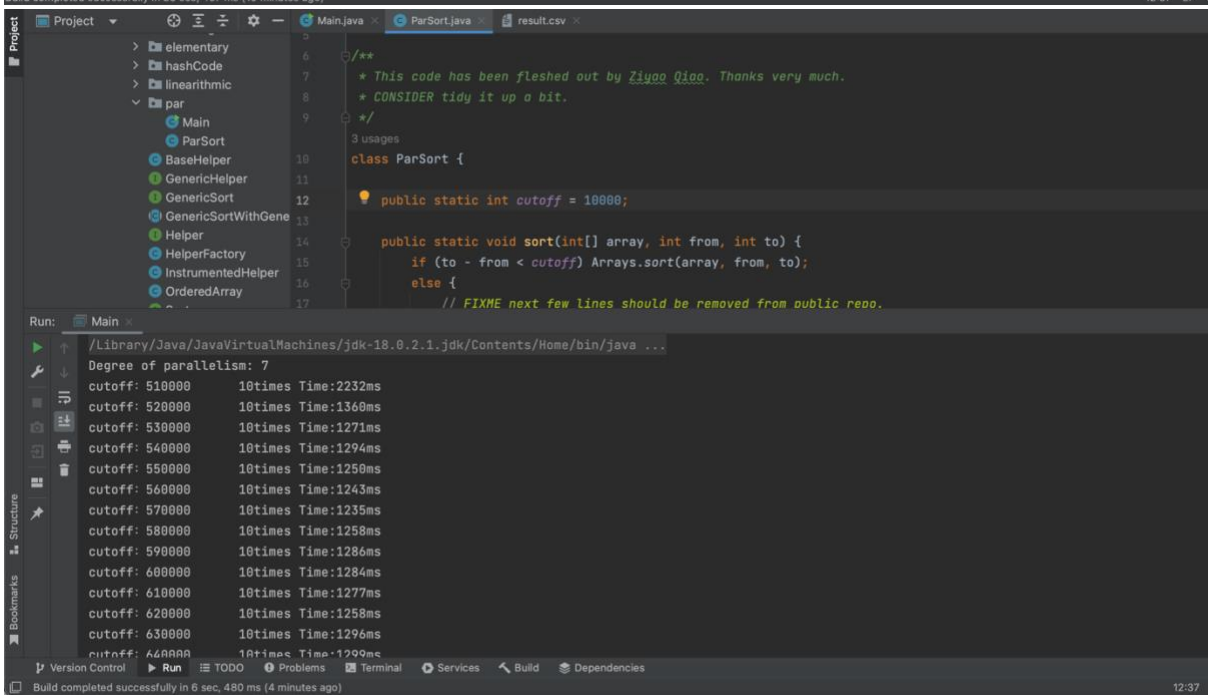
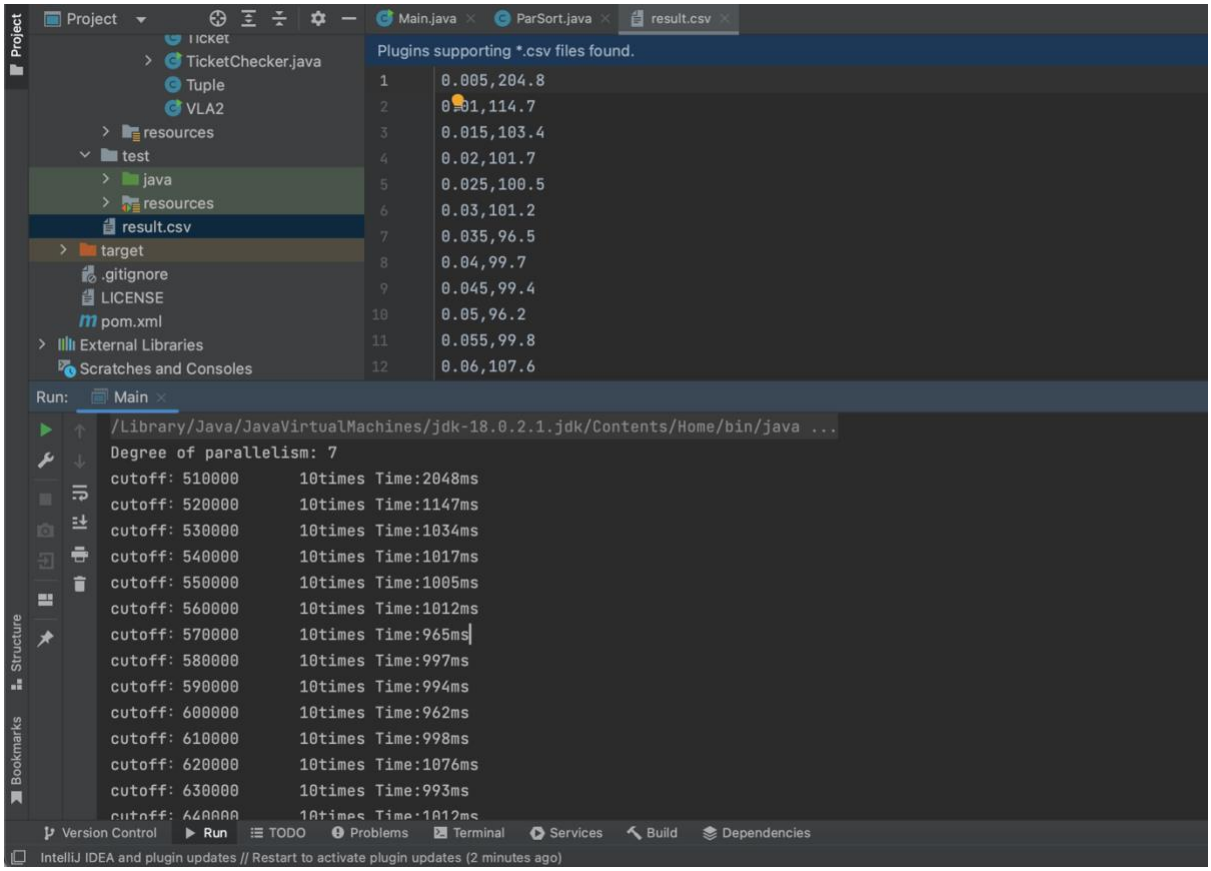
**Task: Assignment 5 (Benchmark)**

