Joanthan Mathew Java
CV Project 5 ImageCompression
Due 03/27/23

Algo Steps

step 0: inFile-->open input file via args[]
numRows, numCols, minVal, maxVal-->read from inFile dynamically allocate zeroFramedAry with extra 2 rows and 2 cols dynamically allocate skeletonAry with extra 2 rows and 2 cols open outFile_1, outFile_2, deBugFile-->open via args[]
Step 1: skeletonFileName-->args[0] + "_skeleton.txt" Step 2: skeletonFile-->open (skeletonFileName) Step 3: decompressedFileName-->args[0] + "_decompressed.txt"
Step 4: decompressFile-->open (decompressedFileName)
step 5: setZero (zeroFramedAry)
setZero (skeletonAry) Step 6: loadImage (inFile, zeroFramedAry) // begins at zeroFramedAry (1,1) Step 7: Distance8 (zeroFramedAry, outFile1, deBugFile) // Perform distance transform
Step 8: skeletonExtraction (zeroFramedAry, skeletonAry, skeletonFile, outFile1, deBugFile)
// perform lossless compression
Step 9: close skeletonFile
re-open skeletonFile Step 10: deCompression (zeroFramedAry, skeletonFile, outFile2, deBugFile)
// perform decompression Step 11: binaryThreshold (zeroFramedAry)
Step 12: Output numRows, numCols, newMinVal, newMaxVal to decompressFile
Step 13: ary2File (zeroFramedAry, decompressFile) Step 14: close all files

Image1.txt Outputs

Output1.txt

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Printing OG Table
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Printing Table After Dist 8 pass 1
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. . . . . 1 2 3 4 5 4 3 2 1 . . . . . 1 2 3 4 5 6 7 6 6 5 5 4 4 3 3 2 2 .
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. . . 1 2 2 2 2 3 4 5 4 3 2 2 2 2 2 1 . . . 1 2 3 4 5 6 7 8 7 7 6 6 5 5 . . . .
. . . 1 2 3 3 3 3 4 5 4 3 3 3 3 3 2 1 . . . 1 2 3 4 5 6 7 8 8 7 7 6 . . . . . .
. . . 1 2 3 4 4 4 4 5 4 4 4 4 4 3 2 1 . . . 1 2 3 4 5 6 7 8 8 8 7 . . . . . .
. . . 1 2 3 4 5 5 5 5 5 5 5 4 3 2 1 . . . 1 2 3 4 5 6 7 8 9 8 . . . . . .
. . . 1 2 3 4 5 6 6 6 6 6 6 5 4 3 2 1 . . . 1 2 3 4 5 6 7 8 9 . . . . . .
. . . 1 2 3 4 5 6 7 7 7 6 5 4 3 2 1 . . . 1 2 3 4 5 6 7 8 1 1 . . . . . .
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. . . . 1 2 3 4 5 6 7 8 8 8 8 8 8 . . . . . .
. . . . . 1 2 3 4 5 6 7 8 9 9 9 9 . . . . . .
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Printing Table After Dist 8 pass 2

30 40 0 1

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. . . . . 1 2 3 4 4 4 3 2 1 . . . . . 1 2 3 4 5 6 6 5 5 4 4 3 3 2 2 1 1 .
. . . . . 1 2 3 4 5 4 3 2 1 . . . . . 1 1 2 3 4 5 6 6 6 5 5 4 4 3 3 2 2 1 1
. . . . . 1 2 3 4 5 4 3 2 1 . . . . . 1 2 3 4 5 6 7 6 6 5 5 4 4 3 3 2 2 1 1 .
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. . . 1 2 3 3 3 3 4 5 4 3 3 3 3 3 2 1 . . . 1 2 3 4 5 4 3 3 2 2 1 1 . . . . . .
. . . 1 2 3 4 4 4 4 5 4 4 4 4 4 3 2 1 . . . 1 2 3 4 5 4 3 2 2 1 1 . . . . . .
. . . 1 2 3 4 5 5 5 5 5 5 5 4 3 2 1 . . . 1 2 3 4 5 4 3 2 1 1 . . . . . .
. . . 1 2 3 4 5 6 6 6 6 6 5 4 3 2 1 . . . 1 2 3 4 5 4 3 2 1 . . . . . .
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Running Local Maxima 30 40 0 1

