University of Science and Technology of Hanoi
18 Hoang Quoc Viet, Cau Giay, Hanoi
Telephone/ Fax: +84-4 37 91 69 60
Website: http://www.usth.edu.vn

IMAGE PROCESSING

Labwork 1: Histogram and Point Processing

Part 1. Use a pen and paper to do the following tasks:

Task 1: Given the following image I:

3	3	2
1	1	0
2	2	2

- Calculate and draw histogram, normalized histogram of image I.
- Calculate and display negative image of I.

Task 2: Given the following image J:

0	2	1	7
3	2	5	2
1	1	7	6
5	0	0	3

- Calculate and draw histogram, normalized histogram of image J.
- Convert image J to a binary image called B using the thresholding technique where the predefined threshold k is the pixel which appears most frequency in the image.

Task 3: Given the following image M:

123	127	128	119	115	130
140	145	148	153	167	172
133	154	183	192	194	191
194	199	207	210	198	195
164	170	175	162	173	151

- Calculate and draw histogram, normalized histogram of image M.

- Calculate and draw equalized histogram from image M. From the equalized histogram infers the new image called N.
- Convert image M to a binary image called B using the thresholding technique where the predefined threshold k is the median of the pixels of image M.

Part 2. Install Anaconda in your computer, then:

- Learn how to use OpenCV with Python in Anaconda.
- Use Jupyter Notebook as your editor.
- Download from the Internet some greyscale images ***(preferred ultrasound images or X-ray images)***, then do the following image processing tasks using OpenCV and Python:

Task 1: Read the downloaded images using the function $cv2.imread()$, then display the images using the matplotlib function $imshow()$

Task 2: Resize the downloaded image using the function $cv2.\ resize()$

Task 3: Change brightness of the downloaded image, using the following formula:

$$img_{processed} = a * f(x,y) + b$$

In which, $f(x, y)$ is the original image (img) at the coordinate (x, y); a and b are user-defined constants.

Task 4: Histogram equalization

- Calculate and display the histogram of the original image, using the function $cv2.calcHist()$.

- Use function $cv2.equalizeHist()$ to calculate the new equalized image.

- Display the equalized histogram.

Task 5: Image Thresholding

- Get an image and display it on the screen. Note that if the chosen image is color, you will need to convert the image to grayscale before displaying it.

- Apply the global thresholding technique to binarize the image.

- Display the binarized image.

***Note**:* you are required to upload the captured photos and the source codes of your labworks to the google drive folder of the DIP course.