Assignment 5:
Parallel Sort

Task:

To implement merge sort but sorting the subarrays in parallel and to find out optimal values for cutoff and thread count.

Conclusion:

Unfortunately, my program is not running for arrays with size greater than 100, so, I'm going to mention my limited observations.

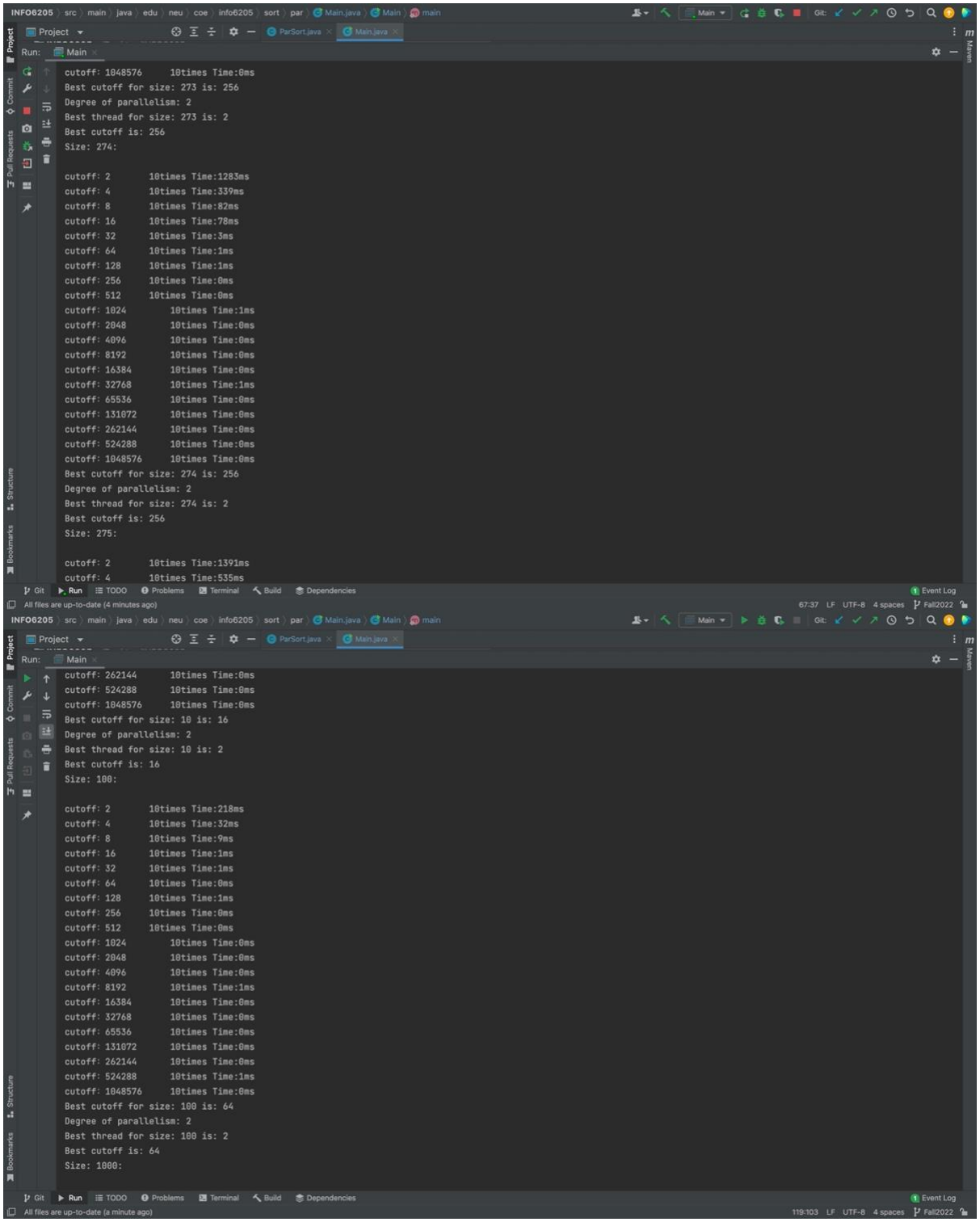
For size 100, a cutoff of 32, 64 and greater values seemed to work best. However, we don't have subarrays with size 64 for an array size 100, so the best cutoff seems to be 32.

