Computer Vision Programming Language: Java

Project #7 Medial Axis/Distance Transform

Andres Quintero

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Hard copy: 3/29/2020

Main*

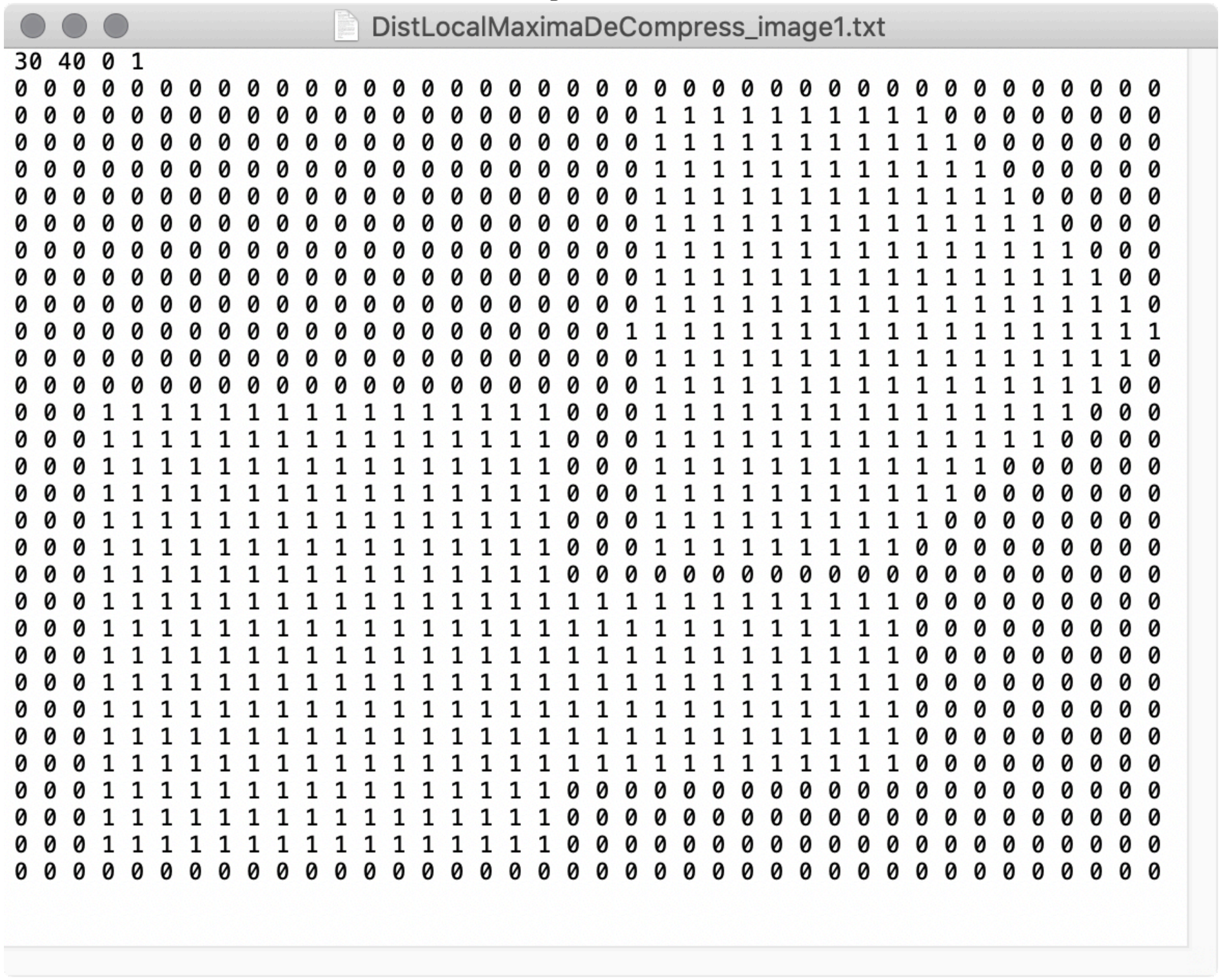
```
step 0: inFile ← open input file
       numRows, numCols, minVal, maxVal ← read from inFile
      dynamically allocate zeroFramedAry with extra 2 rows and 2 cols
      dynamically allocate skeletonAry with extra 2 rows and 2 cols
      open outFile_1, outFile_2

Step 1: skeletonFileName ← argv[1] + "_skeleton"
Step 2: skeletonFile ← open ( skeletonFileName )

Step 3: decompressedFileName ← argv[1] + "_decompressed"
Step 4: decompressFile ← open (decompressedFileName)

step 5: setZero (zeroFramedAry)
        setZero (skeletonAry)

Step 6: loadImage (inFile, zeroFramedAry) // begins at zeroFramedAry
(1,1)

Step 7: compute8Distance (zeroFramedAry, outFile1)  // Perform
distance transform

Step 8: skeletonExtraction (zeroFramedAry, skeletonAry, skeletonFile,
outFile1)
           // perform lossless compression


Step 9: skeletonExpansion (zeroFramedAry, skeletonFile, outFile2)
           // perform decompression

step 10: Output numRows, numCols, newMinVal, newMaxVal to
decompressFile

Step 11: ary2File (zeroFramedAry, decompressFile)

Step 12: close all files
```

Source code:

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

public class Main {
  public static void main(String[] args) {
    int numRows, numCols, minVal, maxVal;
    Scanner inFile = null;
    PrintWriter outFile1 = null;
    PrintWriter outFile2 = null;
    // Opened after reading input image
    PrintWriter skeletonFile = null;
    PrintWriter decompressedFile = null;

    // 0
    try {
      inFile = new Scanner(new File(args[0]));
    } catch (FileNotFoundException err) {
      System.out.println("Error in opening inputFile: " + err);
    }

    numRows = inFile.nextInt();
    numCols = inFile.nextInt();
    minVal = inFile.nextInt();
    maxVal = inFile.nextInt();

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

    try{
      outFile1 = new PrintWriter(args[1]);
      outFile2 = new PrintWriter(args[2]);
    } catch (FileNotFoundException err) {
      System.out.println("Error in opening files from CLI: " + err);
    }
    // 1 - 4
    // String name correction
    String fileName = args[0];
    int pos = fileName.indexOf(".txt");
    fileName = fileName.substring(0,pos);

    // Creating and Opening Skeleton File
    String skeletonFileName = new String(fileName+"_skeleton.txt");
    try {
      skeletonFile = new PrintWriter(skeletonFileName);
    } catch (FileNotFoundException err) {
      System.out.println("Error in opening skeleton file: " + err);
    }

    // Creating and Opening decompressedFile
    String decompressedFileName = new String(fileName + "_decompressed.txt");
    try {
      decompressedFile = new PrintWriter(decompressedFileName);
    } catch (FileNotFoundException err) {
      System.out.println("Error in opening decompressed file: " + err);
    }

    // 5
    setZero(zeroFramedAry, numRows+2, numCols+2);
    setZero(skeletonAry, numRows+2, numCols+2);

    // 6
    loadImage(zeroFramedAry, inFile);

    //DEBUGSTUFF
    // print2DArray(zeroFramedAry, numRows+2, numCols+2);
    // outFile1.println("zeroFramedAry prettyPrint test: ");
    // prettyPrint(zeroFramedAry, outFile1);

    // 7
    compute8Distance(zeroFramedAry, outFile1, fileName);
    //7.5 finding newMin and newMax values
    int newMinVal = Integer.MAX_VALUE;
    int newMaxVal = 0;
    for (int i = 1; i < zeroFramedAry.length-1; i++ ){
      for (int j = 1; j < zeroFramedAry[0].length-1 ; j++ ){
        if(zeroFramedAry[i][j] < newMinVal){newMinVal = zeroFramedAry[i][j];}
        if(zeroFramedAry[i][j] > newMaxVal){newMaxVal = zeroFramedAry[i][j];}
      }
    }

    //8
    skeletonFile.println(numRows + " " + numCols + " " + (newMinVal+1) + " " + newMaxVal); //
skeleton header
    skeletonExtraction(zeroFramedAry, skeletonAry, skeletonFile, outFile1, skeletonFileName);

