

LAB04: Image Enhancement in the Frequency Domain

Objectives

Upon completion of this lab, you will be able to:

1. Understand the mechanics of frequency filtering.
2. Explain the different types of frequency filtering.
3. Write a user-defined function in MATLAB to remove noise in an image using Butterworth lowpass filter and Gaussian lowpass filter.
4. Write a user-defined function in MATLAB for finding the edges of objects within the image using Butterworth highpass filter and Gaussian highpass filter.

Exercises

Note that you should create your own function in MATLAB as MATLAB User-defined function. It means that you cannot call MATLAB built-in function, which generates output in the same manner as your own function. You can use the images provided in the folder \Google Drive\EGCO486-60-1\LABs\LAB04 for your exercises.

- 1) Image enhancement in the frequency domain using Butterworth lowpass filter (Image smoothing)

1.1 Consider the eight image corrupted by Gaussian noise. Write a user-defined function in MATLAB to filter the noisy version of the eight image using Butterworth lowpass filter. Take the following function name: Myblf.m. Using this program on the image “eight_g.tif” should give you result as shown in Figure 1.

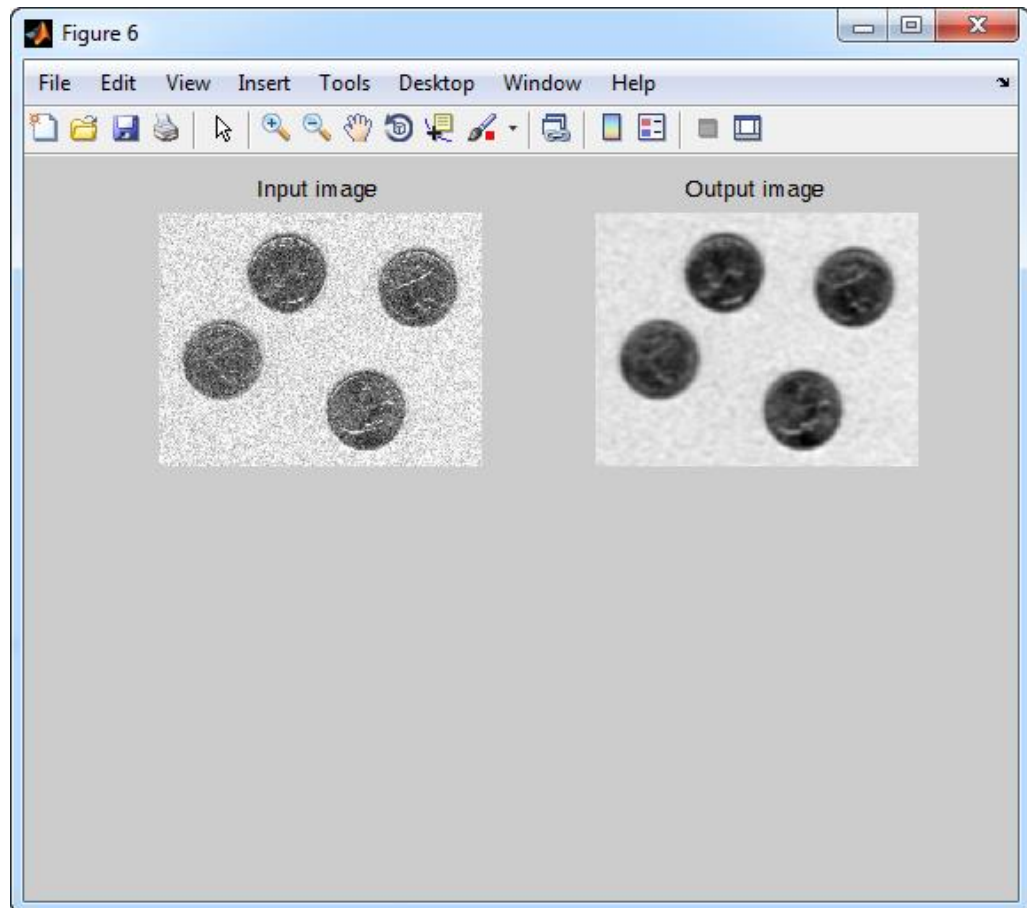


Figure 1: The result of applying the Butterworth lowpass filter on the noisy image ($D_0 = 30$, $n = 2$).

2) Image enhancement in the frequency domain using Gaussian lowpass filter (Image smoothing)

2.1 Write a user-defined function in MATLAB to filter the noisy version of the eight image using Gaussian lowpass filter. Take the following function name: Myglf.m. When this program is used with image “eight_g.tif” the result as shown in Figure 2.