For size 274, the best cutoff seemed to be 64.

This is surprising since in the Merge Sort lecture, I remember the best cutoff being said to be 7.

Evidence:

Since my program wasn't working for larger sizes, I'd be posting incomplete screenshots.


INFO6205 src main java edu neu coe info6205 sort par Main.java Main main
Project
ParSort.java
Main.java
Run: Main
cutoff: 1048576 10times Time:0ms
Best cutoff for size: 273 is: 256
Degree of parallelism: 2
Best thread for size: 273 is: 2
Best cutoff is: 256
Size: 274:
cutoff: 2 10times Time:1283ms
cutoff: 4 10times Time:339ms
cutoff: 8 10times Time:82ms
cutoff: 16 10times Time:78ms
cutoff: 32 10times Time:3ms
cutoff: 64 10times Time:1ms
cutoff: 128 10times Time:1ms
cutoff: 256 10times Time:0ms
cutoff: 512 10times Time:0ms
cutoff: 1024 10times Time:1ms
cutoff: 2048 10times Time:0ms
cutoff: 4096 10times Time:0ms
cutoff: 8192 10times Time:0ms
cutoff: 16384 10times Time:0ms
cutoff: 32768 10times Time:1ms
cutoff: 65536 10times Time:0ms
cutoff: 131072 10times Time:0ms
cutoff: 262144 10times Time:0ms
cutoff: 524288 10times Time:0ms
cutoff: 1048576 10times Time:0ms
Best cutoff for size: 274 is: 256
Degree of parallelism: 2
Best thread for size: 274 is: 2
Best cutoff is: 256
Size: 275:
cutoff: 2 10times Time:1391ms
cutoff: 4 10times Time:535ms
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Event Log
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INFO6205 src main java edu neu coe info6205 sort par Main.java Main main
Project
ParSort.java
Main.java
Run: Main
cutoff: 262144 10times Time:0ms
cutoff: 524288 10times Time:0ms
cutoff: 1048576 10times Time:0ms
Best cutoff for size: 10 is: 16
Degree of parallelism: 2
Best thread for size: 10 is: 2
Best cutoff is: 16
Size: 100:
cutoff: 2 10times Time:218ms
cutoff: 4 10times Time:32ms
cutoff: 8 10times Time:9ms
cutoff: 16 10times Time:1ms
cutoff: 32 10times Time:1ms
cutoff: 64 10times Time:0ms
cutoff: 128 10times Time:1ms
cutoff: 256 10times Time:0ms
cutoff: 512 10times Time:0ms