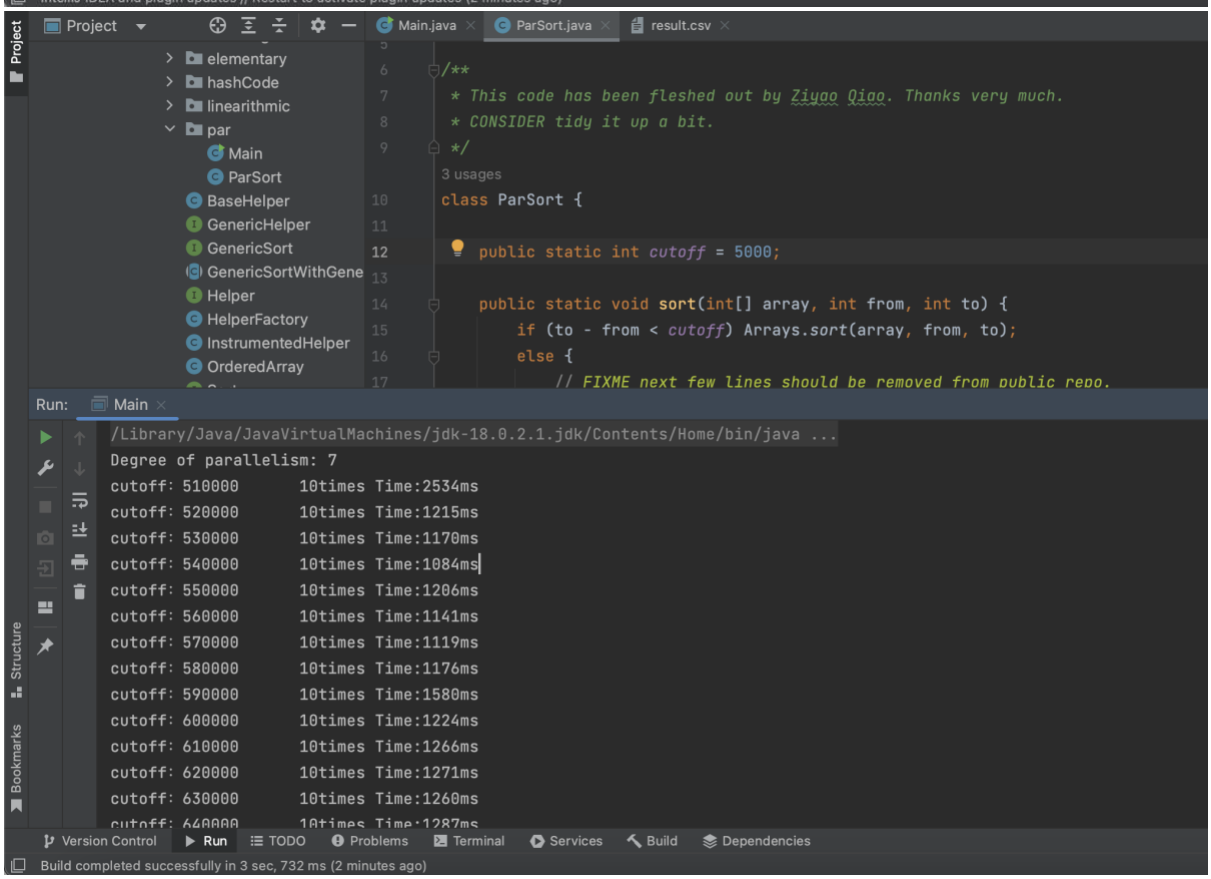
**Unit Test Screenshots:**

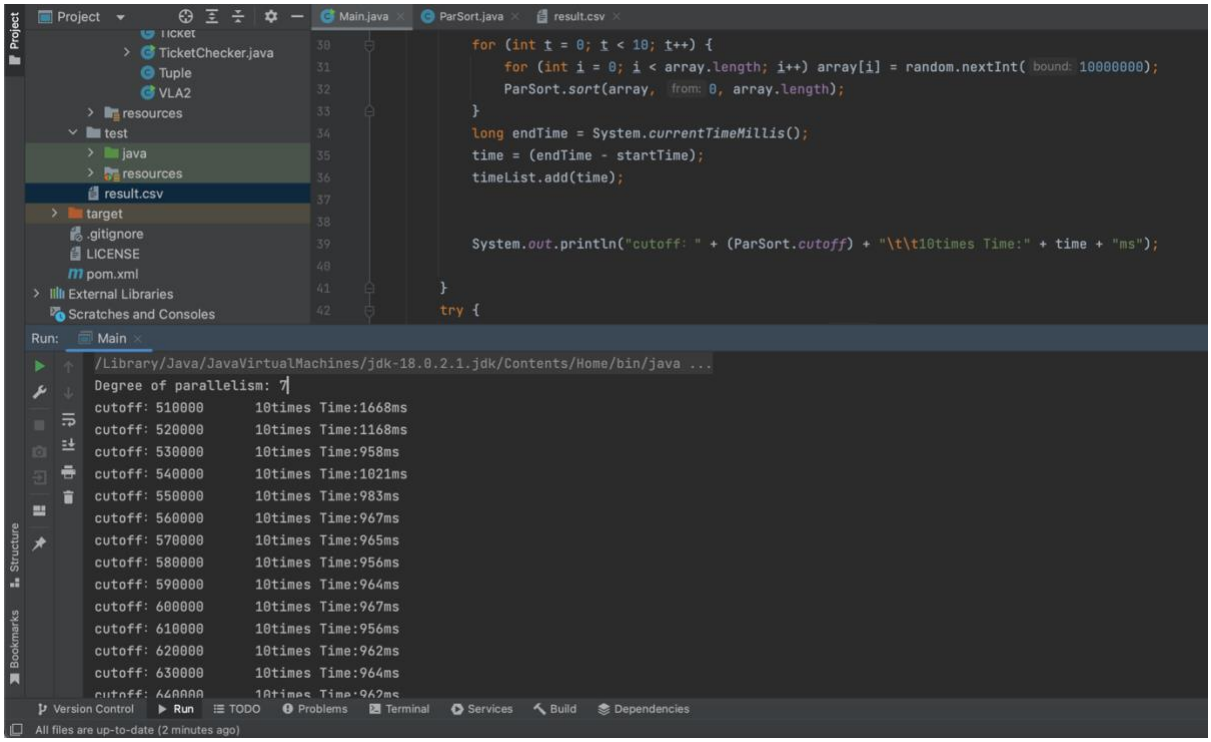


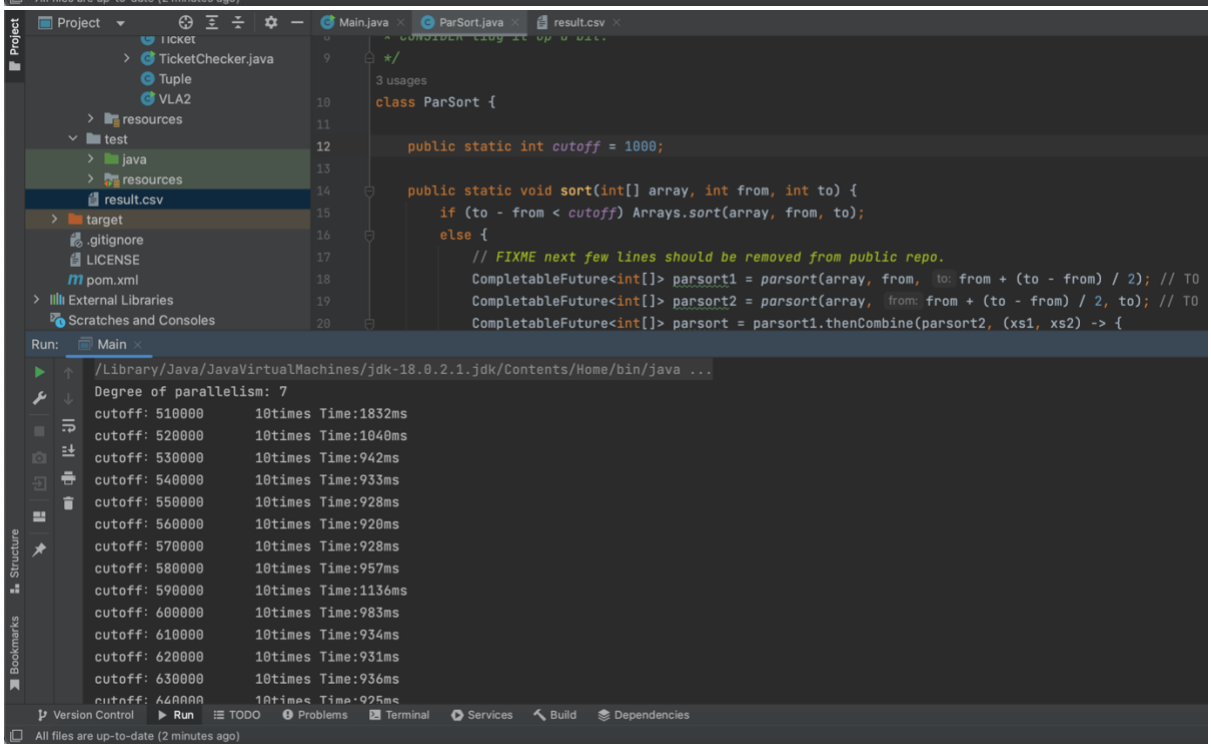

Project
Main.java
ParSort.java
pq
randomwalk
reduction
runLengthEncoding
sort
classic
counting
elementary
hashCode
linearithmic
par
Main
ParSort
BaseHelper
GenericHelper
GenericSort
GenericSortWithGene
Helper
HelperFactory
InstrumentedHelper
/**
* This code has been fleshed out by Ziyao Qiao. Thanks very much.
* CONSIDER tidy it up a bit.
*/
3 usages
class ParSort {
public static int cutoff = 1000;
