ECE 4750 : Digital Signal Processing Lab

Application on Images

Project 2

You must prepare a report containing the answers to each question, include the figures and results. Also, you will need to submit your code scripts.

This project involves the application of DSP and filter design for Images. You are given a couple of noisy images (Refer to "Data" folder). Design appropriate filters for each noisy image to reduce/remove the noise from the image. The folder 'Sample Codes' contains some examples to help you start on the project.

**Hint:** Here are some useful filters and links for MATLAB implementation.
1- Moving Average filter: movmean(A,[kb kf])

https://www.mathworks.com/help/matlab/ref/movmean.html

2- Median Filter: medfilt2(I,[m n])

https://www.mathworks.com/help/images/ref/medfilt2.html

3- Wiener Filter: wiener2(I,[m n])

https://www.mathworks.com/help/images/ref/wiener2.html

4- Window-Based FIR Filter: fir1(n,Wn,ftype)

https://www.mathworks.com/help/signal/ref/fir1.html

5- "2-D" Averaging Filter: filter2(h,A), Example. filter2(fspecial('average',3),Image)/255

https://www.mathworks.com/help/matlab/ref/filter2.html
6. "1-D" Filter: filter(b,a,x)

https://www.mathworks.com/help/matlab/ref/filter.html

Hint: For most of the noisy images you can use an n-point moving average filter, with 'n' of your choice across the columns or the rows, depending on the problem.

You need to submit the MATLAB codes. Also, you need to submit a report for this project. The report should contain an introduction describing the project. A section including the original images, spectrogram of the images, the filters that you have designed and used, frequency response of the filter, and the reconstructed images after applying the filter. You need the clearly describe what filter you used and what the effect of the filter is on the image. The report should also contain a conclusion section. Use appropriate captions for the figures and images in your reports.
An example of the spectrogram of an image is made to give you the direction.