CV

JAVA

Project 7: Chain Code

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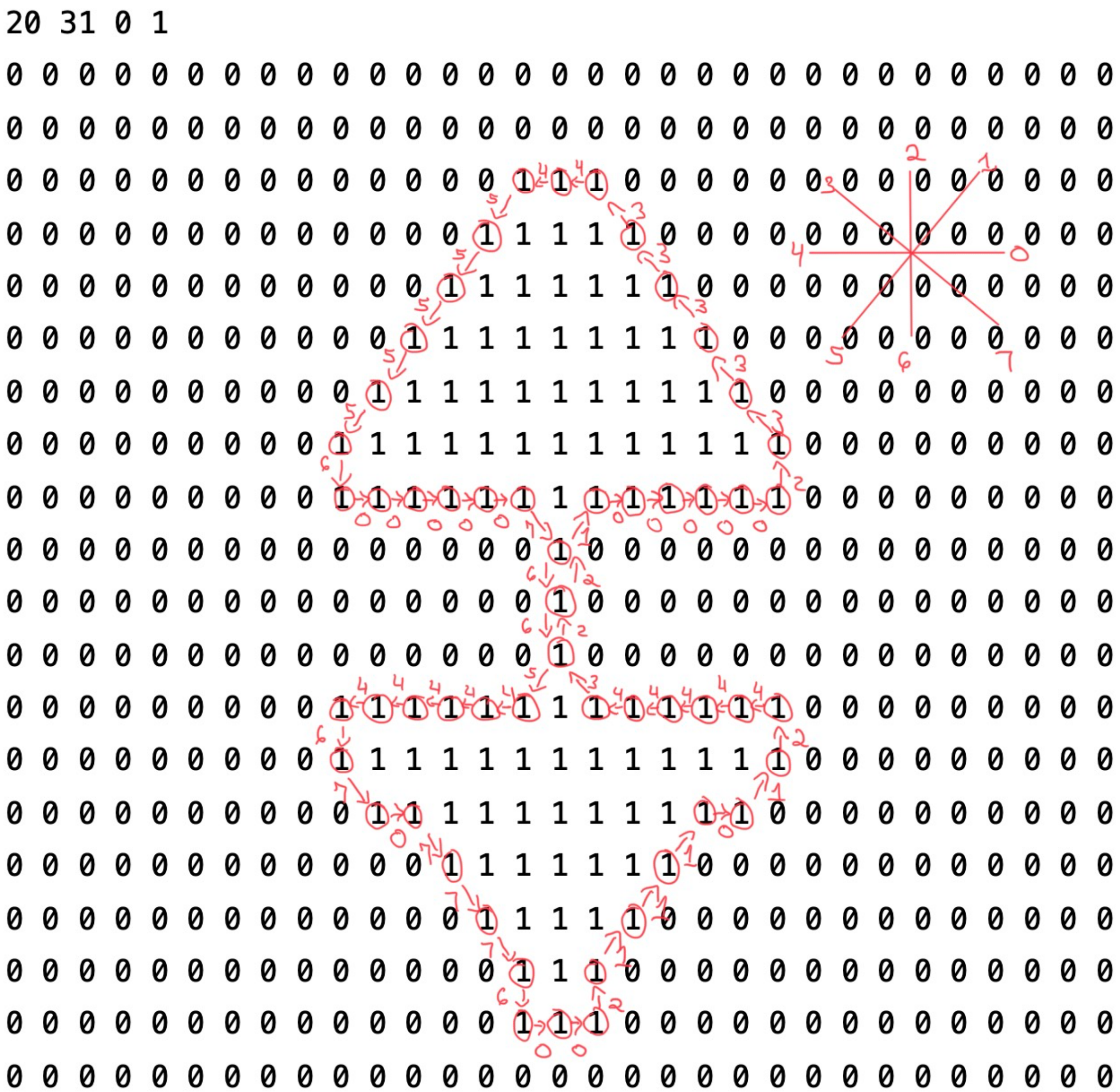
Chain Code Algorithm:

Step 0: Process each object 1 by one. Get the label of the current Object and have empty the dimensional Array for every object then place each object to the empty 2D array. Send it in chain code method
Chain code method:
Step 1:Have a outer for loop that goes over each rows and have inner for loop goes over each columns.
Step2: In inner for loop iterate through each pixel of the array. When current pixel is equal to the label you make the start P's row equal to the current row and start P's column equal to the current column. Then set current P equal to start P. Then set last Q = 4.
Step 3: after you found the pixel in step 2 you exit out of the double for loop
Step 4: let next Q = (lastQ + 1) mod 8
Step 5: let PchainDir = findNextP(Ary, currP, nextQ)
Step 6: nextP = neighborCoord[PchainDir]
Step7: write the chain code to the file by writing the value of PchainDir
Step 8: if PchainDir is equal to zero then set last Q = zeroTable[7]. Else set last Q = zeroTable[PchainDir – 1]
Step 9: set currP equal to nextP
Step 10: Have a loop that will repeat step 4 through 9. That ends when startP is equal to currP.

findNextP Algorithm:

Step1: loadNeighborCoord(currP) // this will load the current Pixels to a neighbor cooridinate array
Step2: create a integer variable for row and column. Create a temp constructor of class Point. Note: class Point has two variables row and column.
Step 3 set row = temp.row and column = temp.col
Step 4: while Ary[row][col] is not greater than 0. Set temp = new point().
Step 5: still in the while loop nextQ = (++nextQ) mod 8
Step 6 : repeat step 3 while step 4 is true
Step 7: after the whole while loop is done you return the value of nextQ

Hand Drawn Chain Code trace of Img1CC.txt:



```
20 31 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 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 0 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 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 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 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 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 0 0 0 0 0 0 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 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 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 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 0 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 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

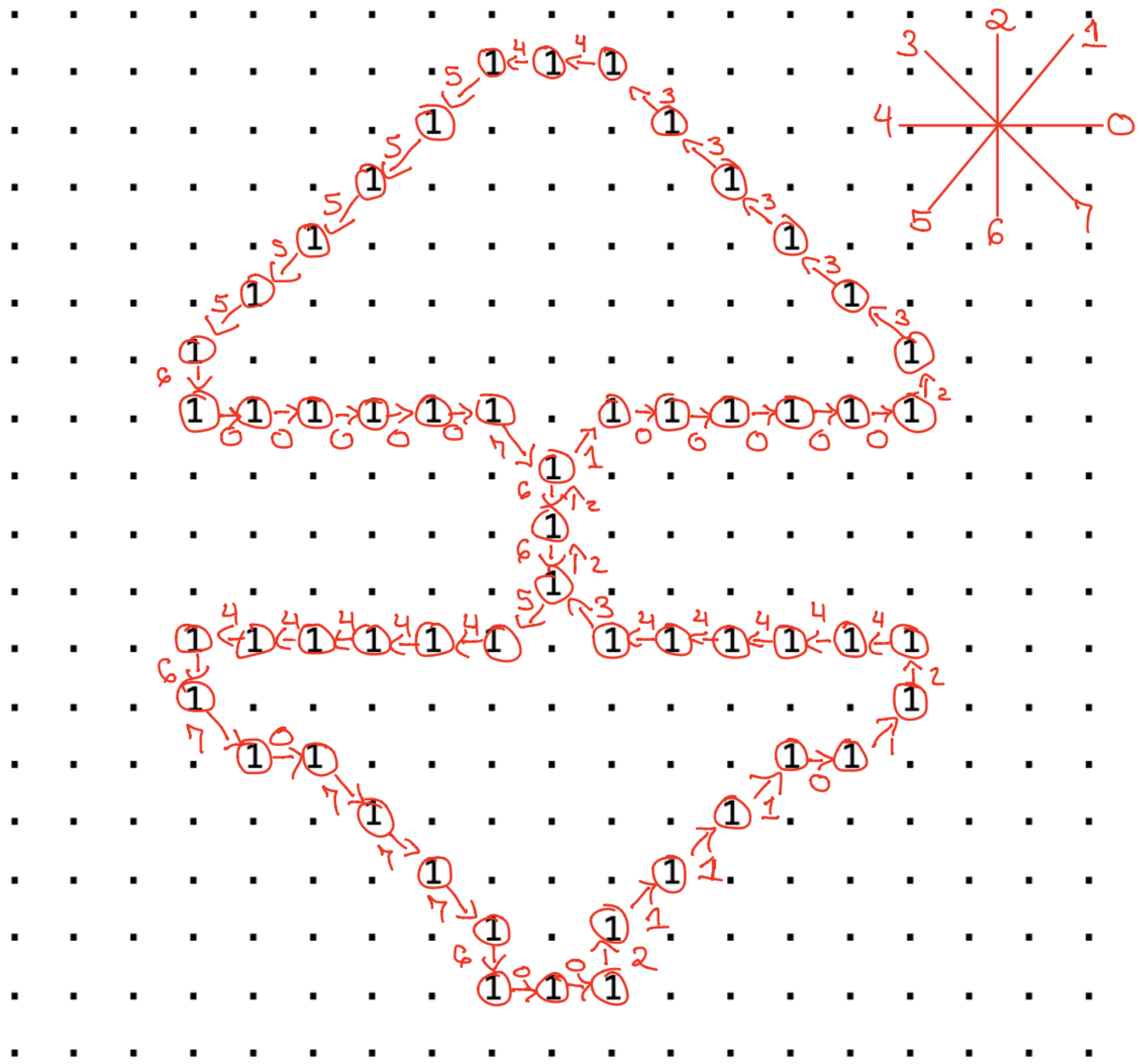
Chain Code of Img1CC

20 31 0 1

1 3 15 555556000000766544444670776002444443221000000233333344

val ↑ start row ↑ start col ↑ — chain code direction

Hand Drawn Chain Code trace of Image 1 output:



Chain Code:

```
20 31 0 1
1 3 15 5 5 5 5 5 6 0 0 0 0 0 7 6 6 5 4 4 4 4 4 6 7 0 7 7 7 6 0 0 2 1 1 1 0 1 2 4 4 4 4 4 3 2 2 1 0 0 0 0 0 2 3 3 3 3 3 4 4
```

Source Code:

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

public class main {

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

            try(
                        Scanner imgFile = new Scanner(new BufferedReader( new
FileReader( args[0])));
                        Scanner CCFile = new Scanner(new BufferedReader( new
FileReader( args[1])));
                        BufferedWriter chainCodeFile = new BufferedWriter(
new FileWriter("chainCode.txt"));
                        BufferedWriter boundaryFile = new BufferedWriter( new
FileWriter("Boundary.txt"));
             ){

                  image img = new image();
                  CCproperty prop = new CCproperty();
                  chainCode chain = new chainCode();
                  img.loadImg(imgFile);
                  prop.readImageheader(CCFile);
                  int numCC = 0;
                  if (CCFile.hasNextInt()) numCC = CCFile.nextInt();
                  chain.numCC = numCC;
                  chain.constructor();
                  chain.CC = prop;
                  chain.printImgHeader(chainCodeFile);
                  while(prop.label <= chain.numCC){
                        prop.loadprop(CCFile);
                        prop.clearCC(img.CCAry);
                        prop.loadCCAry(img.imgAry, img.CCAry);
                        chain.CC = prop;
                        chain.getChainCode(img.CCAry, chainCodeFile);
                        if (prop.label == chain.numCC)
                              break;

                  }
                  System.out.println("finish getting chain code");
                  imgFile.close();
                  CCFile.close();
                  chainCodeFile.close();
                  Scanner chainCodeFile2 = new Scanner(new BufferedReader(
new FileReader( "chainCode.txt")));
                  chain.constructBoundary (img.boundaryAry, chainCodeFile2);
                  System.out.println("finish creating boundary");
                  chain.reformatPrettyPrint(img.boundaryAry, boundaryFile);
                  System.out.println("finish printing boundary");
                  boundaryFile.close();
                  System.out.println("Compilation Complete");
```

```
       }

      }

}
import java.io.*;
import java.util.Scanner;
public class image {
      public int numRows = -1;
      public int numCols = -1;
      public int minValue = -1;
      public int maxValue = -1;

      public int[][] imgAry;
      public int[][] boundaryAry;
      public int[][] CCAry;



      public void initAry() {
            this.imgAry = new int [numRows + 2][numCols + 2];
            this.boundaryAry = new int [numRows + 2][numCols + 2];
            this.CCAry = new int [numRows + 2][numCols + 2];
      }
      public void setZero(int[][] Ary) {
            for (int i = 0; i < numRows + 2; i++) {
                  for(int j = 0; j < numCols + 2; j++) {
                        Ary[i][j] = 0;
                  }
            }
      }

      public void loadImg(Scanner file) throws IOException {

            if (file.hasNextInt()) this.numRows = file.nextInt();
            if (file.hasNextInt()) this.numCols = file.nextInt();
            if (file.hasNextInt()) this.minValue = file.nextInt();
            if (file.hasNextInt()) this.maxValue = file.nextInt();
            initAry();
            setZero(imgAry);


            for (int i = 1; i < this.numRows + 1; i++) {
                  for(int j = 1; j < this.numCols + 1; j++) {
                        if (file.hasNextInt())imgAry[i][j] = file.nextInt();
                  }
            }

      }

}
import java.io.*;
import java.util.Scanner;

public class chainCode {
      public int lastQ = -1;
      public int nextDir = -1;
      public int PchainDir;
      public int numCC = -1;