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Output2.txt

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After Expansion Pass 1
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.........2221...........3455432 1.......
........12321..........2345543 21.......
........13332 1........12345554321.......
........2343 21........123456554432 1.....
.......12444321.......12345665544332211.
.......13454321......112345665554433221 1
.......23454321.......123456554443322 11.
......123454321.......1234555443333221 1..
......123454321.......123455544333222 11...
......123454321.......12345443322211 1....
......123454321.......1234543322 11......
......123454321.......123454322 11.......
......123444321.......12345432 11........
......126666654321...1234543 21.........
......156777654321...1234543 21.........
......456777654321...1234543 21.........
.....3456677665432 1...123454332211 1.....
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....2345566665543333333334544332211.....
...12344556655444444444444444332211......
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...11223344443322111111111111111.........
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.....1122333322 11.....................
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After Expansion Pass 2
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......1233432 1.......123456554433221 1..
......1234443 21.......123456665544332211.
......1234543 21......1123456665554433221 1
......1234543 21.......123456554443332211.
......1234543 21.......123455544333221 1..
...1111234543211111...123455443332221 1...
...1222234543222221...12345443322111....
...1233334543333321...1234543322 11......
...1234444544444321...123454322 11.......
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...1234566666654321...12345432 1.........
...1234567777654321...123454321 1........
...1234567777654321111112345432211.......
...1234566776654322222223454332211......
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Skeleton.txt

2 11 1
4 11 2
5 27 5
5 28 5
6 11 3
6 27 5
6 28 5
8 11 4
8 28 6
9 28 6
9 29 6
9 31 5

10 11 5
10 22 1
10 28 6
10 29 6
10 31 5
10 32 5
10 34 4
10 36 3
10 38 2
10 40 1
11 11 5
11 28 6
12 11 5
13 11 5
13 27 5
13 28 5
14 11 5
14 27 5
15 11 5
15 27 5
16 11 5
16 27 5
17 27 5
18 27 5
19 10 7
19 11 7
19 12 7
19 13 7
19 27 5
20 10 7
20 11 7
20 12 7
20 13 7
20 27 5
21 11 7
21 12 7
21 27 5
22 27 5
22 29 4
22 31 3
22 33 2
22 35 1
23 11 6
23 12 6
23 17 4
23 18 4
23 19 4
23 20 4
23 21 4
23 22 4

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23 23 4
23 24 4
23 25 4
25 11 5
25 12 5
27 11 4
27 12 4
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Debug.txt

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Entering Distance8
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. . . . . .1 1 2 1 1. . . . . .1 2 3 4 4 4 4 3 2 2 1 1. . . . .
. . . . . .1 1 2 2 2 1 1. . . . . .1 2 3 4 5 5 4 3 3 2 2 1 1. . . . .
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. . . . . .1 2 3 4 5 4 3 2 1. . . . . .1 1 2 3 4 5 6 6 6 5 5 4 4 3 3 2 2 1 1
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. . . . . .1 2 3 4 5 4 3 2 1. . . . . .1 2 3 4 5 6 7 7 6 6 5 5 4 4 3 3..
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. . . . . 1 2 3 3 4 3 3 2 1 . . . . . 1 2 3 4 5 6 5 5 4 4 3 3 2 2 1 1 . .
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. . . 1 2 3 4 5 5 5 5 5 5 5 5 4 3 2 1 . . . 1 2 3 4 5 4 3 2 1 1 . . . . . .
. . . 1 2 3 4 5 6 6 6 6 6 6 5 4 3 2 1 . . . 1 2 3 4 5 4 3 2 1 . . . . . .
. . . 1 2 3 4 5 6 7 7 7 7 6 5 4 3 2 1 . . . 1 2 3 4 5 4 3 2 1 1 . . . . . .
. . . 1 2 3 4 5 6 7 7 7 7 6 5 4 3 2 1 1 1 1 1 2 3 4 5 4 3 2 2 1 1 . . . . . .
. . . 1 2 3 4 5 6 6 7 7 6 6 5 4 3 2 2 2 2 2 2 2 3 4 5 4 3 3 2 2 1 1 . . . . . .
. . . 1 2 3 4 5 5 6 6 6 6 5 5 4 3 3 3 3 3 3 3 3 3 4 5 4 4 3 3 2 2 1 1 . . . . .
. . . 1 2 3 4 4 5 5 6 6 5 5 4 4 4 4 4 4 4 4 4 4 4 4 3 3 2 2 1 1 . . . . . .
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Leaving Distance8
Entering skeletonExtraction
Leaving skeletonExtraction
Entering deCompression method
Leaving deCompression method