cutoff: 1024 10times Time:0ms
cutoff: 2048 10times Time:0ms
cutoff: 4096 10times Time:0ms
cutoff: 8192 10times Time:1ms
cutoff: 16384 10times Time:0ms
cutoff: 32768 10times Time:0ms
cutoff: 65536 10times Time:0ms
cutoff: 131072 10times Time:0ms
cutoff: 262144 10times Time:0ms
cutoff: 524288 10times Time:1ms
cutoff: 1048576 10times Time:0ms
Best cutoff for size: 100 is: 64
Degree of parallelism: 2
Best thread for size: 100 is: 2
Best cutoff is: 64
Size: 1000:
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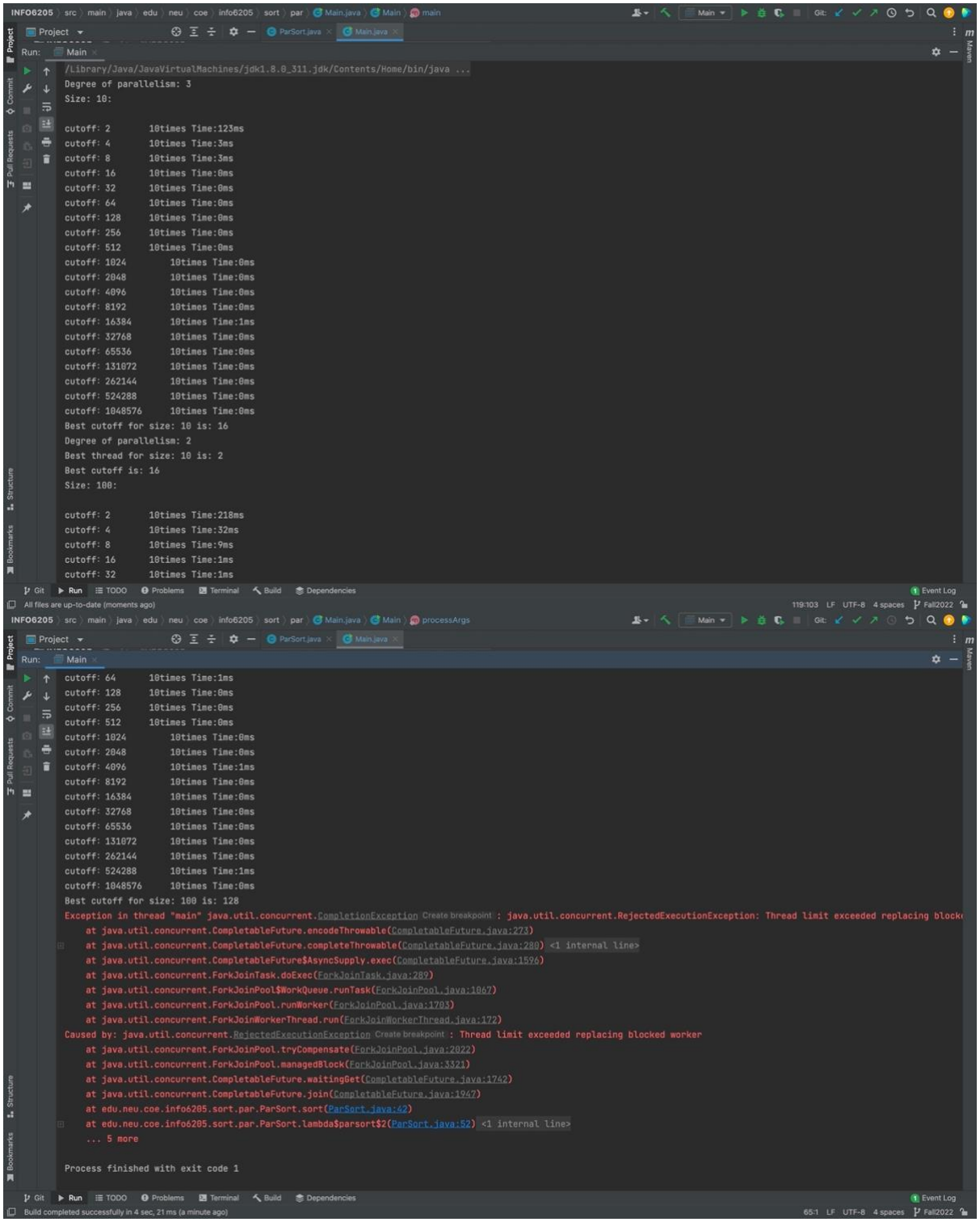
INFO6205 src main java edu neu coe info6205 sort par Main.java Main main
Project
ParSort.java
Main.java
Run: Main
/Library/Java/JavaVirtualMachines/jdk1.8.0_311.jdk/Contents/Home/bin/java ...
Degree of parallelism: 3
Size: 10:
cutoff: 2 10times Time:123ms
cutoff: 4 10times Time:3ms
cutoff: 8 10times Time:3ms
cutoff: 16 10times Time:0ms
cutoff: 32 10times Time:0ms
cutoff: 64 10times Time:0ms
cutoff: 128 10times Time:0ms
cutoff: 256 10times Time:0ms
cutoff: 512 10times Time:0ms
cutoff: 1024 10times Time:0ms
cutoff: 2048 10times Time:0ms
cutoff: 4096 10times Time:0ms
cutoff: 8192 10times Time:0ms
cutoff: 16384 10times Time:1ms
cutoff: 32768 10times Time:0ms
cutoff: 65536 10times Time:0ms
cutoff: 131072 10times Time:0ms
cutoff: 262144 10times Time:0ms
cutoff: 524288 10times Time:0ms
cutoff: 1048576 10times Time:0ms
Best cutoff for size: 10 is: 16
Degree of parallelism: 2
Best thread for size: 10 is: 2
Best cutoff is: 16
Size: 100:
cutoff: 2 10times Time:218ms
cutoff: 4 10times Time:32ms
cutoff: 8 10times Time:9ms
cutoff: 16 10times Time:1ms
cutoff: 32 10times Time:1ms
Git Run TODO Problems Terminal Build Dependencies Event Log
All files are up-to-date (moments ago)
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INFO6205 src main java edu neu coe info6205 sort par Main.java Main processArgs
Project
ParSort.java
Main.java
Run: Main
cutoff: 64 10times Time:1ms
cutoff: 128 10times Time:0ms
