Lab 2 - Image Processing EEE412

Report is due **two weeks** from the date of running this lab

Objectives:

1- To master how to use different image enhancement techniques.

Matlab functions:

Check the following *Matlab* functions :

```
Imhist, histeq, blockproc

Imfilter, fspecial, medfilt2, blockproc, deconvwnr
```

Hint: read the help about each of the previous functions and any other function you might use. Some Matlab functions have a section describing the *Algorithm(s)* they use; it is worth reading this section.

Hint:

Divide big task into smaller sub-tasks, and write a function for each sub-task.

While designing your functions try to make them as general as possible, you may need to use them for other tasks in future.

Use **meaningful names** for your functions and their variables, don't use names such as a, aa, …

Save all your functions in a folder and include it in the Matlab path

Tasks:

1. Task 1 (**50'**):

   Download from ICE the file lab2-material.rar which includes:
   i. A monochrome image lenna512.bmp (load it into Matlab as `im`) which will be used as reference.

ii.   Add Gaussian white noise with zero mean and variance 10 to the image *im* and display the noisy image. Name it as `im_wn`. Please write one function to generate this image instead of calling matlab function directly. (**10'**)

iii.   Add salt & pepper noise with noise density 10% to the image *im* and display the noisy image. Name it as `im_SP`. Please write one function to generate this image instead of calling matlab function directly. (**10'**)

iv.   Evaluate the PSNR of the previous images with respect to the reference image `im` and complete the following table, where the image `im_low_dynamic_range` is loaded from lenna512_low_dynamic_range.bmp in lab2-material.zip. You can use PSNR from you Lab 1. (**5'**)

Image	`im_wn`	`im_SP`	im_low_dynamic _range
PSNR (dB)			

v.   Check the histogram of all the previous images, compare them with the histogram of the reference image, comments and **briefly** explain your finding. (**10'**)

vi.   Try to use the technique of *Image Averaging* to remove the noise of sub-task ii, e.g., average 10 images to get *im_wn10*, average 100 images to get *im_wn100*, and average 1000 images to get *im_wn1000*. Evaluate the PSNR of these three images with respect to the reference image im. Comments and briefly explain this result. (**15'**)

Image	`im_wn10`	`im_wn100`	im_wn1000
PSNR (dB)			

2. Task 2 (**20'**):

(1) Write a function to generate a piece-wise linear mapping transform to enhance the contrast of im_low_dynamic_range, verify the effectiveness of several mapping transform functions by evaluating the PSNR with respect to the reference image, and show all enhanced images. Include also in your report the best intensity mapping function you obtained.

(2) Use the command `histeq` which enhances the contrast of the images by transforming the values in an intensity image. Compare the current result with the best intensity mapping function in (1). Comment and **briefly** explain your finding.

3. Task 3 (**10'**)
Write the code to show the horizontal edges, vertical edges and all edges of the image *im.* Here, please use Sobel operators in the code.

4. Task 4 (**20'**):

Apply the median filter with a 3X3 window and a 5X5 window on the image im_SP. Display and evaluate the PSNR of the obtained images. For each window size, comment on how effectively the noise is reduced while sharp edges and features in the image are preserved.

Use the average filter 3X3 to filter the image im_SP. Compute the PSNR and display the filtered image. As you experimented with the mean and median algorithms what different "performance" did you notice? Was the average or median filter better, and why?

Lab Report

Write a **short** report which should contain a **concise description** of your results and observations and explanations. **Include** listings of the **Matlab scripts** that you have written. **Describe each of the images** that you were asked to display.

Submit the report electronically and a hardcopy version into the white collecting box beside the office EB310 (Hand written reports are not accepted) **before the deadline**.

This page last modified on 2019-10-07 10:09 PM