Decompress.txt

30 40 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0
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Image2 Outputs

Output1.txt

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Printing OG Table
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Printing Table After Dist 8 pass 1

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Printing Table After Dist 8 pass 2

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.....1122211.....1122234445433321 1.....1234321.....
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Output2.txt

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After Expansion Pass 1

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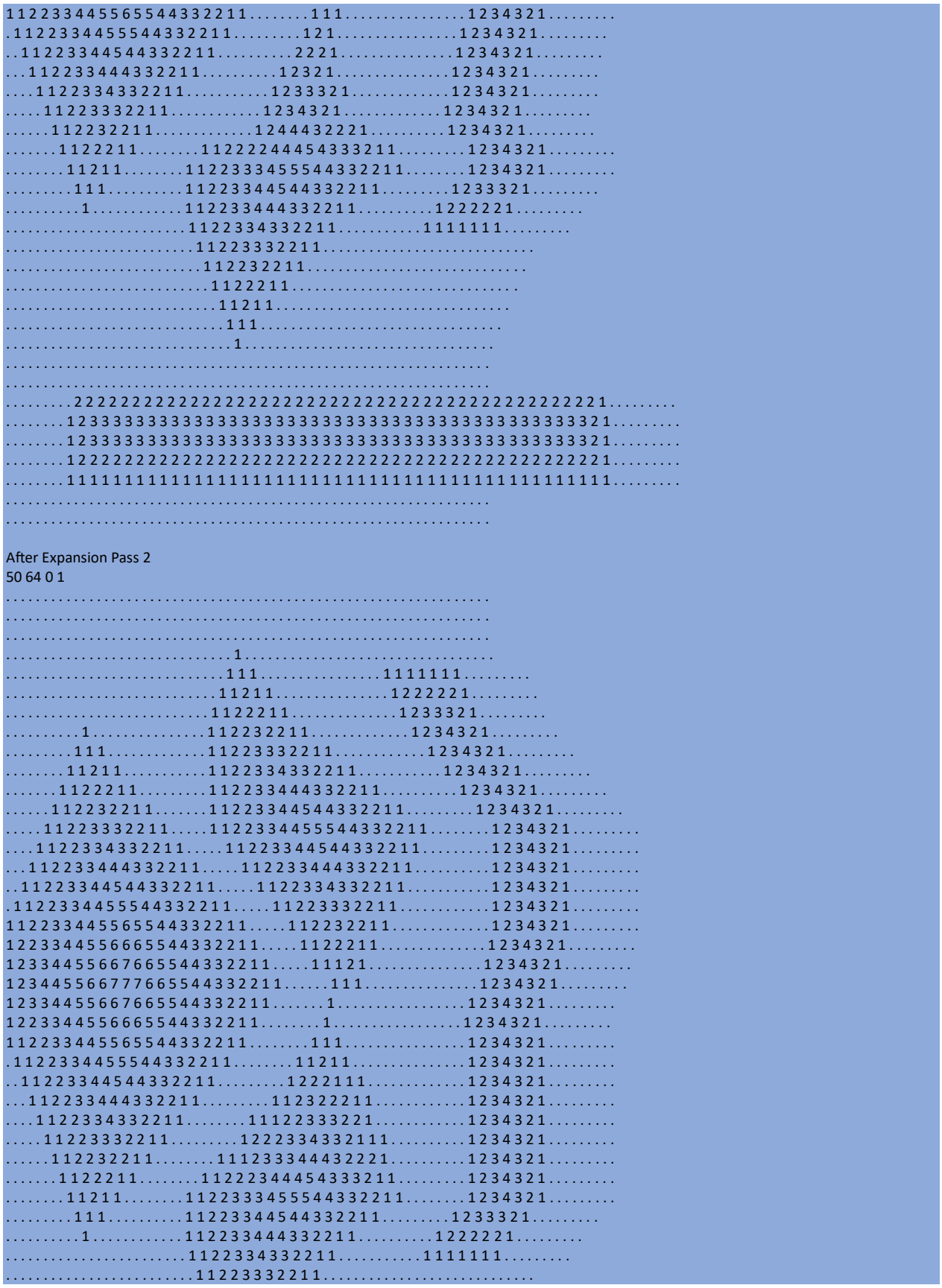