cutoff: 256 10times Time:0ms
cutoff: 512 10times Time:0ms
cutoff: 1024 10times Time:0ms
cutoff: 2048 10times Time:0ms
cutoff: 4096 10times Time:1ms
cutoff: 8192 10times Time:0ms
cutoff: 16384 10times Time:0ms
cutoff: 32768 10times Time:0ms
cutoff: 65536 10times Time:0ms
cutoff: 131072 10times Time:0ms
cutoff: 262144 10times Time:0ms
cutoff: 524288 10times Time:1ms
cutoff: 1048576 10times Time:0ms
Best cutoff for size: 100 is: 128
Exception in thread "main" java.util.concurrent.CompletionException Create breakpoint : java.util.concurrent.RejectedExecutionException: Thread limit exceeded replacing block
at java.util.concurrent.CompletableFuture.encodeThrowable(CompletableFuture.java:273)
at java.util.concurrent.CompletableFuture.completeThrowable(CompletableFuture.java:280) <1 internal line>
at java.util.concurrent.CompletableFuture$AsyncSupply.exec(CompletableFuture.java:1596)
at java.util.concurrent.ForkJoinTask.doExec(ForkJoinTask.java:289)
at java.util.concurrent.ForkJoinPool$WorkQueue.runTask(ForkJoinPool.java:1067)
at java.util.concurrent.ForkJoinPool.runWorker(ForkJoinPool.java:1703)
at java.util.concurrent.ForkJoinWorkerThread.run(ForkJoinWorkerThread.java:172)
Caused by: java.util.concurrent.RejectedExecutionException Create breakpoint : Thread limit exceeded replacing blocked worker
at java.util.concurrent.ForkJoinPool.tryCompensate(ForkJoinPool.java:2022)
at java.util.concurrent.ForkJoinPool.managedBlock(ForkJoinPool.java:3321)
at java.util.concurrent.CompletableFuture.waitingGet(CompletableFuture.java:1742)
at java.util.concurrent.CompletableFuture.join(CompletableFuture.java:1947)
at edu.neu.coe.info6205.sort.par.ParSort.sort(ParSort.java:42)
at edu.neu.coe.info6205.sort.par.ParSort.lambda$parsort$2(ParSort.java:52) <1 internal line>
... 5 more
Process finished with exit code 1
Git Run TODO Problems Terminal Build Dependencies Event Log
Build completed successfully in 4 sec, 21 ms (a minute ago)
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