

CC371: Analysis and Design of Algorithms
Bonus Programming Assignment

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Part 1 Selection Algorithms

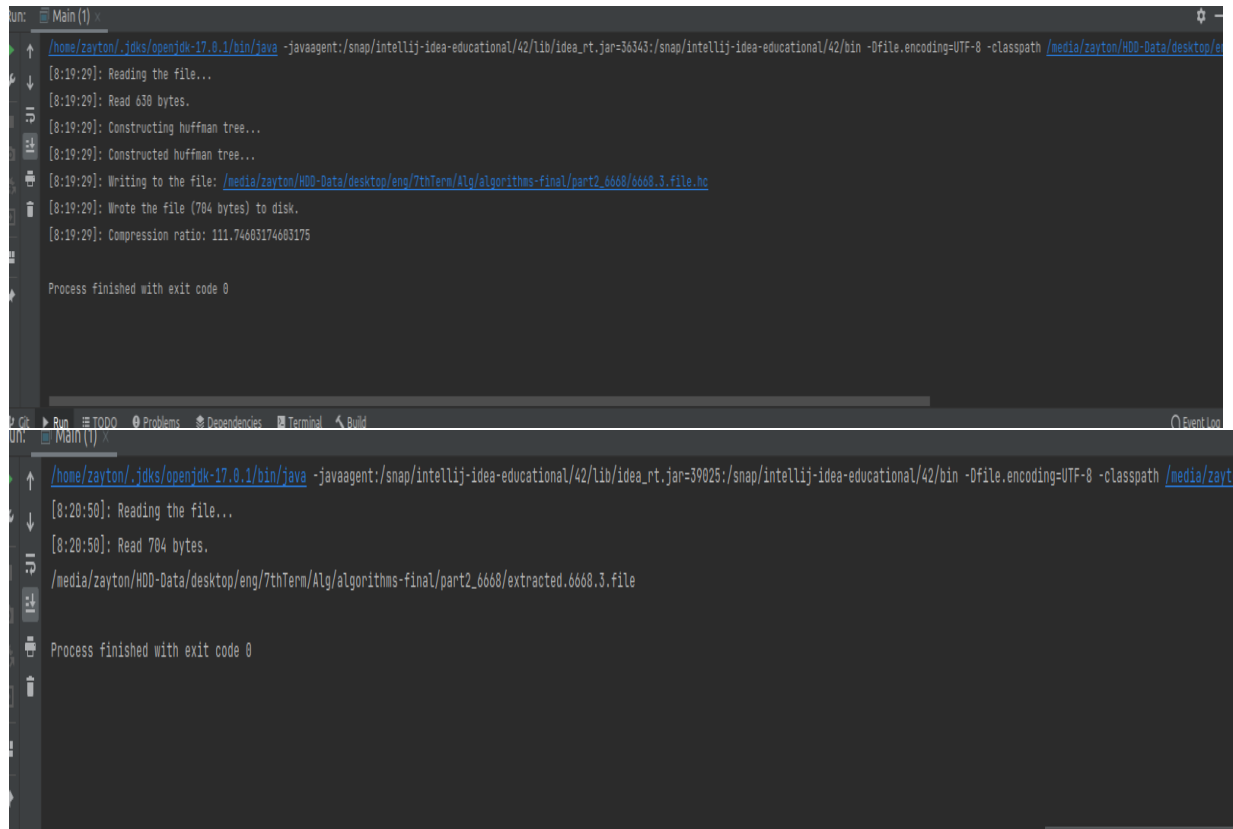
Benchmark	Mode	Cnt	Score	Error	Units
Benchmarks1000.sort1000_medianOfMedians	avgt		24475.460		ns/op
Benchmarks1000.sort1000_naive	avgt		24766.459		ns/op
Benchmarks1000.sort1000_randomized	avgt		8162.536		ns/op
Benchmarks10000.sort10000_medianOfMedians	avgt		258028.728		ns/op
Benchmarks10000.sort10000_naive	avgt		381181.582		ns/op
Benchmarks10000.sort10000_randomized	avgt		83585.125		ns/op
Benchmarks100000.sort100000_medianOfMedians	avgt		2523442.454		ns/op
Benchmarks100000.sort100000_naive	avgt		4219847.385		ns/op
Benchmarks100000.sort100000_randomized	avgt		712522.107		ns/op
Benchmarks1000000.sort1000000_medianOfMedians	avgt		25336915.634		ns/op
Benchmarks1000000.sort1000000_naive	avgt		51022454.945		ns/op
Benchmarks1000000.sort1000000_randomized	avgt		8103038.875		ns/op
Benchmarks10000000.sort10000000_medianOfMedians	avgt		253394782.353		ns/op
Benchmarks10000000.sort10000000_naive	avgt		570676564.706		ns/op
Benchmarks10000000.sort10000000_randomized	avgt		71766659.551		ns/op

Figure 1.1

- Randomized Median algorithm runs faster than the others as shown in figure 1.1

Part 2 Huffman Compression and Decompression

Insert n = 3 byte



The screenshot shows an IDE terminal with two execution logs. The top log shows a compression process where a file of 630 bytes is read, a Huffman tree is constructed, and a 704-byte file is written to disk. The compression ratio is 111.74683174683175. The bottom log shows a decompression process where the 704-byte file is read and its contents are extracted into a new file.