After Expansion Pass 2
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Skeleton.txt

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12 31 5
12 52 4
13 22 1
13 24 2
13 26 3
13 28 4
13 30 5
13 31 5
13 32 5
13 34 4
13 36 3
13 38 2
13 40 1
13 52 4
14 11 4
14 31 5
14 52 4
15 52 4
16 11 5
16 31 4
16 52 4
17 52 4
18 11 6
18 31 3
18 52 4
19 52 4
20 11 7
20 32 2
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20 52 4
21 4 4
21 6 5
21 8 6
21 10 7
21 11 7
21 12 7
21 14 6
21 16 5
21 18 4
21 20 3
21 22 2
21 24 1
21 52 4
22 11 7
22 31 1
22 52 4
23 31 1
23 52 4
24 11 6
24 52 4
25 31 2
25 52 4
26 11 5
26 52 4
27 31 3
27 52 4
28 11 4
28 52 4
29 32 4
29 52 4
30 11 3
30 52 4
31 32 5
31 36 3
31 52 4
32 11 2
32 22 1
32 24 2
32 26 3
32 27 3
32 30 5
32 31 5
32 32 5
32 34 4
32 36 3
32 38 2
32 40 1
32 52 4
33 27 3
33 31 5
34 11 1
35 31 4

37 31 3
39 31 2
41 31 1
45 11 3
45 12 3
45 13 3
45 14 3
45 15 3
45 16 3
45 17 3
45 18 3
45 19 3
45 20 3
45 21 3
45 22 3
45 23 3
45 24 3
45 25 3
45 26 3
45 27 3
45 28 3
45 29 3
45 30 3
45 31 3
45 32 3
45 33 3
45 34 3
45 35 3
45 36 3
45 37 3
45 38 3
45 39 3
45 40 3
45 41 3
45 42 3
45 43 3
45 44 3
45 45 3
45 46 3
45 47 3
45 48 3
45 49 3
45 50 3
45 51 3
45 52 3
45 53 3
46 11 3
46 12 3
46 13 3
46 14 3
46 15 3
46 16 3
46 17 3

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46 19 3
46 20 3
46 21 3
46 22 3
46 23 3
46 24 3
46 25 3
46 26 3
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46 29 3
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46 31 3
46 32 3
46 33 3
46 34 3
46 35 3
46 36 3
46 37 3
46 38 3
46 39 3
46 40 3
46 41 3
46 42 3
46 43 3
46 44 3
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46 46 3
46 47 3
46 48 3
46 49 3
46 50 3
46 51 3
46 52 3
46 53 3
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Debug.txt

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Entering Distance8
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Leaving Distance8
Entering skeletonExtraction
Leaving skeletonExtraction
Entering deCompression method
Leaving deCompression method
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Decompress.txt

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00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000100000000000000000000000000000000000000000000000
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00000000000000000000000000000111110000000000000000111111110000000000000000000000
00000000000000000000000000001111111000000000000000111111110000000000000000000000
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00000000011100000000000000011111111110000000000000111111110000000000000000000000
00000000111110000000000001111111111110000000000000111111110000000000000000000000
00000001111111000000000011111111111111000000000000111111110000000000000000000000
00000011111111100000000111111111111111100000000000111111110000000000000000000000
00000111111111110000011111111111111111100000000000111111110000000000000000000000
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Source Code

