Section: CV

JAVA

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Project Due date: 4/19/2023

Project Number: 6

Algorithm Steps:

```
S1: open inFIle and outFIle from args[]
S2: read numRows, numCols,minVal,maxVal from inFile
S3: HoughAngle = 180
S4: HoughDist = 2 * diagonal of input image
S5: dynamically allocate imgAry[numRows][numCols]
S6: dynamically allocate CartesianHoughAry[HoughDist][HoughAngle] and
PolarHoughAry[HoughDist][HoughAngle]
S7: offset = sqrt(numRows^2 + numCols^2)
S8: loadImage(inFile)
S9:PrettyPrint(imgAry,outFile)
S10: buildHoughSpace()
S11: prettyPrint(CartesianHoughAry,outFile)
S12: prettyPrint(PolarHoughAry,outFile)
S13: close all files
```

Source Code:

Main Class

```java
import java.io.*;
import java.util.Scanner;
public class BaraianA_Main {
	public static void main(String[] args)throws IOException{
		File inputFile = new File(args[0]);
		File outFile = new File(args[1]);
		Scanner inputFileScanner = new Scanner(inputFile);
		BufferedWriter writer = new BufferedWriter(new FileWriter(outFile,true));
		BaraianA_HoughTransform HoughSpace = new BaraianA_HoughTransform();


		HoughSpace.numRows=inputFileScanner.nextInt();
		HoughSpace.numCols=inputFileScanner.nextInt();
		HoughSpace.minVal=inputFileScanner.nextInt();
		HoughSpace.maxVal=inputFileScanner.nextInt();
		HoughSpace.HoughAngle=180;
		HoughSpace.HoughDist= (int) (2 *
Math.sqrt(Math.pow(HoughSpace.numRows,2)+Math.pow(HoughSpace.numCols,2)));
		HoughSpace.imgAry= new int[HoughSpace.numRows][HoughSpace.numCols];
		HoughSpace.CartesianHoughAry = new int [HoughSpace.HoughDist][HoughSpace.HoughAngle];
		HoughSpace.PolarHoughAry = new int[HoughSpace.HoughDist][HoughSpace.HoughAngle];
		for(int i=0;i<HoughSpace.numRows;i++) {
			for(int j=0;j<HoughSpace.numCols;j++) {
				HoughSpace.imgAry[i][j]=0;
			}
		}
		for(int i=0;i<HoughSpace.HoughDist;i++) {
				for(int j=0;j<HoughSpace.HoughAngle;j++) {
					HoughSpace.CartesianHoughAry[i][j]=0;
					HoughSpace.PolarHoughAry[i][j]=0;
				}
			}

			HoughSpace.offset=(int) Math.sqrt(Math.pow(HoughSpace.numRows,2 )+Math.pow(HoughSpace.numCols, 2));

			HoughSpace.loadImage(inputFileScanner);
			writer.write("Img Array\n");
			HoughSpace.reformatPrettyPrint(HoughSpace.imgAry, writer);
			HoughSpace.buildHoughSpace();

			writer.write("Cartesian Hough Array\n");
			HoughSpace.reformatPrettyPrint(HoughSpace.CartesianHoughAry, writer);
			writer.write("Polar Hough Array\n");
			HoughSpace.reformatPrettyPrint(HoughSpace.PolarHoughAry, writer);
			writer.close();
		}


}
```

