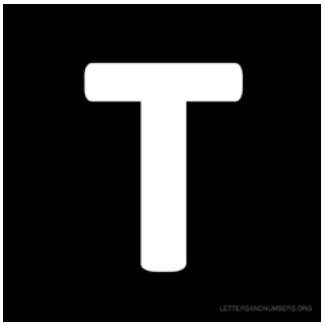
CSCI-B456 – Image Processing
Spring 2018

SCHOOL OF INFORMATICS, COMPUTING, AND ENGINEERING
INDIANA UNIVERSITY

InClass Exercise 2

Due by 1/28/2018, Sunday Midnight through Canvas



***Requirements**: Please ensure that all source code is tested properly and follows general code readability guidelines (i.e., includes proper variable names, adequate comments as well as brief description of your logic or pseudocode or algorithm used). Submit all files including any images. Also, review the lecture notes for week3 carefully before completing the following work:*

Part 1: Affine Transformations

Perform the following affine transformations on the image shown below:

- translation
- scale
- shear
- rotation

Follow the steps given below:

- To get the transformation matrices, visit https://www.mathworks.com/discovery/affine-transformation.html
- Save each transformation as a separate image.

Note: MATLAB has its own functions for image transformations (i.e., imtransform, imwrap, etc.) and you should review those for testing purposes only. We are expecting you to implement your own version of imTransform.

Part 2: Histogram Equalization

a) Write a MATLAB program to calculate the histogram of a grayscale image and plot it

Please follow the below mentioned instructions to use MATLAB's in-built functions to compute and plot histogram of an image:
Img = imread('path-to-input-image')
Output = imhist(img)
Please note that imhist() takes a grayscale image as input.

Explore plotting histograms using the following built-in functions from MATLAB

- Bar()
- Stem()
- Plot()

Label x and y axis using xlabel() and ylabel(). Add title to all the plots using title().

b) Use histogram equalization to enhance the image (PgaNb.png) and write a short description [4-5 lines max] of the differences results observed with step given below:
   - Read the example image provided into MATLAB using imread(). Plot the histogram of the image.
   - Use histeq() to view the histogram equalization as applied to the input image. Plot the histogram of the image obtained from histeq().

c) Repeat part b with your own image. May be access some from textbook website at http://www.imageprocessingplace.com/

Part 3: Gaussian distribution

Create a 5x5 Normal distribution (Gaussian) kernel, using σ = 1.76. The probability distribution of normal distribution is

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{(\mu - x)^2}{2\sigma^2}}$$

Follow these steps:

- Randomly generate x and y values for range [-2,2]
- Use the values in the formula for normal distribution
- Print the 5x5 kernel and display (using something like 2d plot, surf, etc.) with probably labelled axis and with title.