Main.java

```
import java.io.*;

public class Main {

    public static void main(String[] args) throws IOException {

        //step 0
        File in = new File(args[0]),
                outFile1 = new File(args[1]),
                outFile2 = new File(args[2]),
                de =new File(args[3]);

        FileReader inFile = new FileReader(in);

        FileWriter out1 = new FileWriter(outFile1),
                out2 = new FileWriter(outFile2),
                debug = new FileWriter(de);

        BufferedReader br = new BufferedReader(inFile);
        String line = br.readLine();
        String [] header = line.split(" ");
        int numRow = Integer.parseInt(header[0]),
                numCol = Integer.parseInt(header[1]),
                minVal = Integer.parseInt(header[2]),
                maxVal  = Integer.parseInt(header[3]);

        ImageProcessing proj = new ImageProcessing(numRow, numCol, minVal, maxVal);

        //step 1 + 2
        String fileName = args[0];
        fileName = fileName.substring(0,fileName.length()-4);
        FileWriter skeletonFile = new FileWriter(fileName + "_skeleton.txt");

        //step 3+4
        FileWriter decompressedFile = new FileWriter(fileName + "_decompressed.txt");

        //step 5
        proj.setZero(proj.zeroFramedAry);
        proj.setZero(proj.skeletonAry);

        //step 6
        proj.loadImage(inFile, br);

        //step 7
        proj.Distance8(out1, debug);
//        proj.printZero();

        //step 8
        proj.skeletonExtract(skeletonFile, out1, debug);

        //step 9
        FileReader skeletonFileRead = new FileReader(fileName + "_skeleton.txt");
```

```
        //step 10
        proj.deCompression(skeletonFileRead, out2, debug);

        //step 11
        proj.binThr(proj.zeroFramedAry);

        //step 12
//        decompressedFile.write(numRow+" " +numCol +" " + minVal +" " + maxVal);

        //step 13
        decompressedFile.write(numRow + " " + numCol + " " + minVal + " " + maxVal +
"\n");
        for (int row = 1; row < numRow + 1; row++) {
            for (int col = 1; col < numCol + 1; col++) {
                decompressedFile.write(proj.zeroFramedAry[row][col] + " ");
            }
            decompressedFile.write("\n");
        }

        //step 14
        inFile.close();
        out1.close();
        out2.close();
        debug.close();
        decompressedFile.close();
        skeletonFileRead.close();









    }
}
```