      public int[] zeroTable;

      public point[] neighborCoord;
      public point startP;
      public point currP;
      public point nextP;

      public CCproperty CC;

      public void constructor() {
            zeroTable = new int[8];
            neighborCoord = new point[8];
            startP = new point();
            currP = new point();
            nextP = new point();
            initzeroTable();
      }

      private void initzeroTable() {
            zeroTable[0] = 6;
            zeroTable[1] = 0;
            zeroTable[2] = 0;
            zeroTable[3] = 2;
            zeroTable[4] = 2;
            zeroTable[5] = 4;
            zeroTable[6] = 4;
            zeroTable[7] = 6;
      }
      public void printImgHeader(BufferedWriter output) throws IOException  {
            output.write( (CC.numRows) + " " + Integer.toString(CC.numCols) +
" "  );
            output.write( Integer.toString(CC.minValue) + " " +
Integer.toString(CC.maxValue));
            output.write("\n");

      }
      public void getChainCode(int[][] CCAry, BufferedWriter output) throws
IOException {
            int label = CC.label;
            int nextQ = 0;
            boolean isfound = false;

            for (int i = 1; i < CC.numRows + 1 && !isfound; i++) {
                  for (int j = 1; j < CC.numCols + 1 && !isfound; j++) {
                        if (CCAry[i][j] == label) {
                              output.write(label + " " + i + " " + j + " ");
                              isfound = true;
```

```
                startP.row = i;
                startP.col = j;
                currP.row = i;
                currP.col = j;
                lastQ = 4;
            }
        }
    }
    nextQ = (lastQ + 1) % 8;
    PchainDir = findNextP(CCAry, currP, nextQ);
    nextP = neighborCoord[PchainDir];
    output.write(PchainDir + " ");
    if( PchainDir == 0)
        lastQ =zeroTable[7];
    else
        lastQ = zeroTable[PchainDir - 1];
    currP = nextP;
    while (true) {

        nextQ = (lastQ + 1) % 8;

        PchainDir = findNextP(CCAry, currP, nextQ);
        nextP = neighborCoord[PchainDir];
        output.write(PchainDir + " ");
        if( PchainDir == 0)
            lastQ =zeroTable[7];
        else
            lastQ = zeroTable[PchainDir - 1];
        currP = nextP;

        if (currP.row == startP.row && currP.col == startP.col) {
            break;
        }
    }
    output.write("\n");



}

private int findNextP(int[][] CCAry, point currP, int nextQ) {

    int row = 0;
    int col = 0;

    point temp = new point();
    loadNeighborCoord(currP);
    temp = neighborCoord[nextQ];
    row = temp.row;
    col = temp.col;

    while(CCAry[row][col] <= 0) {
        temp = new point();
        nextQ = (++nextQ) % 8;
```

```
            temp = neighborCoord[nextQ];
            row = temp.row;
            col = temp.col;

        }

        return nextQ;
    }


    private void loadNeighborCoord( point currP) {
        int row = currP.row;
        int col = currP.col;
        point temp = new point();
        temp.row = row;
        temp.col = col + 1;
        neighborCoord[0] = temp;
        temp = new point();
        temp.row = row - 1;
        temp.col = col + 1;
        neighborCoord[1] = temp;
        temp = new point();
        temp.row = row - 1;
        temp.col = col;
        neighborCoord[2] = temp;
        temp = new point();
        temp.row = row - 1;
        temp.col = col - 1;
        neighborCoord[3] = temp;
        temp = new point();
        temp.row = row;
        temp.col = col - 1;
        neighborCoord[4] = temp;
        temp = new point();
        temp.row = row + 1;
        temp.col = col - 1;
        neighborCoord[5] = temp;
        temp = new point();
        temp.row = row + 1;
        temp.col = col;
        neighborCoord[6] = temp;
        temp = new point();
        temp.row = row + 1;
        temp.col = col + 1;