    // 8.5 reOpening skeletonFile as skeletonFileRead;
    Scanner skeletonFileRead = null;
    try { skeletonFileRead = new Scanner(new File(skeletonFileName));}
    catch (FileNotFoundException err) {System.out.println("Error in re-opening skeleton file: " +
err);}


    // 9
    skeletonExpansion(zeroFramedAry, skeletonFileRead, outFile2);

    // 10
    decompressedFile.println(numRows + " " + numCols + " " + minVal + " " + maxVal);

    // 11
    ary2File(zeroFramedAry, decompressedFile);

    // 12
    inFile.close();
    outFile1.close();
    outFile2.close();
    skeletonFile.close();
    decompressedFile.close();
    skeletonFileRead.close();
  }

  // Functions
  static void ary2File(int[][] zeroFramedAry, PrintWriter decompressedFile){
    int thresVal = 1;
    for(int i = 1; i < zeroFramedAry.length-1; i++){
      for(int j = 1; j < zeroFramedAry[0].length-1; j++){
        if(zeroFramedAry[i][j] >= thresVal){
          decompressedFile.print(1 + " ");
        } else {
          decompressedFile.print(0 + " ");
        }
      }
      decompressedFile.println();
    }

  }

  static void load(Scanner skeletonFileRead, int[][] zeroFramedAry){
    //read header
    int r = skeletonFileRead.nextInt();
    int c = skeletonFileRead.nextInt();
    int min = skeletonFileRead.nextInt();
    int max = skeletonFileRead.nextInt();
    //
    int i , j, value;
    while(skeletonFileRead.hasNext()){
      i = skeletonFileRead.nextInt();
      j = skeletonFileRead.nextInt();
      value = skeletonFileRead.nextInt();

      zeroFramedAry[i][j] = value;
    }
  }

  static void skeletonExpansion(int[][] zeroFramedAry, Scanner skeletonFileRead, PrintWriter
outFile2){
    setZero(zeroFramedAry, zeroFramedAry.length, zeroFramedAry[0].length);
    load(skeletonFileRead, zeroFramedAry);

    // // DEBUGSTUFF
    // prettyPrint(zeroFramedAry, outFile2);

    firstPassExpansion(zeroFramedAry);
    outFile2.println("After firstPassExpansion():");
    prettyPrint(zeroFramedAry, outFile2);

    secondPassExpansion(zeroFramedAry);
    outFile2.println("After secondPassExpansion():");
    prettyPrint(zeroFramedAry, outFile2);

  }

  static void extractLocalMaxima(int[][] skeletonAry, PrintWriter skeletonFile){
    for(int i = 1; i < skeletonAry.length-1; i++){
      for(int j = 1; j < skeletonAry[0].length-1; j++){
        if(skeletonAry[i][j] > 0){
          skeletonFile.println(i + " " + j + " " + skeletonAry[i][j]);
        }
      }
    }
  }

  static void computeLocalMaxima(int[][] zeroFramedAry, int[][] skeletonAry){
    for (int i = 1; i < zeroFramedAry.length-1; i++ ){
      for (int j = 1; j < zeroFramedAry[0].length-1 ; j++ ) {

        int max = 0;
        // finding max of NEIGHBORS ONLY
        for(int a = i-1; a < i+2; a++){
          for(int b = j-1; b < j+2; b++){
            if(a != 0 && b!= 0){ // skips self
              if(zeroFramedAry[a][b] > max){max = zeroFramedAry[a][b];}
            }
          }
        }

        if(zeroFramedAry[i][j] >= max){
          skeletonAry[i][j] = zeroFramedAry[i][j];
        } else {
          skeletonAry[i][j] = 0;
        }
      }
    }
  }

  static void skeletonExtraction(int[][] zeroFramedAry, int[][] skeletonAry, PrintWriter
skeletonFile, PrintWriter outFile1, String skeletonFileName){
    computeLocalMaxima(zeroFramedAry, skeletonAry);
    outFile1.println(skeletonFileName+ " after computeLocalMaxima():");
    prettyPrint(skeletonAry, outFile1);

    extractLocalMaxima(skeletonAry, skeletonFile);
    skeletonFile.close();
  }

  static int maxNeighbors(int[][] Ary, int i, int j){
    int max = 0;
    for(int a = i-1; a < i+2; a++){
      for(int b = j-1; b < j+2; b++){

        if(a != 0 && b!= 0){ // skips self
          if(Ary[a][b] > max){max = Ary[a][b];}
        }

      }
    }
    return max;
  }

  static void secondPassExpansion(int[][] Ary){
    for(int i = Ary.length-1-1; i > 0 ; i--){
      for(int j = Ary[0].length-1-1; j > 0 ; j--){


          int max = 0;
          // finding max of NEIGHBORS ONLY
          for(int a = i-1; a < i+2; a++){
            for(int b = j-1; b < j+2; b++){
              if(a != 0 && b!= 0){ // skips self
                if(Ary[a][b] > max){max = Ary[a][b];}
              }
            }
          }


          if(Ary[i][j] < max){
            Ary[i][j] = max - 1;
          }
      }
    }
  }

  static void firstPassExpansion(int[][] Ary){
    for(int i = 1; i < Ary.length-1; i++){
      for(int j = 1; j < Ary[0].length-1; j++){

        if(Ary[i][j] == 0){
          int max = 0;
          // finding max of NEIGHBORS ONLY
          for(int a = i-1; a < i+2; a++){
            for(int b = j-1; b < j+2; b++){
              if(a != 0 && b!= 0){ // skips self
                if(Ary[a][b] > max){max = Ary[a][b];}
              }
            }
          }

          max--;

          if(Ary[i][j] < max){
            Ary[i][j] = max;
          }
        }

      }
    }
  }

  static void secondPass_8Distance(int[][] Ary){
    int min = Integer.MAX_VALUE;
    for(int i = Ary.length-1-1; i > 0 ; i--){
      for(int j = Ary[0].length-1-1; j > 0 ; j--){


        min = Math.min(min, Ary[i][j+1]);     //e

        min = Math.min(min, Ary[i+1][j-1]);   //f
        min = Math.min(min, Ary[i+1][j]);     //g
        min = Math.min(min, Ary[i+1][j+1]);   //h