ImageProcessing.java

```
import java.io.BufferedReader;
import java.io.FileReader;
import java.io.FileWriter;
import java.io.IOException;
import java.nio.Buffer;
import java.util.Arrays;
import java.util.zip.ZipError;

public class ImageProcessing {

    public int numRows,
        numCols,
        minVal,
        maxVal,
        newMinVal,
        newMaxVal;

    public int[][] zeroFramedAry,
        skeletonAry;


    public ImageProcessing(int row, int col, int min, int max){

        numRows = row;
```

```
        numCols = col;
        minVal = min;
        maxVal = max;


        zeroFramedAry = new int[numRows+2][numCols+2];
        skeletonAry = new int[numRows+2][numCols+2];
    }


    public void setZero(int[][] arr) {
        // Set all elements of Ary to 0
        for (int[] ints : arr) {
            Arrays.fill(ints, 0);
        }
    }

    public void loadImage(FileReader file, BufferedReader br) throws IOException {
        // Read image data from file and store it in the frame of zeroFramedAry
        // Implementation not shown
        String line;
//         System.out.println(line)

        int count =1;

        while((line=br.readLine()) != null){
            String[] data = line.split(" ");
//             for (int i = count; i < numRows+1; i++){
              for (int j = 1; j< numCols+1; j++){
                  zeroFramedAry[count][j] = Integer.parseInt(data[j-1]);
              }
//             }
            count++;
        }


        printZero();

    }

    public void printZero(){
        for (int i = 0; i < numRows+2; i++){
            for (int j = 1; j< numCols+2; j++){
                if(zeroFramedAry[i][j] == 0){
//                     System.out.print(". ");
                }else{
//                     System.out.print(zeroFramedAry[i][j] + " ");
                }
            }
//             System.out.println();
        }

    }

    public  void Distance8(FileWriter out1, FileWriter debug) throws IOException {
        // Compute the 8-neighbor distance of pixel (i, j) in zeroFramedAry
        // Implementation not shown
        //step 0
        debug.write("Entering Distance8\n");
        //step 1
        out1.write("Printing OG Table\n");
        reformatPrettyPrint(zeroFramedAry, out1);
        distance8pass1(zeroFramedAry);
```

```
        //step 2
        out1.write("Printing Table After Dist 8 pass 1\n");
        reformatPrettyPrint(zeroFramedAry, out1);
        reformatPrettyPrint(zeroFramedAry, debug);
        //step 3
        out1.write("Printing Table After Dist 8 pass 2\n");
        distance8pass2(zeroFramedAry);
        //step 4
        reformatPrettyPrint(zeroFramedAry, out1);
        reformatPrettyPrint(zeroFramedAry, debug);
        //step 5
        debug.write("Leaving Distance8\n");
    }

    private void distance8pass2(int[][] arr) {

        for (int r = numRows; r > 0 ; r--) {
            for (int c = numCols; c > 0 ; c--) {

                if(zeroFramedAry[r][c] > 0){
                    int e = zeroFramedAry[r][c + 1];
                    int f = zeroFramedAry[r + 1][c - 1];
                    int g = zeroFramedAry[r + 1][c];
                    int h = zeroFramedAry[r+1][c +1];

                    zeroFramedAry[r][c] = Math.min(Math.min(e+1, Math.min(f+1,
Math.min(g+1,h+1))), zeroFramedAry[r][c]);
                    newMinVal = Math.min(newMinVal , zeroFramedAry[r][c]);
                    newMaxVal = Math.max(newMaxVal , zeroFramedAry[r][c]);
                }

            }
        }
    }

    private void reformatPrettyPrint(int[][] arr, FileWriter out1) throws IOException
{

        out1.write(numRows + " " + numCols + " " + minVal + " " + maxVal + "\n");
        String str = Integer.toString(newMaxVal);
        int width = str.length();

        int ww;
        int r = 1;

        while (r < numRows+1) {
            int c = 1;
            while (c < numCols+1) {
                if (arr[r][c] == 0) {
                    out1.write(".");
                } else {
                    out1.write(arr[r][c] + "");
                }
                str = Integer.toString(arr[r][c]);
                ww = str.length();
                while (ww <= width) {
                    out1.write(" ");
                    ww++;
                }
                c++;
            }
            r++;
            out1.write("\n");
```

```
        }
        out1.write("\n");

    }

    private void distance8pass1(int[][] arr) {

        for (int r = 1; r < numRows + 1; r++) {
            for (int c = 1; c < numCols + 1; c++) {

                if (arr[r][c] > 0) {
                    int a = arr[r - 1][c - 1];
                    int b = arr[r - 1][c];
                    int cl = arr[r - 1][c + 1];
                    int d = arr[r][c - 1];

                    zeroFramedAry[r][c] = Math.min(a, Math.min(b, Math.min(cl,d))) +
1;

                }

            }
        }

    }


    public void skeletonExtract(FileWriter skeletonFile, FileWriter out1, FileWriter
debug) throws IOException {
//        Step 0: deBugFile("Entering skeletonExtraction")
        debug.write("Entering skeletonExtraction\n");
//        step 1: localMaxima (zeroFramedAry, skeletonAry)
        localMax();
//        Step 2: reformatPrettyPrint (skeletonAry, outFile1)
        out1.write(" Running Local Maxima ");
        reformatPrettyPrint(skeletonAry, out1);
//        step 3: compression (skeletonAry, skeletonFile)
