School of Computing
National University of Singapore
CS4243 Computer Vision and Pattern Recognition
Semester 1, AY 2018/19

Lab 3 – Contrast Stretch, Convolution and Edge Detection

Objective:

To understand the materials covered in the lecture through
- o Implementing contrast stretch for image enhancement in Matlab
- o Implementing 1D convolution and 2D edge detection in Matlab

Preparation:

a. Download the files Lab3_pictures_set1.zip, Lab3_pictures_set2.zip and conv.m from IVLE into your working directory.

b. Uncompress the zipped files and you should find the following 2 folders:

Lab3_pictures_set1 folder:
- meteora_gray.jpg
- penang_hill_gray.jpg
- foggy_carpark_gray.jpg

Lab3_pictures_set2 folder:
- letterBox.jpg
- checker.jpg
- pipe.jpg
- carmanBox.jpg

1. Contrast Stretch to Enhance Images

You will need to work on the images in the folder Lab3_pictures_set1 for this part. You don't need Lab3_pictures_set2 for this part.

In the previous lab, you had done histogram equalization to enhance images. In this lab, you will try to do contrast stretching to enhance images. You should plot the histogram of a picture and observe how you should set the lower and upper cut-off intensities for stretching the histogram. Try a few experiments with different settings and submit one set of setting that you think is best.

Repeat the above with the top halves of the images removed, as in the previous lab.

2. 1D Convolution

Study the 1D convolution matlab script conv.m.   Plot the convolution results for the following cases:

h = [-1 0 1 0 0 0 0 0 0 0]
x = [5 5 5 5 5 0 0 0 0 0]

3. 2D Edge Detection

This is an exercise to make sure you understand edge detection and the concept of 2D convolution.

You will need only to work on the pictures in Lab3_pictures_set2.

Make sure you convert all the pictures into gray scale. You may use the Matlab built in library to do the conversion.

For edge detection, you will use the Sobel edge operator.

Perform edge detection on all the pictures in Lab3_pictures_set2.

General instructions for this lab:

- You are not allowed to use any matlab built in functions for image processing, except reading, writing, displaying images and converting from color to gray scale.
- You must implement contrast stretch, 1D convolution and 2D edge detection by writing Matlab codes by yourself (i.e. you cannot get the codes from elsewhere).

Submission Instruction

Submit the softcopy of your Matlab codes and the resultant image files to IVLE.

Please put your Matlab codes and images in a folder and submit the folder. Use the following convention to name your folder:

StudentNumber_yourName_Lab3.   For example, if your matriculation number is A1234567B, and your name is Chow Yuen Fatt, for this lab, your file name should be *A1234567B_ChowYuenFatt_Lab3*.