        Ary[i][j] = Math.min(Ary[i][j], min + 1);
        min = Integer.MAX_VALUE;
      }
```

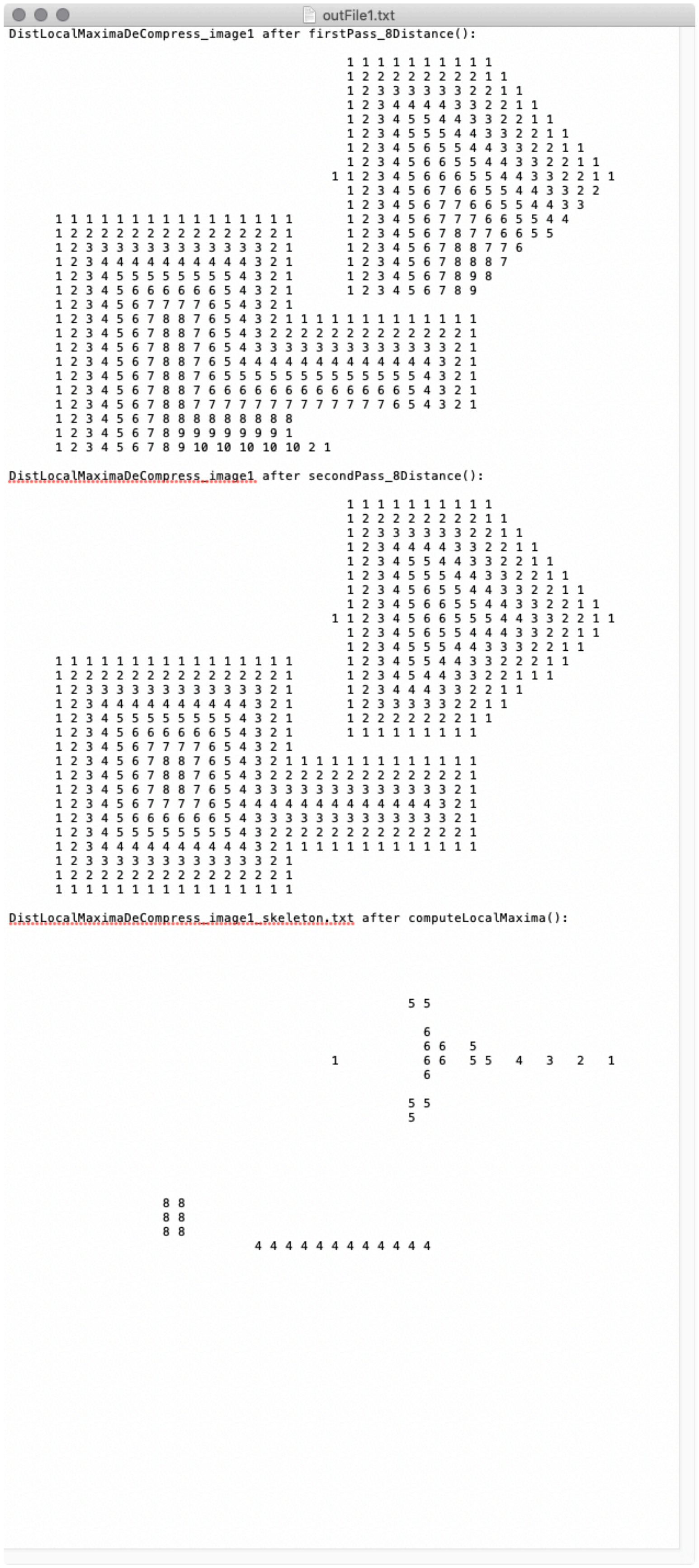
```java
    }
  }

  static void firstPass_8Distance(int[][] Ary){
    int min = Integer.MAX_VALUE;
    for(int i = 1; i < Ary.length-1; i++){
      for(int j = 1; j < Ary[0].length-1; j++){
        if(Ary[i][j] > 0){
          min = Math.min(min, Ary[i-1][j-1]); //a
          min = Math.min(min, Ary[i-1][j]);   //b
          min = Math.min(min, Ary[i-1][j+1]); //c
          min = Math.min(min, Ary[i][j-1]);   //d
          Ary[i][j] = min + 1;
          min = Integer.MAX_VALUE;
        }
      }
    }
  }

  static void compute8Distance(int[][] zeroFramedAry, PrintWriter outFile1, String fileName){
    firstPass_8Distance(zeroFramedAry);
    outFile1.println(fileName + " after firstPass_8Distance():");
    prettyPrint(zeroFramedAry, outFile1);

    secondPass_8Distance(zeroFramedAry);
    outFile1.println(fileName + " after secondPass_8Distance():");
    prettyPrint(zeroFramedAry, outFile1);
  }

  static void prettyPrint(int[][]Ary, PrintWriter outFile){
    for(int i = 1; i < Ary.length-1; i++){
      for(int j = 1; j < Ary[0].length-1; j++){
        if(Ary[i][j] == 0){
          outFile.print("  ");//2 spaces
        } else {
          outFile.print(Ary[i][j] + " ");
        }
      }
      outFile.println();
    }

  }

  static void loadImage(int[][] frameAry, Scanner image){
    int value;
    for (int i = 1; i < frameAry.length-1; i++ ){
      for (int j = 1; j < frameAry[0].length-1 ; j++ ) {
        value = image.nextInt();
        frameAry[i][j] = value;
      }
    }
  }

  static void setZero(int[][] Ary, int rows, int cols){
    for(int i = 0; i < rows; i++){
      for(int j = 0; j < cols; j++){
        Ary[i][j] = 0;
      }
    }
  }

  // DEBUGSTUFF
  static void print2DArray(int[][] Ary, int rows, int cols){
    for(int i = 0; i < rows; i++){
      for(int j = 0; j < cols; j++){
        System.out.print(Ary[i][j] + " ");
      }
      System.out.println();
    }
  }
}
```

image1 files:

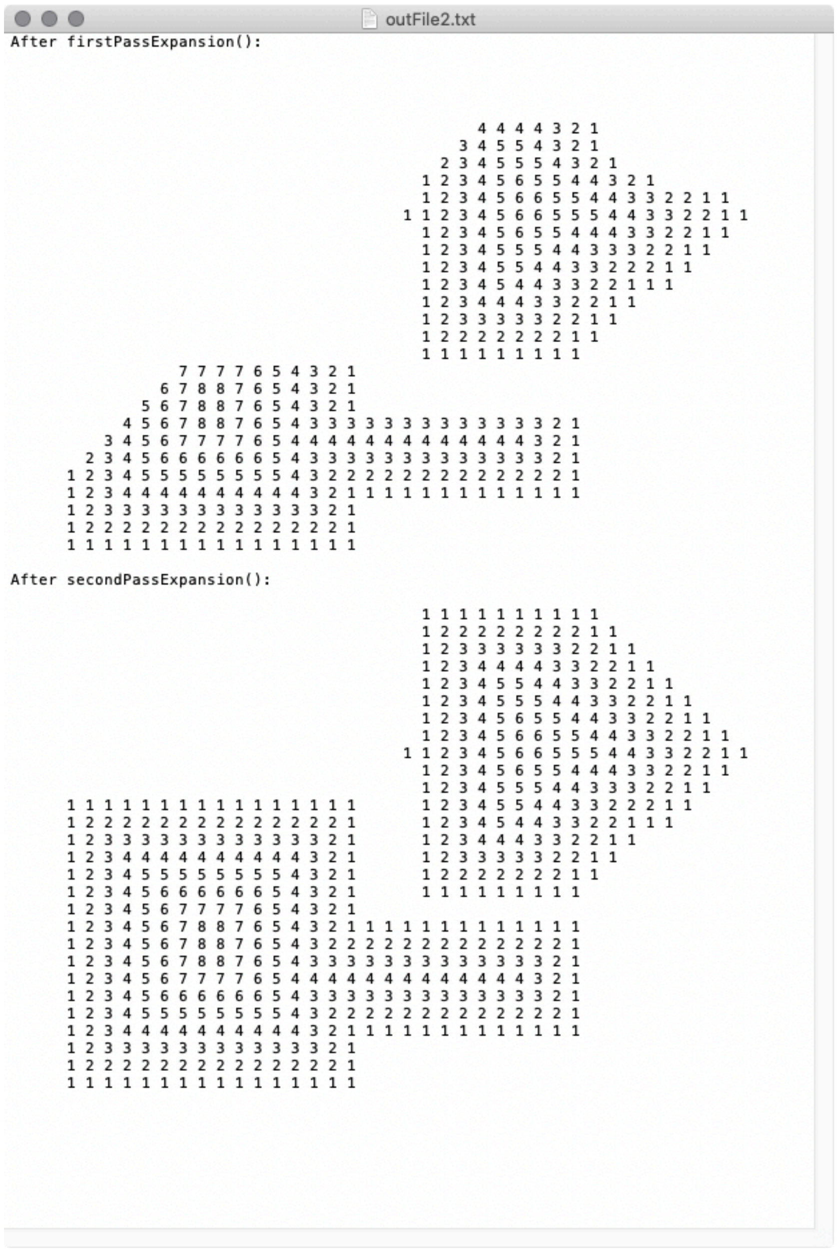


DistLocalMaximaDeCompress_image1.txt

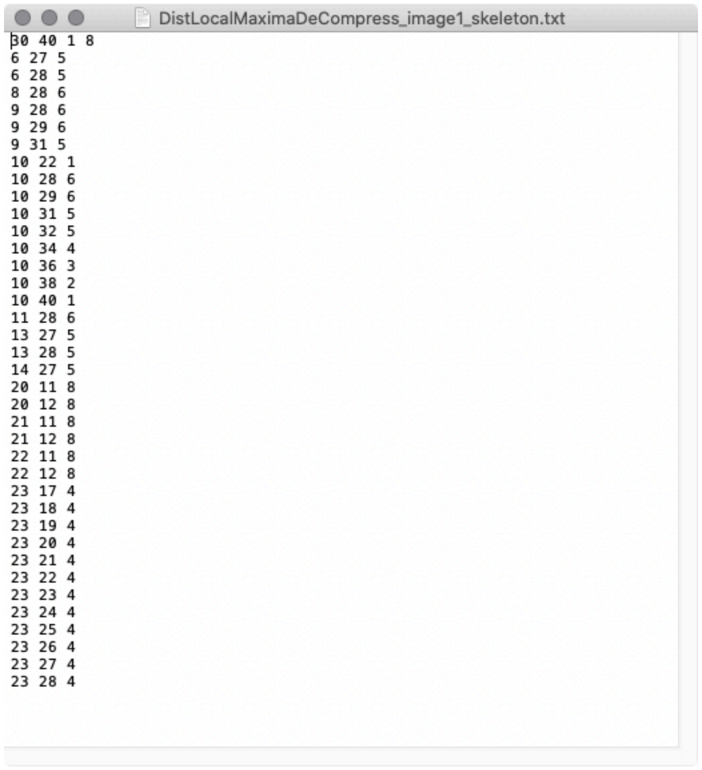
```
30 40 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 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 0 0 0 0 1 1 1 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 0 0 0 0 0 0 0 0 1 1 1 1 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 0 0 0 0 0 0 0 1 1 1 1 1 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 0 0 0 0 0 0 1 1 1 1 1 1 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 0 0 0 0 0 1 1 1 1 1 1 1 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 0 0 0 1 1 1 1 1 1 1 1 1 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 0 0 0 1 1 1 1 1 1 1 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 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 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 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 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 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 0 0
0 0 0 1 1 1 1 1 1 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 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```