        compression(skeletonAry, skeletonFile);
//        Step 4: close skeletonFile
        skeletonFile.close();
//        Step 5: deBugFile("Leaving skeletonExtraction")
        debug.write("Leaving skeletonExtraction\n");
    }

    private void compression(int[][] arr, FileWriter skeletonFile) throws IOException
{



        for (int r = 1; r < numRows + 1; r++) {
            for (int c = 1; c < numCols + 1; c++) {

                if ( arr[r][c] > 0) {
                    skeletonFile.write(r + " " + c +  " " + arr[r][c] + "\n");
                }

            }
        }

    }

    private void localMax() {
        for (int r = 1 ; r<numRows+1; r++){
```

```
            for(int c=1; c <numCols+1;c++){

                //step 2
                if(isLocalMax(r,c)){

                    skeletonAry[r][c] = zeroFramedAry[r][c];
                }else{
                    skeletonAry[r][c] = 0;
                }
            }
        }
    }

    private boolean isLocalMax(int r, int c) {

        int a = zeroFramedAry[r - 1][c - 1],
                b = zeroFramedAry[r - 1][c],
                cl = zeroFramedAry[r - 1][c + 1],
                d = zeroFramedAry[r][c - 1],
                e =  zeroFramedAry[r][c + 1],
                f = zeroFramedAry[r + 1][c - 1],
                g = zeroFramedAry[r +1][c],
                h = zeroFramedAry[r +1][c + 1];

        return zeroFramedAry[r][c] >= a &&
                zeroFramedAry[r][c] >= b &&
                zeroFramedAry[r][c] >= cl &&
                zeroFramedAry[r][c] >= d &&
                zeroFramedAry[r][c] >= e &&
                zeroFramedAry[r][c] >= f &&
                zeroFramedAry[r][c] >= g &&
                zeroFramedAry[r][c] >= h;
    }

    public void deCompression( FileReader skeletonFile, FileWriter out2, FileWriter
debug) throws IOException {
//        Step 0: deBugFile("Entering deCompression method"
        debug.write("Entering deCompression method\n");
//        Step 1: setZero (zeroFramedAry)
        setZero(zeroFramedAry);
//        step 2: load (skeletonFile, zeroFramedAry)
        load(skeletonFile);
        out2.write("Zero fram arr\n");
        reformatPrettyPrint(zeroFramedAry, out2);
//        step 3: expension8Pass1 (zeroFramedAry)
        expension8Pass1();
//        step 4: reformatPrettyPrint (zeroFramedAry, outFile2)
        out2.write("After Expansion Pass 1\n");
        reformatPrettyPrint(zeroFramedAry, out2);
//        step 5: expension8Pass2 (zeroFramedAry)
        expension8Pass2();
//          step 6
        out2.write("After Expansion Pass 2\n");
        reformatPrettyPrint(zeroFramedAry, out2);
        //step 7
        debug.write("Leaving deCompression method\n");

    }


    private void load(FileReader skeletonFile) throws IOException {
        int r, c, val;
        String line;
```

```
        BufferedReader br  = new BufferedReader(skeletonFile);

        while((line=br.readLine()) != null){
            String[]  comp = line.split( " ");
            r = Integer.parseInt(comp[0]);
            c = Integer.parseInt(comp[1]);
            val = Integer.parseInt(comp[2]);
            zeroFramedAry[r][c] = val;

        }



    }

    private void expension8Pass1() {


        for (int r = 1; r < numRows + 1; r++) {
            for (int c = 1; c < numCols + 1; c++) {

                int a = zeroFramedAry[r - 1][c - 1] -1,
                        b = zeroFramedAry[r - 1][c] -1,
                        cl = zeroFramedAry[r - 1][c + 1] -1 ,
                        d = zeroFramedAry[r][c - 1]-1,
                        e =  zeroFramedAry[r][c + 1]-1,
                        f = zeroFramedAry[r + 1][c - 1]-1,
                        g = zeroFramedAry[r +1][c]-1,
                        h = zeroFramedAry[r +1][c + 1]-1;
                //step 2
                if (zeroFramedAry[r][c] == 0) {

                    zeroFramedAry[r][c] = Math.max( zeroFramedAry[r][c],
Math.max(a,Math.max(b, Math.max(cl,Math.max(d,Math.max(e, Math.max(f, Math.max(g,
h)))))));

                }

            }
        }

    }

    private void expension8Pass2() {


        for (int r = numRows; r > 0; r--) {
            for (int c = numCols; c > 0; c--) {

                //step 2
                int a = zeroFramedAry[r - 1][c - 1] -1,
                        b = zeroFramedAry[r - 1][c] -1,
                        cl = zeroFramedAry[r - 1][c + 1] -1 ,
                        d = zeroFramedAry[r][c - 1]-1,
                        e =  zeroFramedAry[r][c + 1]-1,
                        f = zeroFramedAry[r + 1][c - 1]-1,
                        g = zeroFramedAry[r +1][c]-1,
                        h = zeroFramedAry[r +1][c + 1]-1,
                        max = zeroFramedAry[r][c];

                max =  zeroFramedAry[r][c] = Math.max( zeroFramedAry[r][c],
Math.max(a,Math.max(b, Math.max(cl,Math.max(d,Math.max(e, Math.max(f, Math.max(g,
h)))))));
```

```
                if (zeroFramedAry[r][c] < max) {
                    zeroFramedAry[r][c] = max;
                }

            }
        }
    }



    public void binThr(int[][] zeroFramedAry) {

        for(int r = 0; r < numRows + 2; r++) {
            for(int c = 0; c < numCols + 2; c++) {

                if(zeroFramedAry[r][c]>0){
                    zeroFramedAry[r][c] = 1;
                }else{
                    zeroFramedAry[r][c] = 0;
                }

            }
        }
    }



}
```