

DMET 1001 – Image Processing

Assignment #1

No predefined functions to be used unless explicitly specified
(Due on September 10, 2020 at mid-night)

Problem 1

Implement the histogram smoothing algorithm. Your function should take as input the gray scaled image and the value of K . The function should output the histogram of the image before smoothing and after smoothing. Apply your function to the image “Sphinx.png”.

Apply K with two values, $K = 3$ and $K = 11$.

Deliverables:

- Your code.
 - A plot of the histogram before smoothing for both values of K . Name the plot “Before_Smoothing.jpg”.
 - A plot of the histogram after smoothing for both values of K . Name the plot “After_Smoothing.jpg”.
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Problem 2

Implement a function that applies a low-pass, a high-pass and a bandpass filter to an input gray-scale image. Your low-pass filter should be the Butterworth filter, your high-pass filter should be the Gaussian filter and your bandpass filter should use both. Implement a function for every filter.

The low-pass filter function should take as inputs the input image, the order of the filter, the cutoff distance of the Butterworth filter D_0 . It should output the filtered image.

The high-pass filter function should take as inputs the input image, the cutoff distance of the Gaussian filter D_0 . It should output the filtered image.

In the Bandpass filter you should use the previous implemented functions.

Apply the filters to the image “cameraman.png” .

Note: In this problem, you are only allowed to use the Python function that obtains the frequency-domain representation of an image. All other function should be implemented.

Deliverables:

- Your code.
- The output image obtained using 1st order Butterworth low-pass filter with $D_0 = 50$. Name the output image “cameramanlow.png”.
- The output image obtained using Gaussian high-pass filter with $D_0 = 50$. Name the output image “cameramanhigh.png”.
- The output image obtained using the bandpass filter with 2nd order Butterworth low-pass filter with $D_0 = 50$ and Gaussian high-pass filter of $D_0 = 50$. Name the output image “camermanband.png”.