outFile1.txt

```
DistLocalMaximaDeCompress_image1 after firstPass_8Distance():

                                            1 1 1 1 1 1 1 1 1 1
                                            1 2 2 2 2 2 2 2 2 1 1
                                            1 2 3 3 3 3 3 3 2 2 1 1
                                            1 2 3 4 4 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 6 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 6 6 5 5 4 4 3 3 2 2 1 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 6 7 6 6 5 5 4 4 3 3 2 2
                                            1 2 3 4 5 6 7 7 6 6 5 5 4 4 3 3
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1       1 2 3 4 5 6 7 7 7 6 6 5 5 4 4
      1 2 2 2 2 2 2 2 2 2 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 3 3 3 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 4 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 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 7 6 5 4 3 2 1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 2 1 1 1 1 1 1 1 1 1 1 1 1 1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 2 2 2 2 2 2 2 2 2 2 2 2 2 1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 3 3 3 3 3 3 3 3 3 3 3 3 2 1
      1 2 3 4 5 6 7 8 8 7 6 5 4 4 4 4 4 4 4 4 4 4 4 4 4 3 2 1
      1 2 3 4 5 6 7 8 8 7 6 5 5 5 5 5 5 5 5 5 5 5 5 5 4 3 2 1
      1 2 3 4 5 6 7 8 8 7 6 6 6 6 6 6 6 6 6 6 6 6 6 5 4 3 2 1
      1 2 3 4 5 6 7 8 8 7 7 7 7 7 7 7 7 7 7 7 7 7 6 5 4 3 2 1
      1 2 3 4 5 6 7 8 8 8 8 8 8 8 8 8
      1 2 3 4 5 6 7 8 9 9 9 9 9 9 9 1
      1 2 3 4 5 6 7 8 9 10 10 10 10 10 2 1

DistLocalMaximaDeCompress_image1 after secondPass_8Distance():

                                            1 1 1 1 1 1 1 1 1 1
                                            1 2 2 2 2 2 2 2 2 1 1
                                            1 2 3 3 3 3 3 3 2 2 1 1
                                            1 2 3 4 4 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 6 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 6 6 5 5 4 4 3 3 2 2 1 1
                                          1 1 2 3 4 5 6 6 5 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 6 5 5 4 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 5 5 4 4 3 3 3 2 2 1 1
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1       1 2 3 4 5 5 4 4 3 3 2 2 2 1 1
      1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1       1 2 3 4 5 4 4 3 3 2 2 1 1 1
      1 2 3 3 3 3 3 3 3 3 3 3 3 3 2 1       1 2 3 4 4 4 3 3 2 2 1 1
      1 2 3 4 4 4 4 4 4 4 4 4 4 3 2 1       1 2 3 3 3 3 3 2 2 1 1
      1 2 3 4 5 5 5 5 5 5 5 5 4 3 2 1       1 2 2 2 2 2 2 2 1 1
      1 2 3 4 5 6 6 6 6 6 6 5 4 3 2 1       1 1 1 1 1 1 1 1 1
      1 2 3 4 5 6 7 7 7 7 6 5 4 3 2 1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 2 1 1 1 1 1 1 1 1 1 1 1 1 1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 2 2 2 2 2 2 2 2 2 2 2 2 2 1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 3 3 3 3 3 3 3 3 3 3 3 3 2 1
      1 2 3 4 5 6 7 7 7 7 6 5 4 4 4 4 4 4 4 4 4 4 4 4 4 3 2 1
      1 2 3 4 5 6 6 6 6 6 6 5 4 3 3 3 3 3 3 3 3 3 3 3 3 3 2 1
      1 2 3 4 5 5 5 5 5 5 5 5 4 3 2 2 2 2 2 2 2 2 2 2 2 2 2 1
      1 2 3 4 4 4 4 4 4 4 4 4 4 3 2 1 1 1 1 1 1 1 1 1 1 1 1 1
      1 2 3 3 3 3 3 3 3 3 3 3 3 3 2 1
      1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

DistLocalMaximaDeCompress_image1_skeleton.txt after computeLocalMaxima():





                                                    5 5

                                                      6
                                                      6 6   5
                                          1           6 6   5 5   4   3   2   1
                                                      6

                                                    5 5
                                                    5





                    8 8
                    8 8
                    8 8
                                4 4 4 4 4 4 4 4 4 4 4 4
```