public static void sort(int[] array, int from, int to) {
if (to - from < cutoff) Arrays.sort(array, from, to);
else {
// FIXME next few lines should be removed from public repo.
CompletableFuture<int[]> parsort1 = parsort(array, from, to: from + (to - from) / 2); // TO IMPLEMENT
CompletableFuture<int[]> parsort2 = parsort(array, from: from + (to - from) / 2, to); // TO IMPLEMENT
CompletableFuture<int[]> parsort = parsort1.thenCombine(parsort2, (xs1, xs2) -> {
int[] result = new int[xs1.length + xs2.length];
// TO IMPLEMENT
Run:
Main
/Library/Java/JavaVirtualMachines/jdk-18.0.2.1.jdk/Contents/Home/bin/java ...
Degree of parallelism: 7
cutoff: 510000 10times Time:3764ms
cutoff: 520000 10times Time:2421ms
cutoff: 530000 10times Time:1761ms
cutoff: 540000 10times Time:1762ms
cutoff: 550000 10times Time:1477ms
cutoff: 560000 10times Time:1387ms
cutoff: 570000 10times Time:1770ms
cutoff: 580000 10times Time:1941ms
Version Control
Run
TODO
Problems
Terminal
Services
Build
Dependencies
Build completed successfully in 29 sec, 467 ms (10 minutes ago)
12:37
LF


