

Homework 4

“Due” April 26

Homework 4

- Implement the K-way External Sorting Algorithm described in class
- On the next slide I give you a very bare bones definition of the External Sorter class
- You have some flexibility in how you do this but you must follow the following requirements
- The number of ints in main memory at any time must not be greater than $\text{numBuffers} * \text{pageSize}$
- You must first do a partial sort for each part of the file that includes (at most) $\text{numBuffers} * \text{pageSize}$ ints.
- Following the partial sort you will do one or more (usually more than one) merge phases until the output file is sorted
- Undergraduates can work in pairs but graduate students must work alone

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```
import java.io.*;
import java.util.*;

public class ExternalSorter {
//implements K-Way External Merge Sort

    public ExternalSorter(String in, String out, int numBuffers, int pageSize) throws IOException {
        //in is the name of an unsorted binary file of ints
        //out is the name of the output binary file (the destination of the sorted ints)
        //numBuffers is the number of in memory page buffers available for sorting
        //pageSize is the number of ints in a page
    }
}
```

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```
import java.io.*;
import java.util.*;

public class BinaryToASCII {

    public static void makeInts(String out, int numInts, int maxInt, long seed) throws IOException {
        DataOutputStream nums = new DataOutputStream(new FileOutputStream(out));
        Random r = new Random(seed);
        for (int i = 0; i < numInts; i++) {
            nums.writeInt(r.nextInt(maxInt));
        }
        nums.close();
    }
}
```

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```
public static void printInts(String in) throws IOException {
    DataInputStream nums = new DataInputStream(new FileInputStream(in));
    Boolean EOF = false;
    while (!EOF) {
        try {
            System.out.println(nums.readInt());
        }
        catch (EOFException e) {
            EOF = true;
        }
    }
    nums.close();
}
```

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```
public static void main(String args[]) throws IOException {
    if (args[0].equals("Make")) {
        int numInts = Integer.parseInt(args[2]);
        int maxInt = Integer.parseInt(args[3]);
        long seed = (long) Integer.parseInt(args[4]);
        makeInts(args[1], numInts, maxInt, seed);
    } else { //args[0] should be "Print"
        printInts(args[1]);
    }
}
}
```

Homework 4 Submission

- You will demonstrate your program to me. I will give you a driver to use for the demonstration but you must develop your own driver to test your implementation before you demonstration.
- I will also give you some input files to use during the demonstration
- After the demonstration you will upload one zip file to Canvas. The zip file should contain 1 java file: ExternalSort.java