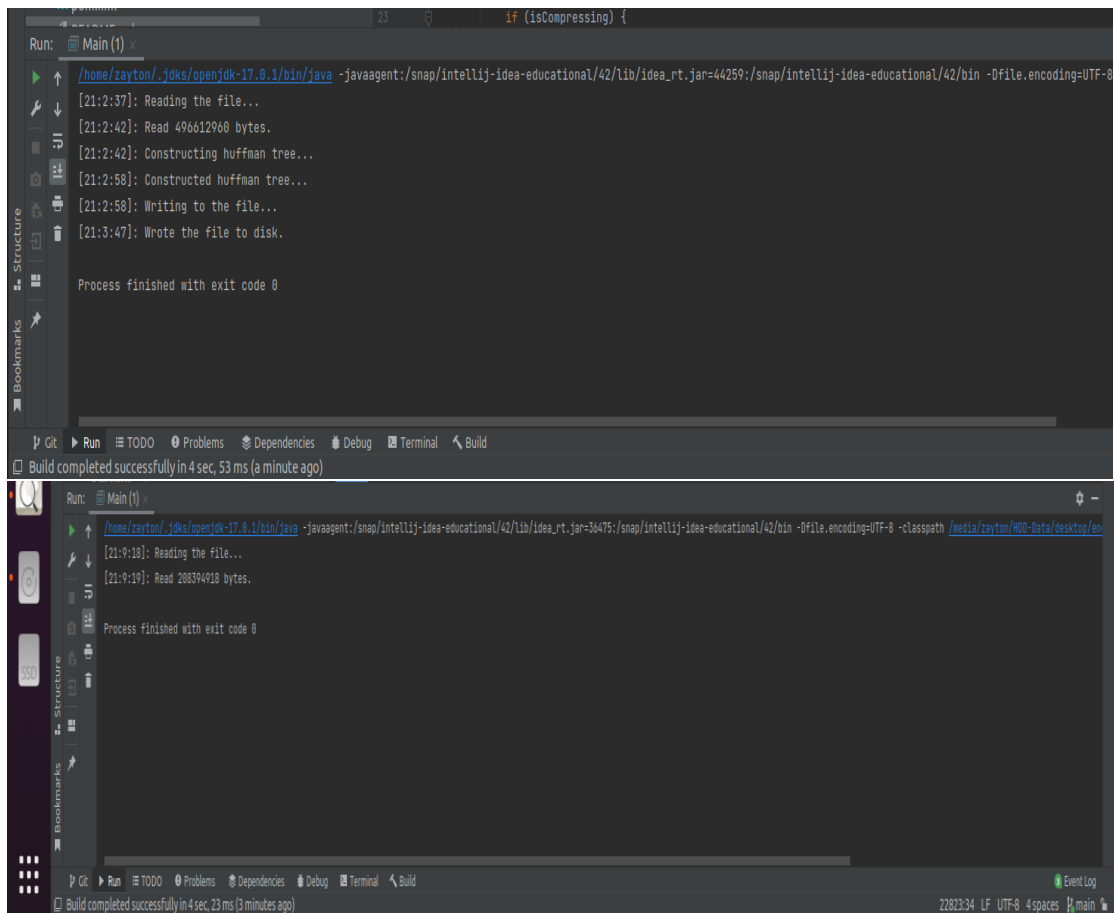
```
run: Main()
/home/zayton/.jdk/openjdk-17.0.1/bin/java -javaagent:/snap/intellij-idea-educational/42/lib/idea_rt.jar=36343:/snap/intellij-idea-educational/42/bin -Dfile.encoding=UTF-8 -classpath /media/zayton/HDD-Data/desktop/...
[8:19:29]: Reading the file...
[8:19:29]: Read 630 bytes.
[8:19:29]: Constructing huffman tree...
[8:19:29]: Constructed huffman tree...
[8:19:29]: Writing to the file: /media/zayton/HDD-Data/desktop/eng/7thTerm/Alg/algorithms-final/part2_6668/6668.3.file.bc
[8:19:29]: Wrote the file (704 bytes) to disk.
[8:19:29]: Compression ratio: 111.74683174683175

Process finished with exit code 0

run: Main()
/home/zayton/.jdk/openjdk-17.0.1/bin/java -javaagent:/snap/intellij-idea-educational/42/lib/idea_rt.jar=39825:/snap/intellij-idea-educational/42/bin -Dfile.encoding=UTF-8 -classpath /media/zayt...
[8:20:50]: Reading the file...
[8:20:50]: Read 704 bytes.
/media/zayton/HDD-Data/desktop/eng/7thTerm/Alg/algorithms-final/part2_6668/extracted.6668.3.file

Process finished with exit code 0
```

Insert n = 2 byte



Insert n = 5 byte

```
↑ /home/zayton/.jdk/openjdk-17.0.1/bin/java -javaagent:/snap/intellij-idea-educational/42/lib/idea_rt.jar=36077:/snap/intellij-idea-educational/42/bin -Dfile.encoding=UTF-8 -classpath /media/zayton/H...
↓ [8:24:12]: Reading the file...
[8:24:18]: Read 496612968 bytes.
[8:24:18]: Constructing huffman tree...
[8:24:46]: Constructed huffman tree...
[8:24:46]: Writing to the file: /media/zayton/HDD-Data/desktop/eng/7thTerm/Alg/algorithms-final/part2_6668/6668.5.f.seq.hc
[8:30:22]: Wrote the file (188661308 bytes) to disk.
[8:30:22]: Compression ratio: 37.97752277749659

Process finished with exit code 0
```

```
Run: Main()
↑ /home/zayton/.jdk/openjdk-17.0.1/bin/java -javaagent:/snap/intellij-idea-educational/42/lib/idea_rt.jar=34037:/snap/intellij-idea-educational/42/bin -Dfile.encoding=UTF-8 -classpath /media/zayton/HDD-Data/desktop...
↓ [8:32:12]: Reading the file...
[8:32:14]: Read 188661308 bytes.
/media/zayton/HDD-Data/desktop/eng/7thTerm/Alg/algorithms-final/part2_6668/extracted.6668.5.f.seq
```