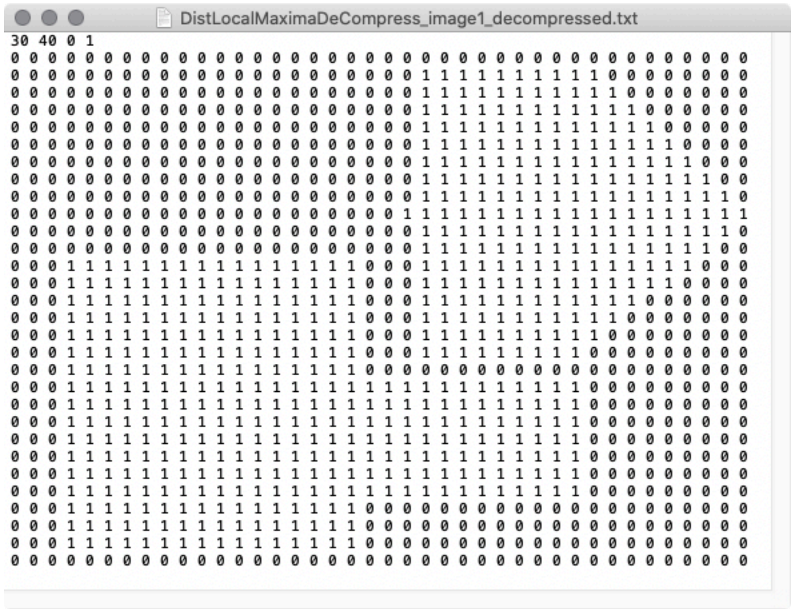


```
After firstPassExpansion():




                                                  4 4 4 4 3 2 1
                                                3 4 5 5 4 3 2 1
                                              2 3 4 5 5 5 4 3 2 1
                                            1 2 3 4 5 6 5 5 4 4 3 2 1
                                            1 2 3 4 5 6 6 5 5 4 4 3 3 2 2 1 1
                                          1 1 2 3 4 5 6 6 5 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 6 5 5 4 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 5 5 4 4 3 3 3 2 2 1 1
                                            1 2 3 4 5 5 4 4 3 3 2 2 2 1 1
                                            1 2 3 4 5 4 4 3 3 2 2 1 1 1
                                            1 2 3 4 4 4 3 3 2 2 1 1
                                            1 2 3 3 3 3 3 2 2 1 1
                                            1 2 2 2 2 2 2 2 1 1
                                            1 1 1 1 1 1 1 1 1
                  7 7 7 7 6 5 4 3 2 1
                6 7 8 8 7 6 5 4 3 2 1
              5 6 7 8 8 7 6 5 4 3 2 1
            4 5 6 7 8 8 7 6 5 4 3 3 3 3 3 3 3 3 3 3 3 3 3 2 1
          3 4 5 6 7 7 7 7 6 5 4 4 4 4 4 4 4 4 4 4 4 4 4 3 2 1
        2 3 4 5 6 6 6 6 6 6 5 4 3 3 3 3 3 3 3 3 3 3 3 3 3 2 1
      1 2 3 4 5 5 5 5 5 5 5 5 4 3 2 2 2 2 2 2 2 2 2 2 2 2 2 1
      1 2 3 4 4 4 4 4 4 4 4 4 4 3 2 1 1 1 1 1 1 1 1 1 1 1 1 1
      1 2 3 3 3 3 3 3 3 3 3 3 3 3 2 1
      1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

After secondPassExpansion():

                                            1 1 1 1 1 1 1 1 1 1
                                            1 2 2 2 2 2 2 2 2 1 1
                                            1 2 3 3 3 3 3 3 2 2 1 1
                                            1 2 3 4 4 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 6 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 6 6 5 5 4 4 3 3 2 2 1 1
                                          1 1 2 3 4 5 6 6 5 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 6 5 5 4 4 4 3 3 2 2 1 1
                                            1 2 3 4 5 5 5 4 4 3 3 3 2 2 1 1
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1       1 2 3 4 5 5 4 4 3 3 2 2 2 1 1
      1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1       1 2 3 4 5 4 4 3 3 2 2 1 1 1
      1 2 3 3 3 3 3 3 3 3 3 3 3 3 2 1       1 2 3 4 4 4 3 3 2 2 1 1
      1 2 3 4 4 4 4 4 4 4 4 4 4 3 2 1       1 2 3 3 3 3 3 2 2 1 1
      1 2 3 4 5 5 5 5 5 5 5 5 4 3 2 1       1 2 2 2 2 2 2 2 1 1
      1 2 3 4 5 6 6 6 6 6 6 5 4 3 2 1       1 1 1 1 1 1 1 1 1
      1 2 3 4 5 6 7 7 7 7 6 5 4 3 2 1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 2 1 1 1 1 1 1 1 1 1 1 1 1 1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 2 2 2 2 2 2 2 2 2 2 2 2 2 1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 3 3 3 3 3 3 3 3 3 3 3 3 2 1
      1 2 3 4 5 6 7 7 7 7 6 5 4 4 4 4 4 4 4 4 4 4 4 4 4 3 2 1
      1 2 3 4 5 6 6 6 6 6 6 5 4 3 3 3 3 3 3 3 3 3 3 3 3 3 2 1
      1 2 3 4 5 5 5 5 5 5 5 5 4 3 2 2 2 2 2 2 2 2 2 2 2 2 2 1
      1 2 3 4 4 4 4 4 4 4 4 4 4 3 2 1 1 1 1 1 1 1 1 1 1 1 1 1
      1 2 3 3 3 3 3 3 3 3 3 3 3 3 2 1
      1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```



DistLocalMaximaDeCompress_image1_skeleton.txt

```
30 40 1 8
6 27 5
6 28 5
8 28 6
9 28 6
9 29 6
9 31 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 28 6
13 27 5
13 28 5
14 27 5
20 11 8
20 12 8
21 11 8
21 12 8
22 11 8
22 12 8
23 17 4
23 18 4
23 19 4
23 20 4
23 21 4
23 22 4
23 23 4
23 24 4
23 25 4
23 26 4
23 27 4
23 28 4
```

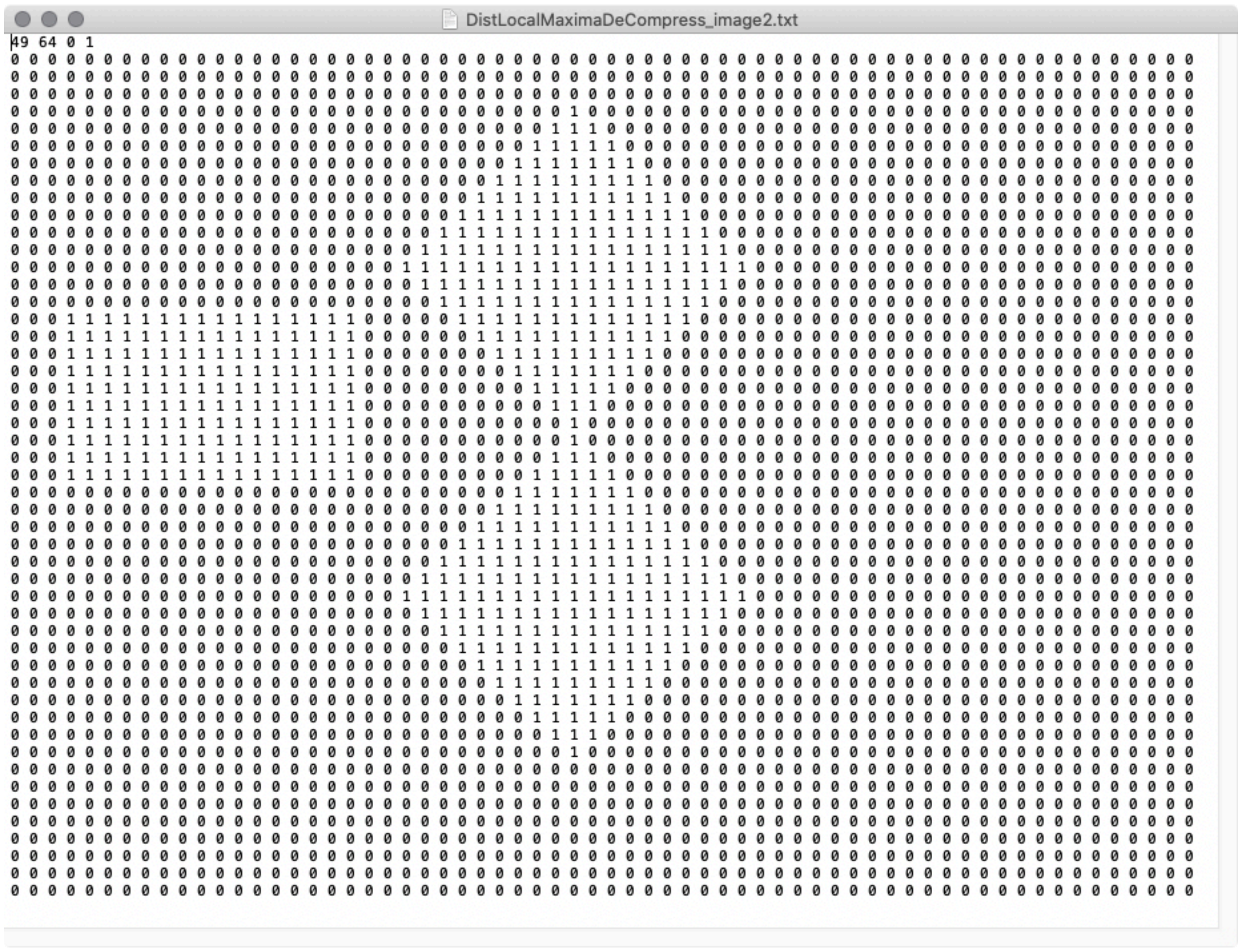


DistLocalMaximaDeCompress_image1_decompressed.txt