HoughTransform Class

```
import java.io.*;
import java.util.Scanner;
public class BaraianA_HoughTransform {
		int numRows;
		int numCols;
		int minVal;
		int maxVal;
		int HoughDist;
		int HoughAngle=180;
		int imgAry[][];
		int CartesianHoughAry[][];
		int PolarHoughAry[][];
		int angleInDegree;
		double angleInRadians;
		int offset;

		void loadImage(Scanner S) {
			for(int i=0;i<numRows;i++) {
				for(int j=0;j<numCols;j++) {
					imgAry[i][j]=S.nextInt();
				}
			}
		}

		void PrettyPrint(BufferedWriter writer) throws IOException {
			for(int i=0;i<numRows;i++) {
				for(int j=0;j<numCols;j++) {
					writer.write(imgAry[i][j]+" ");
				}
				writer.write("\n");
			}
		}

		void buildHoughSpace() {
```

```
                for(int i=0;i<numRows;i++) {
                        for(int j=0;j<numCols;j++) {
                                if(imgAry[i][j]>0) {
                                        computeSinusoid(i,j);
                                }
                        }
                }
        }

        void computeSinusoid(int x,int y) {
                angleInDegree=0;
                double dist;
                int distInt;
                while(angleInDegree<=179) {
                angleInRadians = (double)(angleInDegree*Math.PI/180);
                dist=CartesianDist(x,y);
                distInt=(int)dist;
                CartesianHoughAry[distInt][angleInDegree]++;
                dist=PolarDist(x,y);
                distInt=(int)dist;
                PolarHoughAry[distInt][angleInDegree]++;
                angleInDegree++;
                }
        }

        double CartesianDist(int x,int y) {
                double t= angleInRadians- Math.atan(y/x)- Math.PI/2;
                double cartesiandistance=Math.sqrt(Math.pow(x, 2)+Math.pow(y,2)) * Math.cos(t) + offset;
                return cartesiandistance;
        }
        double PolarDist(int x, int y) {
                double polardistance = x* Math.cos(angleInRadians) + y* Math.sin(angleInRadians) + offset;
                return polardistance;
        }
        void reformatPrettyPrint(int Ary[][],BufferedWriter writer) throws IOException {
                int max=0;
                 for(int row=0;row<Ary.length;row++){
       for(int col=0;col<Ary[0].length;col++){
         if(max<Ary[row][col]){
          max=Ary[row][col];
         }

       }
     }

                 int r=0,c=0;
                 while(r<Ary.length) {
                         c=0;
                         while(c<Ary[0].length) {
                                 if(max<10) {
                                         if(Ary[r][c]==0) {
                                                 writer.write(". ");
                                         }
                                         else {
                                                 writer.write(Ary[r][c] + " ");
                                         }
                                 }
                                 else {
                                         if(Ary[r][c]==0) {
                                                 writer.write(".  ");
                                         }
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```
                                                else if(Ary[r][c]>=10) {
                                                        writer.write(Ary[r][c]+ " ");
                                                }
                                                else {
                                                        writer.write(Ary[r][c]+"  ");
                                                }
                                        }
                                        c++;
                                }
                                writer.write("\n");
                                r++;
                        }
                        writer.write("\n");
                        writer.flush();

                }


        }
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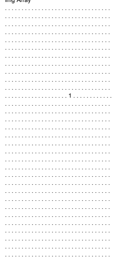
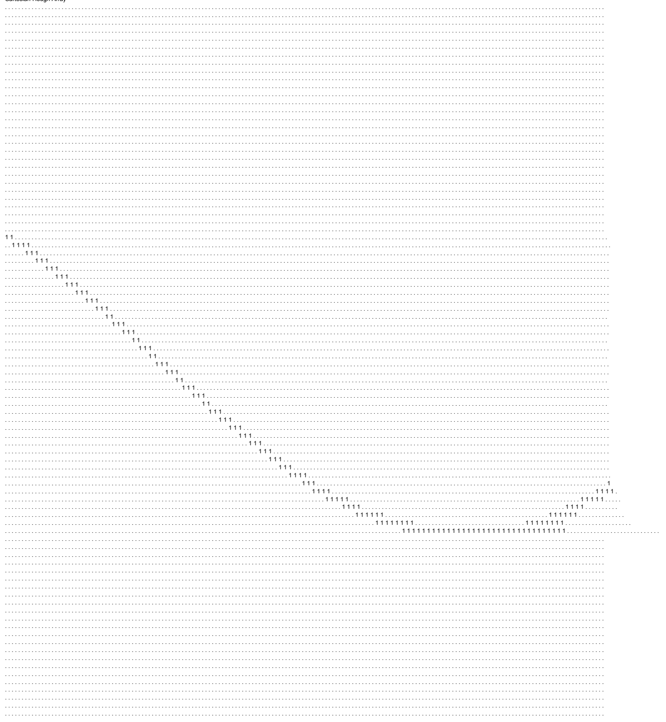
Outfile From 2)

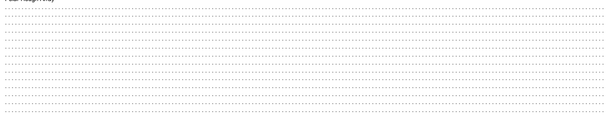
Img Array



Cartesian Hough Array



Polar Hough Array



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Outfile From 3)

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Cartesian Hough Array

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Polar Hough Array

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Cartesian Hough Array

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Cartesian Hough Array

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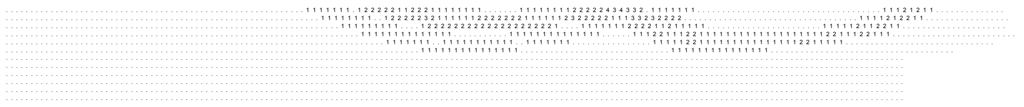

Polar Hough Array