        neighborCoord[7] = temp;
    }

    public void constructBoundary(int[][] boundaryAry, Scanner file) {
        if (file.hasNextInt()) CC.numRows = file.nextInt();
        if (file.hasNextInt()) CC.numCols = file.nextInt();
        if (file.hasNextInt()) CC.minValue = file.nextInt();
        if (file.hasNextInt()) CC.maxValue = file.nextInt();

        int direct = 0;
        int r = 0;
        int c = 0;
        if (file.hasNextInt()) CC.label = file.nextInt();
        while(CC.label <= numCC){
            if (file.hasNextInt()) r = file.nextInt();
            if (file.hasNextInt()) c = file.nextInt();
            if (file.hasNextInt()) direct = file.nextInt();

            startP.row = r;
            startP.col = c;
            currP = startP;
            boundaryAry[currP.row][currP.col] = CC.label;
            loadNeighborCoord(currP);
            point temp = new point();
            temp = neighborCoord[direct];
            currP = temp;
            while (true) {
                if (file.hasNextInt()) direct = file.nextInt();
                boundaryAry[currP.row][currP.col] = CC.label;
                loadNeighborCoord(currP);
                temp = new point();
                temp = neighborCoord[direct];
                currP = temp;
                if(currP.row == startP.row && currP.col ==
startP.col)
                    break;
            }
            if (CC.label == numCC)
                break;
            if (file.hasNextInt()) CC.label = file.nextInt();


        }

    }

    public void reformatPrettyPrint(int[][] Ary, BufferedWriter output)
throws IOException  {
        output.write( (CC.numRows) + " " + Integer.toString(CC.numCols) +
" "  );
        output.write( Integer.toString(CC.minValue) + " " +
Integer.toString(CC.maxValue));
        output.write("\n");

        for (int i = 1; i < CC.numRows + 1; i++) {
            for(int j = 1; j < CC.numCols + 1; j++) {

                if (Ary[i][j] > 0) output.write(
Integer.toString(Ary[i][j]) + " ");
                else output.write(". ");
            }
            output.write("\n");
        }
        output.write("\n\n");

    }
```

```java
}

import java.io.BufferedWriter;
import java.util.Scanner;

public class CCproperty {
      public int numRows = -1;
      public int numCols = -1;
      public int minValue = -1;
      public int maxValue = -1;
      public int label = 0;
      public int numpixels = 0;
      public int minRow = -1;
      public int minCol = -1;
      public int maxRow = -1;
      public int maxCol = -1;

      public void readImageheader(Scanner file){
            if (file.hasNextInt()) this.numRows = file.nextInt();
            if (file.hasNextInt()) this.numCols = file.nextInt();
            if (file.hasNextInt()) this.minValue = file.nextInt();
            if (file.hasNextInt()) this.maxValue = file.nextInt();
      }
      public void clearCC(int[][] Ary) {
            for (int i = 0; i < numRows + 2; i++) {
                  for(int j = 0; j < numCols + 2; j++) {
                        Ary[i][j] = 0;
                  }
            }
      }
      public void loadprop(Scanner file) {
            if (file.hasNextInt()) this.label = file.nextInt();
            if (file.hasNextInt()) this.numpixels = file.nextInt();
            if (file.hasNextInt()) this.minRow = file.nextInt();
            if (file.hasNextInt()) this.minCol = file.nextInt();
            if (file.hasNextInt()) this.maxRow = file.nextInt();
            if (file.hasNextInt()) this.maxCol = file.nextInt();


      }
      public void loadCCAry(int[][] imgAry, int[][] CCAry) {
            for(int i = minRow + 1; i < maxRow + 2; i++) {
                  for(int j = minCol + 1; j < maxCol + 2; j++) {
                        CCAry[i][j] = imgAry[i][j];
                  }
            }
      }
}

public class point extends chainCode {
      public int row = -1;
      public int col = -1;

}
```

