German University in Cairo
Faculty of Media Engineering and Technology
Spring 2019

DMET 1002 – Advanced Media Lab

Mini Project 2

(Due on: a week after your lab)

Problem 1

Implement a function that applies a low-pass filter to an input gray-scale image. The function should take as inputs the input image, the type of the filter (ideal, Butterworth or Gaussian), the order of the filter if it's Butterworth and the cutoff distance of the low-pass filter D_0. It should output the filtered image. Apply the filter to the noisy image "GUC.jpg".

Deliverables:

- Your code.
- The output images obtained using Ideal Low-pass Filter with $D_0 = 5$, $D_0 = 30$ and $D_0 = 50$. Name the output images "GUC_ILPF_5.jpg", "GUC_ILPF_30.jpg" and "GUC_ILPF_50.jpg", respectively.
- The output images obtained using 1st order Butterworth Low-pass Filter with $D_0 = 5$, $D_0 = 30$ and $D_0 = 50$. Name the output images "GUC_BLPF_5.jpg", "GUC_BLPF_30.jpg" and "GUC_BLPF_50.jpg", respectively.
- The output images obtained using Gaussian Low-pass Filter with $D_0 = 5$, $D_0 = 30$ and $D_0 = 50$. Name the output images "GUC_GLPF_5.jpg", "GUC_GLPF_30.jpg" and "GUC_GLPF_50.jpg", respectively.

Problem 2

Implement a function that applies a high-boost filter to an input gray-scale image. Your filter should use the butterworth high-pass filter. The function should take as inputs the input image, the order of the filter, the cutoff distance of the high-pass filter D_0 and the constant A. It should output the filtered image. Apply the filter to the image "Moon.jpg".

Deliverables:

- Your code.
- The output image obtained using 1st order butterworth filter with $D_0 = 50$ and $A = 1.5$. Name the output image "MoonHB_1.jpg".

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- The output image obtained using 1st order butterworth filter with $D_0 = 50$ and $A = 2$. Name the output image "MoonHB_2.jpg".
- The output image obtained using 2nd order butterworth filter with $D_0 = 50$ and $A = 2$. Name the output image "MoonHB_3.jpg".

Note: You can use any programming language for implementation. However, it might be easier to use MATLAB since there are many functions that are already implemented that you can use directly, but you are required to write your own version of the required filters. You are allowed to use MATLAB functions that compute the 2D Fourier transform.