```
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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 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
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 1 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 0 0 0 0 1 1 1 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 0 0 0 0 0 0 0 0 1 1 1 1 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 0 0 0 0 0 0 0 1 1 1 1 1 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 0 0 0 0 0 0 1 1 1 1 1 1 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 0 0 0 0 0 1 1 1 1 1 1 1 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 0 0 0 1 1 1 1 1 1 1 1 1 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 0 0 0 1 1 1 1 1 1 1 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 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 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 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 1 1 1 1 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 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 0 0
0 0 0 1 1 1 1 1 1 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 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

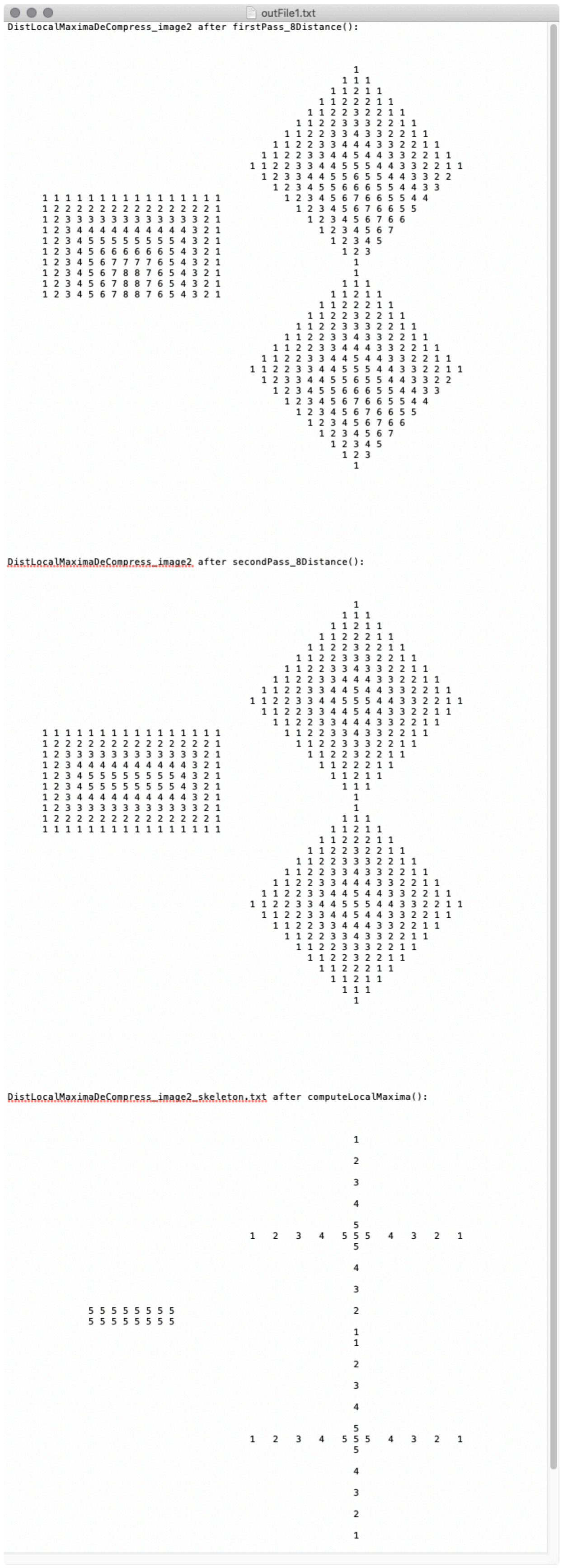
END OF image1 OUTPUTS

image2 files:



