Digital Image Processing (03/02/2016)

HOMEWORK ASSIGNMENT #1

Image Enhancement and Noise Removal

Due Date: 11:59am on 03/15/2016

Please read the submission guideline (posted on the class website) carefully before getting started.

All images in this homework can be downloaded from our class website: *https://ceiba.ntu.edu.tw/1042DIP*. Images are in the **raw** file format. The size of each image is listed in the appendix.

For MATLAB users, you are **NOT** allowed to use the MATLAB Image Processing toolbox except the imshow() and image() functions.

WARM-UP: SIMPLE MANIPULATIONS

Given an image I as shown in Fig. 1, please vertically and horizontally flip the given image and output these two results, respectively.

Fig. 1: sample1.raw

PROBLEM 1: IMAGE ENHANCEMENT

In this problem, you are given an image D, as shown in Fig. 2. Please follow the instructions below to create several new images.

(a) Plot the histograms of I and D. What can you observe from these two histograms? What can you do to make D look like I?

(b) Perform histogram equalization on D and output the result as H.

(c) Perform local histogram equalization on image D and output the result as L.

(d) Plot the histograms of H and L. What's the main difference between local and global histogram equalization?

(e) Perform the log transform, inverse log transform and power-law transform to

enhance image D. Please adjust the parameters as best as you can. Show the parameters, output images and corresponding histograms. Provide some discussions on the results as well.

Fig. 2: sample2.raw

PROBLEM 2: NOISE REMOVAL

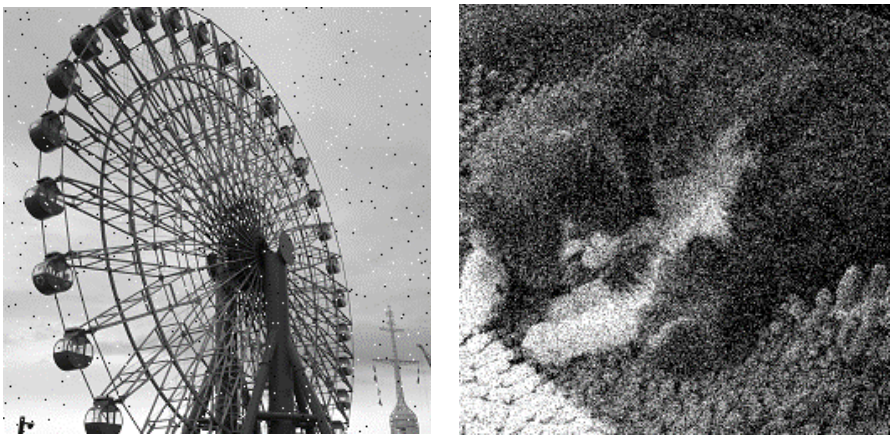
Please follow the instructions below to create some new images.

(a) The image shown in Fig. 3(a) is corrupted by certain noise. Please add the same kind of noise to image I and denote the result as N_1.

(b) Another image shown in Fig. 3(b) is contaminated by certain noise. Please add the same kind of noise to image I and the output is denoted as N_2.

(c) Choose proper filters and parameters to remove the noise in N_1 and N_2, and denote the resultant images as R_1 and R_2, respectively. Please specify the steps of your de-noise process and provide some discussions about the reason why those filters and parameters are chosen.

(d) Compute the PSNR values of R_1 and R_2 and provide some discussions.



(a) sample3.raw (b) sample4.raw

Fig.3: Examples of images with noise.

Appendix:

Image files

Warn-up: SIMPLE MANIPULATIONS			
sample1.raw	Fig. 1	256 x 256 image	gray-scale
Problem1: GETTING STARTED & IMAGE ENHANCEMENT			
sample2.raw	Fig. 2	256 x 256 image	gray-scale
Problem2: NOISE REMOVAL			
sample3.raw	Fig. 3	256 x 256 image	gray-scale
sample4.raw	Fig. 3	256 x 256 image	gray-scale