Laboratory Work #3

INTENSITY TRANSFORMATIONS AND HISTOGRAM PROCESSING FOR IMAGE ENHANCEMENT

The objective of this experiment is to implement the fundamental intensity transformations and image enhancement techniques using MATLAB Image Processing Toolbox. The basic intensity transformations namely image negatives, log transformations, gamma transformations and contrast stretching are implemented. Histogram processing is also used for image enhancement. Image histograms will be generated and plotted, and histogram equalization technique will be implemented for improving the quality of digital images.

EXPERIMENTAL WORK:

E1. Intensity transformations are simple techniques that map a pixel value *r* into a pixel value *s* using the transformation in the form of *s=T(r)*. The basic intensity transformations namely image negatives, log transformations, gamma transformations and contrast stretching are implemented in the function "intrans" [from the reference book "R. C. Gonzalez, R. E. Woods and S. L. Eddins, *Digital Image Processing using MATLAB, 2nd* Edition, Prentice Hall, 2009"]**.**

    (a) Apply the following transformations using the corresponding images by calling "intrans" function (write a small code to call intrans function with different parameter values) and obtain the output images for the following transformations:

        (i) Image negative on Fig1

        (ii) Log transformation on Fig2

        (iii) Gamma transformation with parameter values 0.3, 0.4, 06, 2.5 on Fig3

        (iv) Contrast stretching on Fig1 (Use the following statements for contrast stretching):

```
x=imread('fig1.tif');
y=intrans(x,'stretch',mean2(im2double(x)), 0.9);
figure, imshow(y)
```

(b) Modify the "intrans" function to perform image negative using "imadjust" function and compare the output obtained with the output of E1.(a)(i).

E2. Histogram processing plays an important role in image processing in areas such as enhancement, compression, segmentation and description. Perform the following tasks to obtain, plot and use histograms for image enhancement, and apply histogram equalization technique:

(a) Use Figure 3.16 (a), (b), (c), and (d) from the reference book "R. C. Gonzalez and R. E. Woods, *Digital Image Processing,* 3rd Edition, Prentice Hall, 2008", plot the histograms of these images in 4 different ways using the following functions:

    (i)   imhist

    (ii)   bar

    (iii)   stem

    (iv)   plot

(b) Apply histogram equalization on the 4 images given in Figure 3.16 (a) to (d) and plot the histograms of these histogram-equalized images using **histeq** and **imhist** functions.

E3. Write down a <u>report</u> (1 or 2 pages) discussing the results obtained in E1 and E2. The report will be submitted to the assistant 1 day after the lab date. *(Discussion of the results must be written with your own words, otherwise the report will not be graded.)*