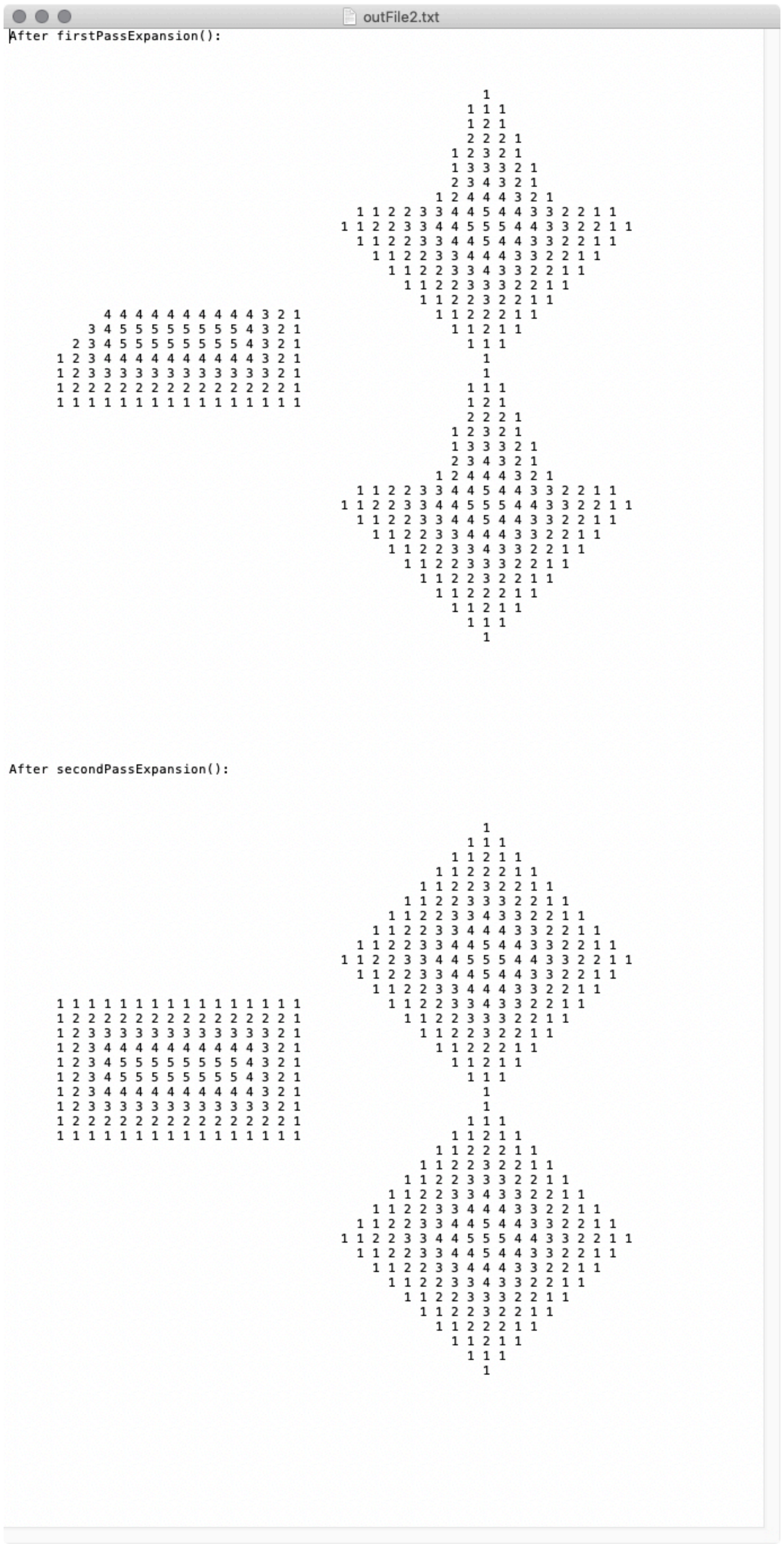
DistLocalMaximaDeCompress_image2.txt

```
49 64 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 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 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 0 0 0 0
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 1 1 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 0 0 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 1 1 1 1 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 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 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 0 0 0 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 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 0 0 0 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 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 0 0 0 0 0 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 1 1 1 1 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 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 1 1 1 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 0 0 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 1 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 0 0 0 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 1 1 1 1 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 0 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 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 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0
0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 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 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 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 1 1 1 1 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 0 0 0 0 0 0 0
0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 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 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 0 0 0 0
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 1 1 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 0 0 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 1 1 1 1 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 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 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 0 0 0 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 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 0 0 0 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 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 0 0 0 0 0 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 1 1 1 1 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 0 0
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 1 1 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 0 0 0
0 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 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 0 0 0 0
0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

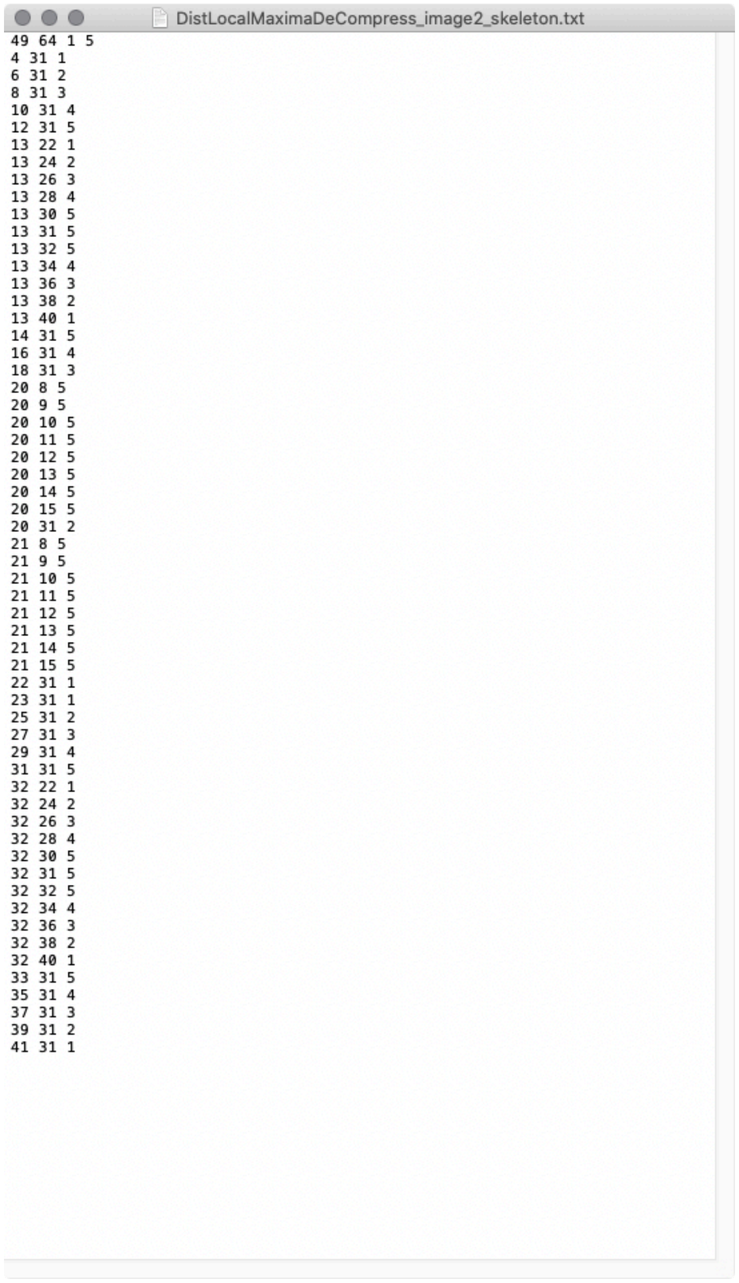


outFile1.txt

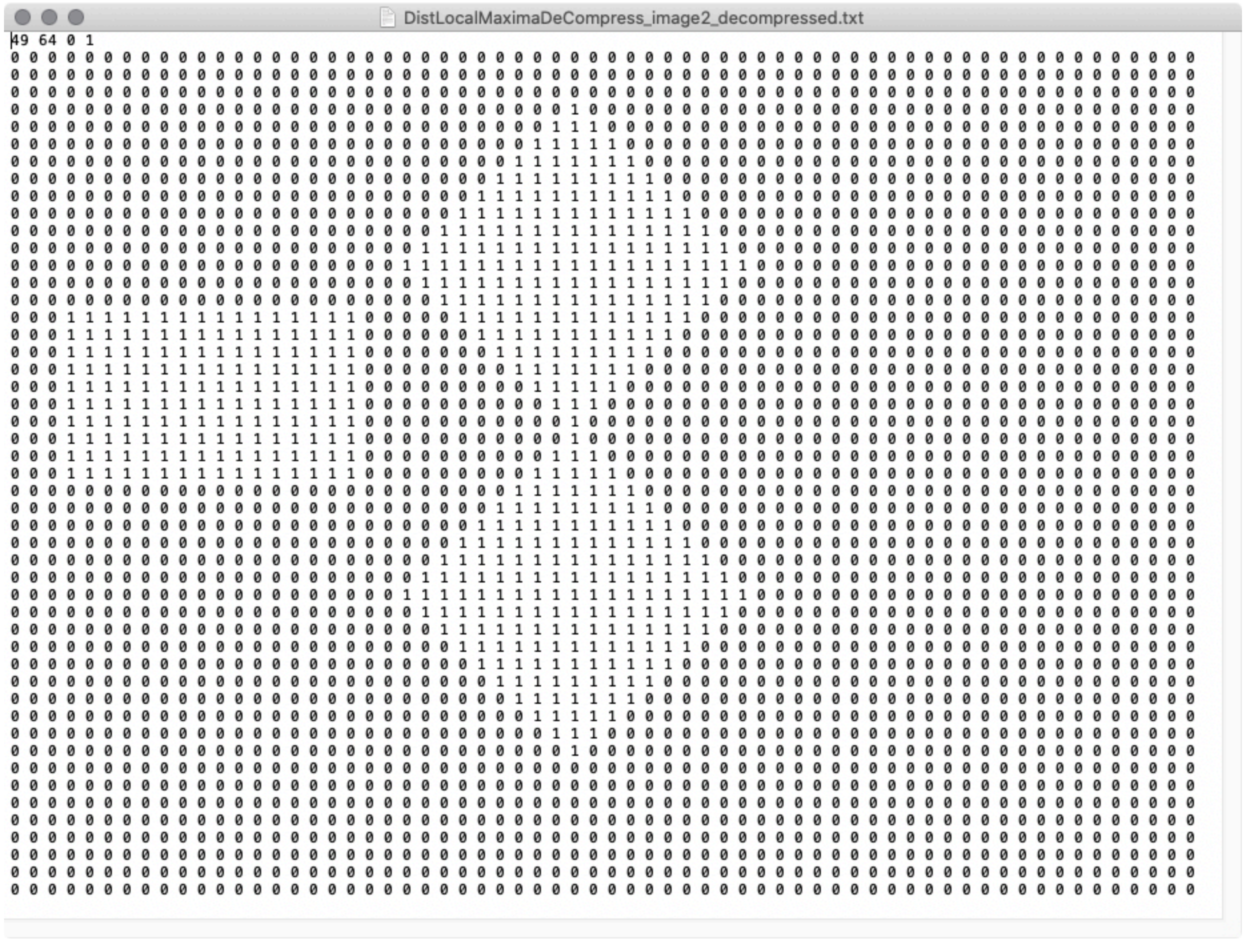
```
DistLocalMaximaDeCompress_image2 after firstPass_8Distance():



