CAP5415 Computer Vision Fall 2014
Programming Assignment # 1

1. Write a function that convolves an image with a given convolution filter

function [output_Image]= myImageFilter(Input_image, filter)

Your function should output image of the same size as that of input Image (use padding).

Test your function (on attached images House1.jpg and House2.jpg) and show results on the following Kernels.

i. Averaging Kernel (3×3 and 5×5)

ii. Gaussian Kernel (σ =1,2,3) Use $(2\sigma+1)\times(2\sigma+1)$ as size of Kernel (You may write a separate function to generate Gaussian Kernels for different values of σ.)

iii. Sobel Edge Operators: $\begin{bmatrix}-1 & -2 & -1\\ 0 & 0 & 0\\ 1 & 2 & 1\end{bmatrix}$ and $\begin{bmatrix}-1 & 0 & 1\\ -2 & 0 & 2\\ -1 & 0 & 1\end{bmatrix}$

iv. Prewitt Edge Operators: $\begin{bmatrix}-1 & 0 & 1\\ -1 & 0 & 1\\ -1 & 0 & 1\end{bmatrix}$ and $\begin{bmatrix}1 & 1 & 1\\ 0 & 0 & 0\\ -1 & -1 & 1\end{bmatrix}$

2. Attached 'Noisy image1' and 'Noisy image2' are corrupted by salt and paper noise. Apply 5 by 5 Averaging and Median filter and show your outputs. Why Median filter works better than averaging filter?

3. Compute gradient magnitude for attached image 'Q3_Image' (using Matlab built-in function gradient);

i. Stretch the resulting magnitude (between 0 to 255) for better visualization
ii. Compute the histogram of gradient magnitude
iii. Compute gradient orientation (the angle of gradient vector)
iv. Compute histogram of gradient orientation (angle between 0 and 2*pi)

4. Load *walk_1.jpg* and *walk_2.jpg* images in Matlab. Convert them to gray scale and subtract *walk_2.jpg* from *walk_1.jpg*. What is the result? Why?

5. Apply canny edge detector on the "Q_3.jpg" using Matlab function "edge". Test different values of 'Sigma' and 'Threshold'.

Deliverables:

1. Report including Input and Output images (Soft Copy)
2. Code (Soft copy)

Please send your assignments by email to waqas5163@gmail.com. Please use Assig_1_CAP541514 as subject of the email.

Note: Please write some lines about how to run your code.

Submission Deadline: 09/10/2014 (23:59)