Image Processing ToolKit

- Installation/Execution
- Explanation
- Functions
    - Add
    - Binarize
    - Box Blur
    - Dual Thresholding
    - Scale
    - Color Brightness
    - Color Visual
    - Histogram stretching/normalized
    - Histogram Threshold
    - Color Stretching
    - RGB to HSI
    - HSI to RGB
    - HSI Histogram Stretching/normailized
    - Sobel filter size 3
    - Sobel filter size 5
    - Binary Edge Detection

Installation/Execution

This program runs on linux. To start using this software go to project directory and run make, this will compile the program.

Once compiled go to bin directory in project folder and execute ./iptool parameter.txt in command line. This will run the program

parameters.txt is contained in the bin folder and is what is used to take user input.

The parameters.txt file should be formatted in this matter

1. the input file name; (must be contained in bin folder)

2. the output file name; (will save into the bin folder upon execution)

3. the number of ROIs 1-3;

4. ROI x starting position;

5. ROI y starting position;

6. ROI width Sx;

7. ROI height Sy;

8. the name of the function;

9. the parameters of the function

if multiple ROIs repeat from step 4 for second and third ROI

Example parameter.txt

On line 1 (make sure there are not empty extra lines)

Ex.1)

input.pgm output.pgm 1 0 0 511 511 func p1 p2 ….pn

Ex 2)

input.pgm output.pgm 2 0 0 20 50 func1 funcParam1... 100 150 200 200 func2 funcParam1...

parameter.txt can have multiple lines filled with different input/output images as long as it is formatted properly and there are no empty lines.

Explanation

This program is an Image Processing Toolkit used to apply basic operations on a specified area of an Image to gather some usefull information about an image.

The two main image file types that work with this program are

PPM: RGB colored images

PGM: GREY-Scale images

The program uses Regions of Interest(ROIs) to apply filters on specific areas of an Image. This allows to only apply the algorithms on specified parts of the image which can make data collection more efficient and faster.

There can be a minimum of 1 ROI and maximum of 3 ROIs. ROIS can overlap but cannot go out of the image bounderies. ROIs are applied in inverse order so ROI 3 will apply first and ROI 1 last.

Functions

Add

Function Call: add

Params: p1, intensity to increase by

Imagetype: pgm grey-scale

Functionality: brightens the intensity of each pixel

Ex. Parameters call

baboon.pgm addtest.pgm 1 0 0 500 500 add 50

Binarize

Function Call: binarize

Params: p1, threshold value to split extreme

ImageType: pgm grey-scale

Functionality: Thresholds the image making it one extreme or the other

Ex. Parameters

baboon.pgm bintest.pgm 1 0 0 500 500 binarize 150

Box Blur

Function Call: reg2dsmooth

Params: window size either 3 or 5

ImageType: pgm grey-scale

Functionality: smooth(blur) the image

Ex. Parameters

baboon.pgm smoothe3test.pgm 1 0 0 500 500 reg2dsmooth 3

Dual Thresholding

Function Call: dualthres

Params: Threshold T, value to increase brightness V1, value to decrease brightness

ImageType: pgm greyscale

Functionality: Increase and decrease brightness of an image given a threshold image and changes pixel value based on lower or higher threshold

Ex. Params

baboon.pgm dualthrestest.pgm 1 0 0 500 500 dualthres 150 30 30

Scale

Function Call: scale

Params: ratio to scale

ImageType: pgm greyscale

Functionality: reduction/expansion of image(zoom)

Ex. Parameters

baboon.pgm scaletest.pgm 1 0 0 500 500 scale 2

Color Brightness

Function Call: colorbright

Params: value to increase Red Brightness DR, value for Blue Brightness DB, value for Green brightness DG