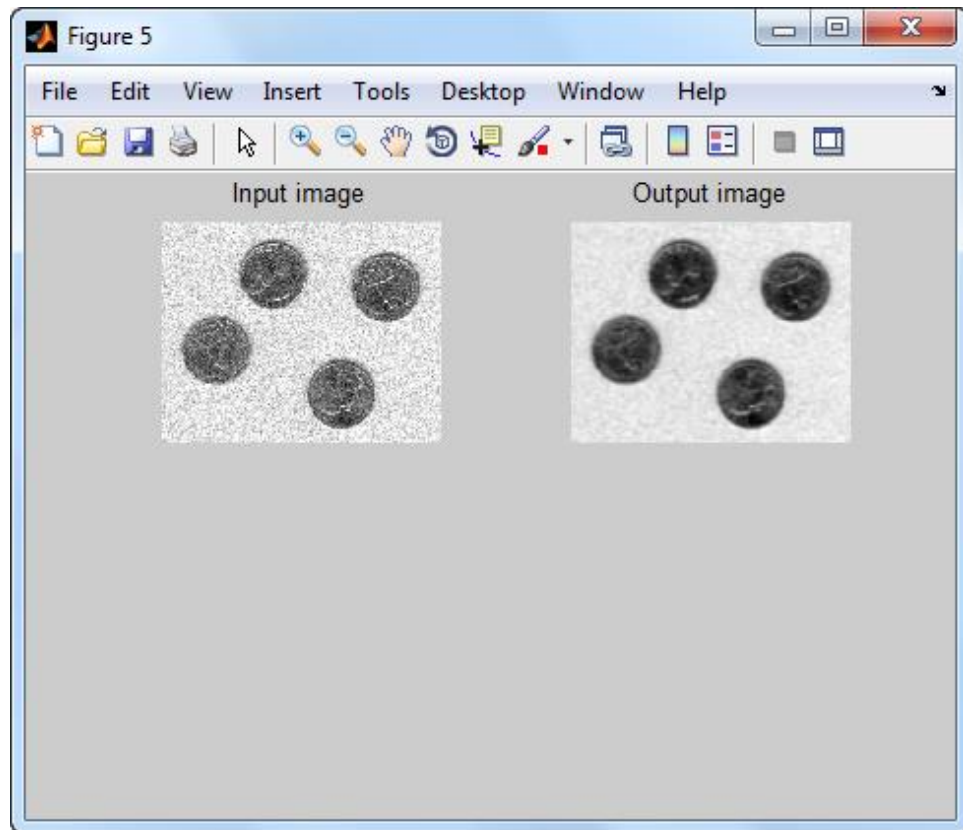


Figure 2: The result of applying the Gaussian lowpass filter on the noisy image ($D_0 = 30$).

- 3) Image enhancement in the frequency domain using Butterworth highpass filter (Image sharpening)

3.1 Write a user-defined function in MATLAB for finding the edges of objects within an image using Butterworth highpass filter. Take the following function name: Mybhf.m. Using this program on the image “aaa256.jpg” should give you result as shown in Figure 3.