                                                            1
                                                          1 1 1
                                                        1 1 2 1 1
                                                      1 1 2 2 2 1 1
                                                    1 1 2 2 3 2 2 1 1
                                                  1 1 2 2 3 3 3 2 2 1 1
                                                1 1 2 2 3 3 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                          1 1 2 2 3 3 4 4 5 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 3 4 4 5 5 6 5 5 4 4 3 3 2 2
                                              1 2 3 4 5 5 6 6 6 5 5 4 4 3 3
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1           1 2 3 4 5 6 7 6 6 5 5 4 4
      1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1             1 2 3 4 5 6 7 6 6 5 5
      1 2 3 3 3 3 3 3 3 3 3 3 3 3 2 1               1 2 3 4 5 6 7 6 6
      1 2 3 4 4 4 4 4 4 4 4 4 4 3 2 1                 1 2 3 4 5 6 7
      1 2 3 4 5 5 5 5 5 5 5 5 4 3 2 1                   1 2 3 4 5
      1 2 3 4 5 6 6 6 6 6 6 5 4 3 2 1                     1 2 3
      1 2 3 4 5 6 7 7 7 7 6 5 4 3 2 1                       1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 2 1                       1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 2 1                     1 1 1
      1 2 3 4 5 6 7 8 8 7 6 5 4 3 2 1                   1 1 2 1 1
                                                      1 1 2 2 2 1 1
                                                    1 1 2 2 3 2 2 1 1
                                                  1 1 2 2 3 3 3 2 2 1 1
                                                1 1 2 2 3 3 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                          1 1 2 2 3 3 4 4 5 5 5 4 4 3 3 2 2 1 1
                                            1 2 3 3 4 4 5 5 6 5 5 4 4 3 3 2 2
                                              1 2 3 4 5 5 6 6 6 5 5 4 4 3 3
                                                1 2 3 4 5 6 7 6 6 5 5 4 4
                                                  1 2 3 4 5 6 7 6 6 5 5
                                                    1 2 3 4 5 6 7 6 6
                                                      1 2 3 4 5 6 7
                                                        1 2 3 4 5
                                                          1 2 3
                                                            1








DistLocalMaximaDeCompress_image2 after secondPass_8Distance():



                                                            1
                                                          1 1 1
                                                        1 1 2 1 1
                                                      1 1 2 2 2 1 1
                                                    1 1 2 2 3 2 2 1 1
                                                  1 1 2 2 3 3 3 2 2 1 1
                                                1 1 2 2 3 3 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                          1 1 2 2 3 3 4 4 5 5 5 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1           1 1 2 2 3 3 4 3 3 2 2 1 1
      1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1             1 1 2 2 3 3 3 2 2 1 1
      1 2 3 3 3 3 3 3 3 3 3 3 3 3 2 1               1 1 2 2 3 2 2 1 1
      1 2 3 4 4 4 4 4 4 4 4 4 4 3 2 1                 1 1 2 2 2 1 1
      1 2 3 4 5 5 5 5 5 5 5 5 4 3 2 1                   1 1 2 1 1
      1 2 3 4 5 5 5 5 5 5 5 5 4 3 2 1                     1 1 1
      1 2 3 4 4 4 4 4 4 4 4 4 4 3 2 1                       1
      1 2 3 3 3 3 3 3 3 3 3 3 3 3 2 1                       1
      1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1                     1 1 1
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                   1 1 2 1 1
                                                      1 1 2 2 2 1 1
                                                    1 1 2 2 3 2 2 1 1
                                                  1 1 2 2 3 3 3 2 2 1 1
                                                1 1 2 2 3 3 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                          1 1 2 2 3 3 4 4 5 5 5 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
                                                1 1 2 2 3 3 4 3 3 2 2 1 1
                                                  1 1 2 2 3 3 3 2 2 1 1
                                                    1 1 2 2 3 2 2 1 1
                                                      1 1 2 2 2 1 1
                                                        1 1 2 1 1
                                                          1 1 1
                                                            1








DistLocalMaximaDeCompress_image2_skeleton.txt after computeLocalMaxima():



                                                            1

                                                            2

                                                            3

                                                            4

                                                            5
                                          1   2   3   4   5 5 5   4   3   2   1
                                                            5

                                                            4

                                                            3

              5 5 5 5 5 5 5 5                               2
              5 5 5 5 5 5 5 5
                                                            1
                                                            1

                                                            2

                                                            3

                                                            4

                                                            5
                                          1   2   3   4   5 5 5   4   3   2   1
                                                            5

                                                            4

                                                            3

                                                            2

                                                            1
```



```
After firstPassExpansion():


                                                            1
                                                          1 1 1
                                                          1 2 1
                                                          2 2 2 1
                                                        1 2 3 2 1
                                                        1 3 3 3 2 1
                                                        2 3 4 3 2 1
                                                      1 2 4 4 4 3 2 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                          1 1 2 2 3 3 4 4 5 5 5 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
                                                1 1 2 2 3 3 4 3 3 2 2 1 1
                                                  1 1 2 2 3 3 3 2 2 1 1
                                                    1 1 2 2 3 2 2 1 1
            4 4 4 4 4 4 4 4 4 4 3 2 1                 1 1 2 2 2 1 1
          3 4 5 5 5 5 5 5 5 5 4 3 2 1                   1 1 2 1 1
        2 3 4 5 5 5 5 5 5 5 5 4 3 2 1                     1 1 1
      1 2 3 4 4 4 4 4 4 4 4 4 4 3 2 1                       1
      1 2 3 3 3 3 3 3 3 3 3 3 3 3 2 1                       1
      1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1                     1 1 1
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                     1 2 1
                                                          2 2 2 1
                                                        1 2 3 2 1
                                                        1 3 3 3 2 1
                                                        2 3 4 3 2 1
                                                      1 2 4 4 4 3 2 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                          1 1 2 2 3 3 4 4 5 5 5 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
                                                1 1 2 2 3 3 4 3 3 2 2 1 1
                                                  1 1 2 2 3 3 3 2 2 1 1
                                                    1 1 2 2 3 2 2 1 1
                                                      1 1 2 2 2 1 1
                                                        1 1 2 1 1
                                                          1 1 1
                                                            1





After secondPassExpansion():


                                                            1
                                                          1 1 1
                                                        1 1 2 1 1
                                                      1 1 2 2 2 1 1
                                                    1 1 2 2 3 2 2 1 1
                                                  1 1 2 2 3 3 3 2 2 1 1
                                                1 1 2 2 3 3 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                          1 1 2 2 3 3 4 4 5 5 5 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1           1 1 2 2 3 3 4 3 3 2 2 1 1
      1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1             1 1 2 2 3 3 3 2 2 1 1
      1 2 3 3 3 3 3 3 3 3 3 3 3 3 2 1               1 1 2 2 3 2 2 1 1
      1 2 3 4 4 4 4 4 4 4 4 4 4 3 2 1                 1 1 2 2 2 1 1
      1 2 3 4 5 5 5 5 5 5 5 5 4 3 2 1                   1 1 2 1 1
      1 2 3 4 5 5 5 5 5 5 5 5 4 3 2 1                     1 1 1
      1 2 3 4 4 4 4 4 4 4 4 4 4 3 2 1                       1
      1 2 3 3 3 3 3 3 3 3 3 3 3 3 2 1                       1
      1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1                     1 1 1
      1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                   1 1 2 1 1
                                                      1 1 2 2 2 1 1
                                                    1 1 2 2 3 2 2 1 1
                                                  1 1 2 2 3 3 3 2 2 1 1
                                                1 1 2 2 3 3 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                          1 1 2 2 3 3 4 4 5 5 5 4 4 3 3 2 2 1 1
                                            1 1 2 2 3 3 4 4 5 4 4 3 3 2 2 1 1
                                              1 1 2 2 3 3 4 4 4 3 3 2 2 1 1
                                                1 1 2 2 3 3 4 3 3 2 2 1 1
                                                  1 1 2 2 3 3 3 2 2 1 1
                                                    1 1 2 2 3 2 2 1 1
                                                      1 1 2 2 2 1 1
                                                        1 1 2 1 1
                                                          1 1 1
                                                            1
```


DistLocalMaximaDeCompress_image2_skeleton.txt

```
49 64 1 5
4 31 1
6 31 2
8 31 3
10 31 4
12 31 5
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
14 31 5
16 31 4
18 31 3
20 8 5
20 9 5
20 10 5
20 11 5
20 12 5
20 13 5
20 14 5
20 15 5
20 31 2
21 8 5
21 9 5
21 10 5
21 11 5
21 12 5
21 13 5
21 14 5
21 15 5
22 31 1
23 31 1
25 31 2
27 31 3
29 31 4
31 31 5
32 22 1
32 24 2
32 26 3
32 28 4
32 30 5
32 31 5
32 32 5
32 34 4
32 36 3
32 38 2
32 40 1
33 31 5
35 31 4
37 31 3
39 31 2
41 31 1
```



DistLocalMaximaDeCompress_image2_decompressed.txt

```
49 64 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

END OF image2 OUTPUTS