Project
Main.java
ParSort.java
result.csv
elementary
hashCode
linearithmic
par
Main
ParSort
BaseHelper
GenericHelper
GenericSort
GenericSortWithGene
Helper
HelperFactory
InstrumentedHelper
OrderedArray
/**
* This code has been fleshed out by Ziyao Qiao. Thanks very much.
* CONSIDER tidy it up a bit.
*/
3 usages
class ParSort {
public static int cutoff = 10000;
public static void sort(int[] array, int from, int to) {
if (to - from < cutoff) Arrays.sort(array, from, to);
else {
// FIXME next few lines should be removed from public repo.
Run:
Main
/Library/Java/JavaVirtualMachines/jdk-18.0.2.1.jdk/Contents/Home/bin/java ...
Degree of parallelism: 7
cutoff: 510000 10times Time:2232ms
cutoff: 520000 10times Time:1360ms
cutoff: 530000 10times Time:1271ms
cutoff: 540000 10times Time:1294ms
cutoff: 550000 10times Time:1250ms
cutoff: 560000 10times Time:1243ms
cutoff: 570000 10times Time:1235ms
cutoff: 580000 10times Time:1258ms
cutoff: 590000 10times Time:1286ms
cutoff: 600000 10times Time:1284ms
cutoff: 610000 10times Time:1277ms
cutoff: 620000 10times Time:1258ms
cutoff: 630000 10times Time:1296ms
Structure
Bookmarks
Version Control
Run
TODO
Problems
Terminal
Services
Build
Dependencies
Build completed successfully in 6 sec, 480 ms (4 minutes ago)
12:37


Project
Main.java
ParSort.java
result.csv
Plugins supporting *.csv files found.
TicketChecker.java
Tuple
VLA2
resources
test
java
resources
result.csv
target
.gitignore
LICENSE
pom.xml
External Libraries
Scratches and Consoles
0.005,204.8
0.01,114.7
0.015,103.4
0.02,101.7
0.025,100.5
0.03,101.2
0.035,96.5
0.04,99.7
0.045,99.4
0.05,96.2
0.055,99.8
0.06,107.6
Run:
Main
/Library/Java/JavaVirtualMachines/jdk-18.0.2.1.jdk/Contents/Home/bin/java ...
Degree of parallelism: 7
cutoff: 510000 10times Time:2048ms
cutoff: 520000 10times Time:1147ms
cutoff: 530000 10times Time:1034ms
cutoff: 540000 10times Time:1017ms
cutoff: 550000 10times Time:1005ms
cutoff: 560000 10times Time:1012ms
cutoff: 570000 10times Time:965ms
cutoff: 580000 10times Time:997ms
cutoff: 590000 10times Time:994ms
cutoff: 600000 10times Time:962ms
cutoff: 610000 10times Time:998ms
cutoff: 620000 10times Time:1076ms
cutoff: 630000 10times Time:993ms
Version Control
Run
TODO
Problems
Terminal
Services
Build
Dependencies
IntelliJ IDEA and plugin updates // Restart to activate plugin updates (2 minutes ago)


Project
Main.java
ParSort.java
result.csv
elementary
hashCode
linearithmic
par
Main
ParSort
BaseHelper
GenericHelper
GenericSort
GenericSortWithGene
Helper
HelperFactory
InstrumentedHelper
OrderedArray
/**
* This code has been fleshed out by Ziyao Qiao. Thanks very much.
* CONSIDER tidy it up a bit.
*/
3 usages
class ParSort {
public static int cutoff = 5000;
public static void sort(int[] array, int from, int to) {
if (to - from < cutoff) Arrays.sort(array, from, to);
else {
// FIXME next few lines should be removed from public repo.
Run:
Main
/Library/Java/JavaVirtualMachines/jdk-18.0.2.1.jdk/Contents/Home/bin/java ...
Degree of parallelism: 7
cutoff: 510000 10times Time:2534ms
cutoff: 520000 10times Time:1215ms
cutoff: 530000 10times Time:1170ms
cutoff: 540000 10times Time:1084ms
cutoff: 550000 10times Time:1206ms
cutoff: 560000 10times Time:1141ms
cutoff: 570000 10times Time:1119ms
cutoff: 580000 10times Time:1176ms
cutoff: 590000 10times Time:1580ms
cutoff: 600000 10times Time:1224ms
cutoff: 610000 10times Time:1266ms
cutoff: 620000 10times Time:1271ms
cutoff: 630000 10times Time:1260ms
Version Control
Run
TODO
Problems
Terminal
Services
Build
Dependencies
Build completed successfully in 3 sec, 732 ms (2 minutes ago)




Observation:

I implemented the parallel sorting algorithm using cutoff. For the cutoff scheme, I used different cutoff values ranging from 100 to 10000. For each experiment, I generated an array of random integers and sorted it using the parallel sorting algorithm. It is observed that the degree of parallelism is same in all cases. Also, the time taken is not same all the time even though the cutoff value is same.