Image 1:

Input :

Img1CC.txt:

```
20 31 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 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 0 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 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 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 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 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 0 0 0 0 0 0 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 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 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 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 0 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 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 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

Img1Property.txt:

```
20 31 0 1
1
1
119
2 9
18 21
```

Output:

Img1ChainCode.txt:

```
20 31 0 1
1 3 15 5 5 5 5 5 6 0 0 0 0 0 7 6 6 5 4 4 4 4 4 6 7 0 7 7 7 6 0 0 2 1 1 1 0 1 2 4 4 4 4 4 3 2 2 1 0 0 0 0 0 2 3 3 3 3 3 4 4
```

Img1Boundar.txt:

```
20 31 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 . . . . . . . . . . . . . . .
. . . . . . . . . . . . . . . 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 . . . . . . . . . . . . . .
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
```

Image 2:

Input :

Img2CC.txt:

```
20 40 0 3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 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 2 2 2 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 2 2 2 2 2 0 0 0 0 0 0 0
0 0 0 0 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 0 0 0 0 0 0
0 0 0 0 0 1 1 1 1 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2 2 0 0 0 0 0
0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2 2 2 2 0 0 0 0
0 0 0 0 1 1 1 1 1 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2 2 2 2 0 0 0 0
0 0 0 0 1 1 1 1 1 1 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2 2 2 2 0 0 0 0
0 0 0 0 1 1 1 1 1 1 0 0 0 0 1 1 1 1 1 0 0 0 0 0 0 0 2 2 2 2 2 2 2 2 2 0 0 0 0 0
0 0 0 0 1 1 1 1 1 1 0 0 0 1 1 1 1 1 1 0 0 0 0 0 0 0 0 2 2 2 2 2 2 2 0 0 0 0 0 0
0 0 0 0 1 1 1 1 1 1 1 0 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 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 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 3 3 3 3 3 3 3 3 3 3 3 3 3 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 3 3 3 3 3 3 3 3 3 3 3 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 3 3 3 3 3 3 3 3 3 3 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 3 3 3 3 0 3 3 3 3 3 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 1 1 1 1 0 0 0 1 1 1 1 0 0 0 0 3 3 3 3 0 0 3 3 3 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 1 1 1 0 0 0 3 3 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 1 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

Img2Property.txt:

```
20 40 0 3
3
1
172
2 4
19 20
2
73
2 25
10 35
3
68
12 23
19 37
```

Img2ChainCode.txt:

```
20 40 0 3
1 3 8 5 4 5 7 0 7 5 4 4 6 6 6 6 6 6 6 7 7 7 0 7 6 1 1 1 0 0 7 0 7 7 1 3 2 1 0 2 2 2 3 3 2 3 3 2 2 6 6 5 5 5 5 5 3 3 2 2 2 2 2 2 2 4 3
2 3 30 5 5 5 5 6 6 7 7 0 0 0 0 0 0 1 1 2 2 3 3 3 3 4 4
3 13 24 7 7 5 5 6 6 7 2 1 0 2 1 7 7 0 0 1 1 1 0 1 1 4 4 4 4 4 4 4 4 4 4 4 4 4 4
```

Img2Boundar.txt:

```
20 40 0 3
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
. . . . . . . 1 . . . . . . . . . . . . . . . . . . . . . 2 2 2 . . . . . . . .
. . . . . 1 1 . 1 1 . . . . . . . . . . . . . . . . . . 2 . . . 2 . . . . . . .
. . . . 1 . . . . 1 . . . . . . . . . . . . . . . . . 2 . . . . . 2 . . . . . .
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