ImageType: ppm color image

Functionality: Increases brightness of color channels rgb with user given values

Ex. Parameter

baboon.ppm colorbrighttest.ppm 1 0 0 400 400 colorbright 2 2 2

Color Visual

Function Call: colorvisual

Params: Threshold T, intensity value V1

ImageType: grey to rgb in pgm -> out ppm

Functionality: colors pixels with intensity close to V1 red

Ex. Parameter

baboon.pgm colorvistest.ppm 1 0 0 500 500 colorvisual 50 80

Histogram stretching

Function Call: histostretch

Params: A higher range, B lower range

ImageType: greylevel pgm

Functionality: uses histogram stretching to equalize an image. Stretch intensities of max I and min I to range A, B

Ex.Parameters

baboon.pgm histostretchtest.pgm 1 0 0 400 400 histostretch 100 150

Histogram stretching normalized

Function Call: histostretchnorm

Params: no params default min/max A B values used

ImageType: greylevel pgm

Functionality: uses histogram stretching to equalize an image. Stretch intensities of max I and min I to range 0, 256

Ex. Parameters

slope.pgm histostretchnormtest.pgm 1 0 0 400 400 histostretchnorm

Histogram Threshold

Function Call: histothres

Params: Threshold T, foreground or background F or B, A higher range, B lower range

ImageType: pgm greyscale

Functionality: combines basic thresholding with histogram stretching to get a distinct foreground or background.

Ex.Parameters

baboon.pgm histothrestest.pgm 1 0 0 400 400 histothres 150 F 150 50

Color Stretching

Function Call: colorstretch

Params: color channel C = R G or B, higher range A, lower range B

ImageType: color images ppm

Functionality: applies histogram stretching on R G or B channel

Ex. Parameters

baboon.ppm colorstretchtest.ppm 1 0 0 400 400 colorstretch R 150 100

RGB to HIS

Function Call: rgbtohsi

Params: no params just src and tgt image

ImageType: color images ppm

Functionality: converts RGB channel to HSI channels respectively for further operations

Ex. Parameters

baboon.ppm rgbtohsitest.ppm 1 0 0 400 400 rgbtohsi

HSI to RGB

Function Call: hsitorgb

Params: no params just src and tgt

ImageType: ppm, only usefull on images if input image was converted to hsi using rgbtohsi

Functionality: turns HSI values to RGB respectively

Ex. Parameters

baboonhsi.ppm hsitorgbtest.ppm 1 0 0 400 400 hsitorgb

HSI Histogram Stretching

Function Call: hsistretch

Params: Range for histogram stretch A, B

ImageType: hsi image input ppm. //convert rgb to hsi using rgbtohsi before using this function. Keep roi same.

Functionality: adjusts contrats of color image with user given range //200 250 = higher contrast

Ex. Parameters

Baboonhsi.ppm hsistretchtest.ppm 1 0 0 400 400 hsistretch 200 250

HSI Histogram Stretching normalized

Function Call: hsistretchnorm

Params: no parameters just src, tgt

Imagetype: hsi image ppm. “convert rgb image to hsi using rgbtohsi before calling using this function. Keep roi same for both calls”.

Functionality: adjusts the contrast of a rgb image using HSI intensity value with histogram equalization

Ex.Parameters

Baboonhsi.ppm hsistretchnormtest.ppm 1 0 0 400 400 hsistretchnorm

Sobel filter size 3

Function Call: sobel3

Params: no params just src, tgt

ImageType: grey level pgm

Functionality: gradient based method to find edges in images, uses kernel size 3

Ex.Parameters

baboon.pgm sobel3test.pgm 1 0 0 400 400 sobel3

Sobel filter size 5

Function Call: sobel5

Params:no params just src, tgt

Image Type: grey level pgm

Functionality: gradient based method to find edges in images, uses kernel size 5

Ex.Parameters

baboon.pgm sobel5test.pgm 1 0 0 400 400 sobel5

Binary Edge Detection

Function Call: binaryedge

Params: higher threshold TH lower threshold TL

Image Type: grey level pgm

Functionality: gets edges of an image and then binarizes. Also gets horizontal edges and 45 degree edges saved as separate pgm files.

Ex.Parameters

wheel.pgm binaryedgetest.pgm 1 0 0 299 299 binaryedge 50 9

octagon.pgm BEoctogontest.pgm 1 0 0 511 511 binaryedge 50 9