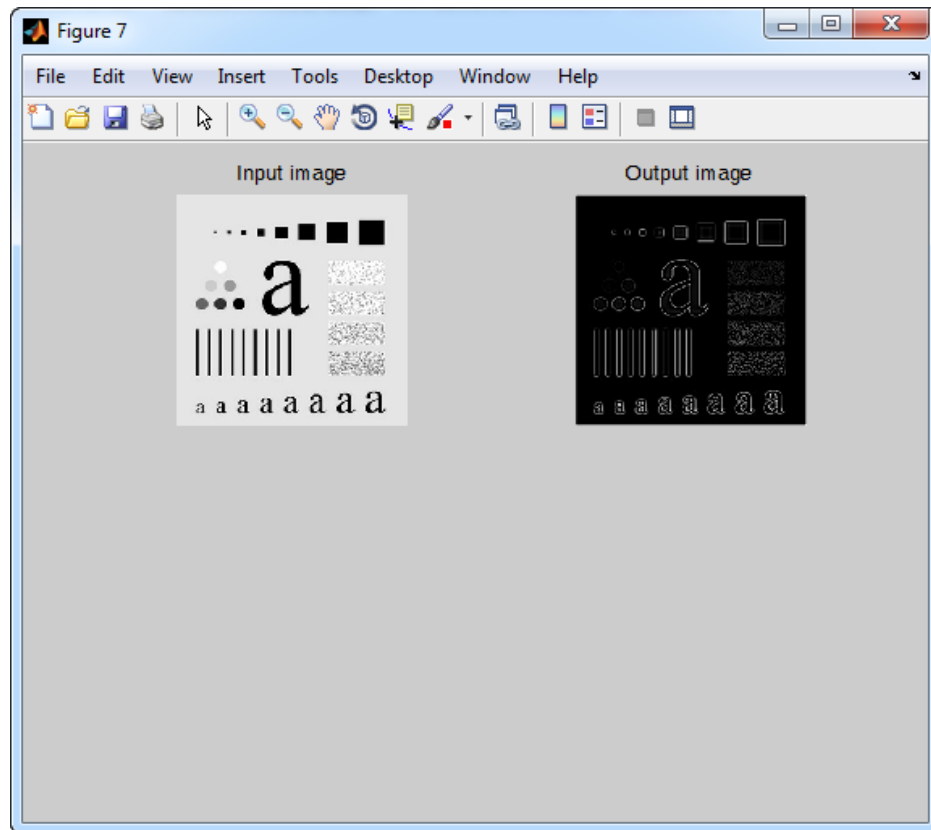


Figure 3: The result of applying the Butterworth highpass filter on the input image ($D_0 = 80$, $n = 2$).

- 4) Image enhancement in the frequency domain using Gaussian highpass filter (Image sharpening)

4.1 Write a user-defined function in MATLAB for finding the edges of objects within an image using Gaussian highpass filter. Take the following function name: Myghf.m. When this program is used with image “aaa256.jpg” the result as shown in Figure 4.

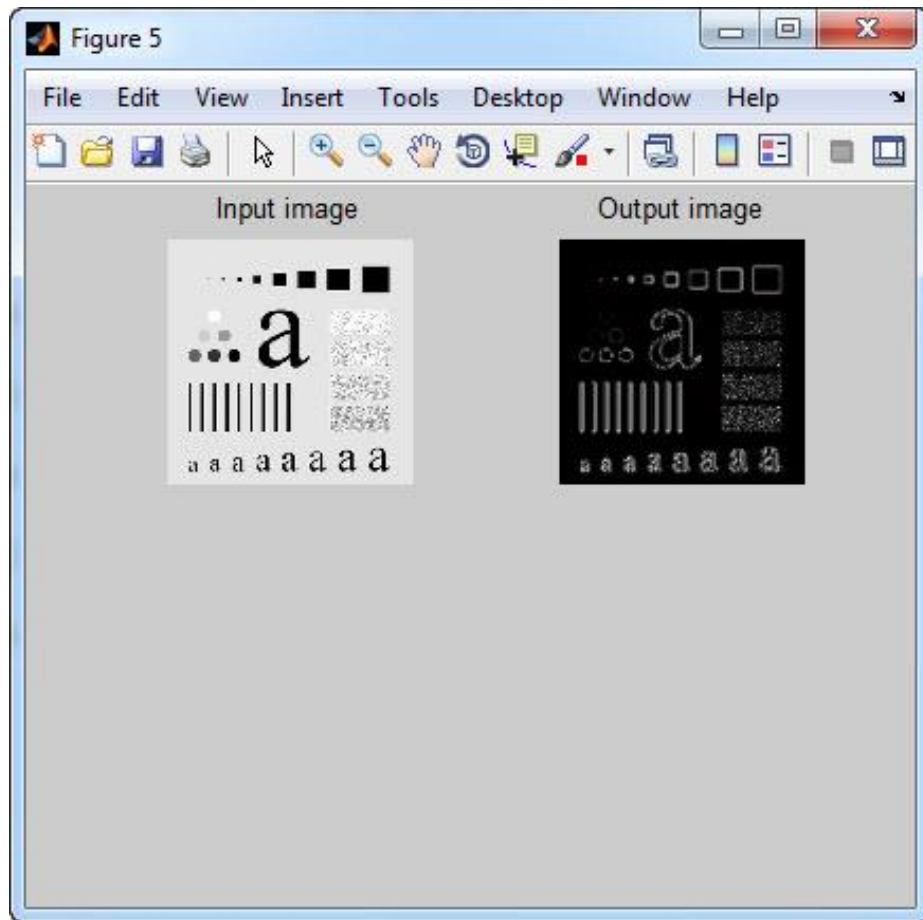


Figure 4: The result of applying the Gaussian highpass filter on the input image ($D_0 = 80$).

What you need to submit:

Prepare a zip file that contains all matlab files (m-file extension). Email the zip file to the account **send2narit@hotmail.com** with the following subject line: **EGCO486_LABxx_yyy**, which xx is a number of LAB and yyy is the last 3 digits of the student identification number. Your email should reach us before Tuesday 11:59 PM.