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Section: 224

Project #: 0

Project Name: Binary and non-binary thresholding (C++)

Due Date: 2/3/2024

**Algorithm steps**

**SinnerineS\_Project0\_Main (…)**

step 0: inFile 🡨 open argv [1] // i.e., ifstream inFile.open (argv [1])

thrValue 🡨 cast argv [2] from string to integer // i.e., int (argv [2]) or (int) argv [2]

outFile1 🡨 open argv [3]

outFile2 🡨 open argv [4]

numRows 🡨 read from inFile // i.e., inFile >> numRows

numCols 🡨 read from inFile

minVal, maxVal 🡨 read from inFile

maxVal 🡨 read from inFile

step 1: outFile1 🡨 output numRows, numCols, 0, 1 to outFile1 // i.e., outFile1 << numRows etc.

outFile2 🡨 output numRows, numCols, 0, maxVal to outFile2

step 2: processing (inFile, outFile1, outFile2, thrValue)

step 3: close all files  
  
processing (inFile, outFile1, outFile2, thrValue) // the 3 files need to pass by references (i.e., precede by &)  
  
step 0: (int) pixelVal

(int) count 🡨 0

step 1: pixelVal 🡨 read one integer from inFile // i.e., inFile >> pixelVal

step 2: if pixelVal >= thrVal

outFile1 🡨 write 1 follows by 1 blank // binary threshold.

outFile2 🡨 write pixelVal follows by 1 blank //non-binary threshold.

else

outFile1 🡨 write 0 follows by 1 blank

outFile2 🡨 write 0 follows by 2 blanks

step 3: count++

step 4: if count > numCols

outFile1 🡨 write end of text line

outFile2 🡨 write end of text line

count 🡨 0

step 5: repeat step 1 - step 4 until the inFile is empty

**Source Code**

#include <iostream>

#include <fstream>

#include <cstdlib>

using namespace std;

// Class to represent image properties

class Image {

public:

int numRows;

int numCols;

int minVal;

int maxVal;

int thrValue;

// Constructor for the Image class to initialize class member variables

Image() {

numRows = 0;

numCols = 0;

minVal = 0;

maxVal = 0;

thrValue = 0;

}

// Method to read image header from input file

void readHeader(ifstream& inFile) {

inFile >> numRows >> numCols >> minVal >> maxVal;

}

// Method to write image header to output file with updated minVal and maxVal

void writeHeader(ofstream& outFile, int newMinVal, int newMaxVal) {

outFile << numRows << " " << numCols << " " << newMinVal << " " << newMaxVal << endl;

}

};

// Function to perform binary and non-binary threshold operations

void processing(ifstream& inFile, ofstream& outFile1, ofstream& outFile2, int thrValue) {

Image image;

// Read the image header from the input file

image.readHeader(inFile);

// Output header to both output files with updated minVal and maxVal

image.writeHeader(outFile1, 0, 1); // Updated for binary threshold operation

image.writeHeader(outFile2, 0, image.maxVal); // Updated for non-binary threshold operation

int pixelVal, count = 0;

// Read pixel values from the input file

while (inFile >> pixelVal) {

if (pixelVal >= thrValue) {

outFile1 << "1 "; // binary threshold

outFile2 << pixelVal << " "; // non-binary threshold

} else {

outFile1 << "0 ";

outFile2 << "0 ";

}

count++;

// Check if the end of the row is reached

if (count >= image.numCols) {

// Write end of line to both output files

outFile1 << endl;

outFile2 << endl;

// Reset the count for the next row

count = 0;

}

}

}

int main(int argc, char\* argv[]) {

// Check for correct number of command-line arguments

if (argc != 5) {

cerr << "Invalid Arguments: inFile thrValue outFile1 outFile2" << endl;

return 1;

}

// Open input file

ifstream inFile(argv[1]);

if (!inFile) {

cerr << "Error: Unable to open input file" << endl;

return 1;

}

// Convert threshold value from string (containing digits) to integer

int thrValue = atoi(argv[2]);

// Open output files

ofstream outFile1(argv[3]);

ofstream outFile2(argv[4]);

if (!outFile1 || !outFile2) {

cerr << "Error: Unable to open output files" << endl;

return 1;

}

// Perform processing and write results to output files

processing(inFile, outFile1, outFile2, thrValue);

// Close all files

inFile.close();

outFile1.close();

outFile2.close();

return 0;

}

**Program Output - outFile1.txt**

46 46 0 1

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**outFile2.txt**

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