

LAB03: Image Enhancement in the Spatial Domain (part1)

Objectives

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

1. Understand the concepts of image enhancement in spatial domain.
2. Describe the different types of gray-level transformations.
3. Write an user-defined function in MATLAB for the gray-level transformations, including image negatives, power-law transformations, gray level slicing, bit plane slicing and histogram.

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\LAB03_Part1** for your exercises.

1) Image enhancement in spatial domain using image negatives

1.1 Write the user-defined function in MATLAB for converting the original image to obtain the negative image, with the following function name: Myneg.m. Using this program on the image “breast_digital_Xray.tif” should give you result as shown in Figure 1.

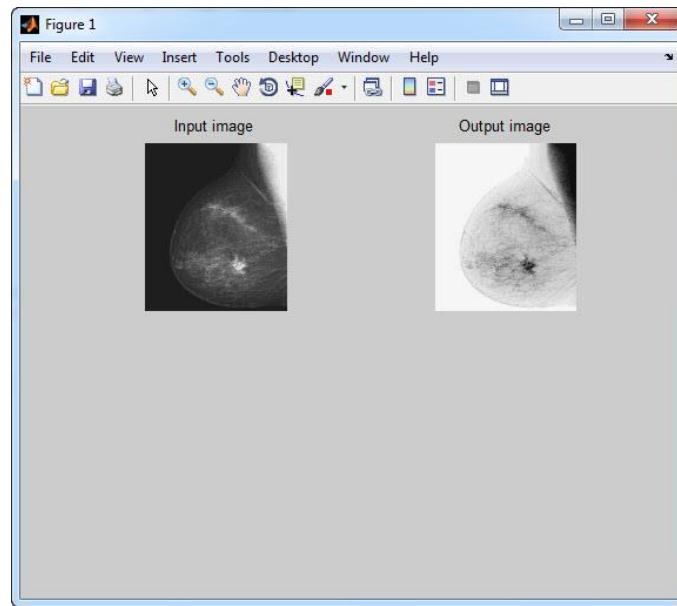


Figure 1: The result image of converting to obtain the negative image.

2) Image enhancement in spatial domain using power-law transformations

2.1 Write the user-defined function in MATLAB which generates the brightness of an image by applying the power-law transformation on the original image, with the following function name: Mypow.m. When this program is used with the image “fractured_spine.tif” result as shown in Figure 2.

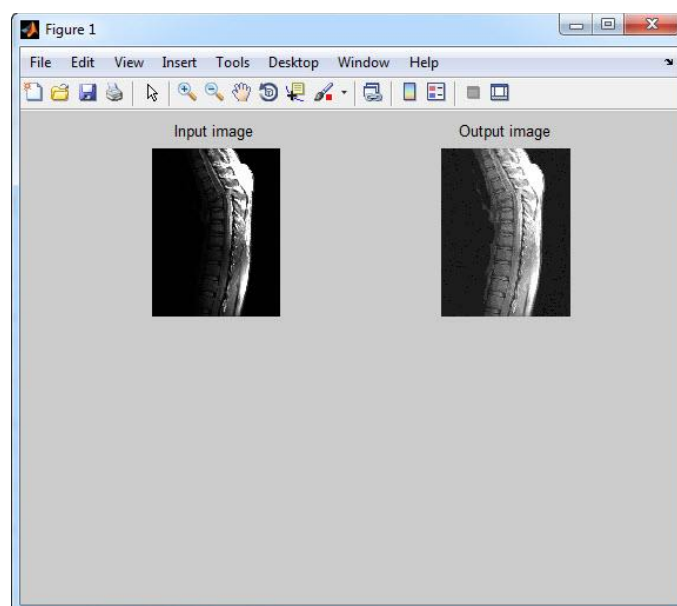


Figure 2: The result image of applying the power-law transformation (with gamma of 0.4) to obtain brightness image.

2.2 By using your own function “Mypow” in section 2.1, generate the darkness of an image by applying the power-law transformation on the original image. When this program is used with the image “washed_out_aerial_image.tif” result as shown in Figure 3.

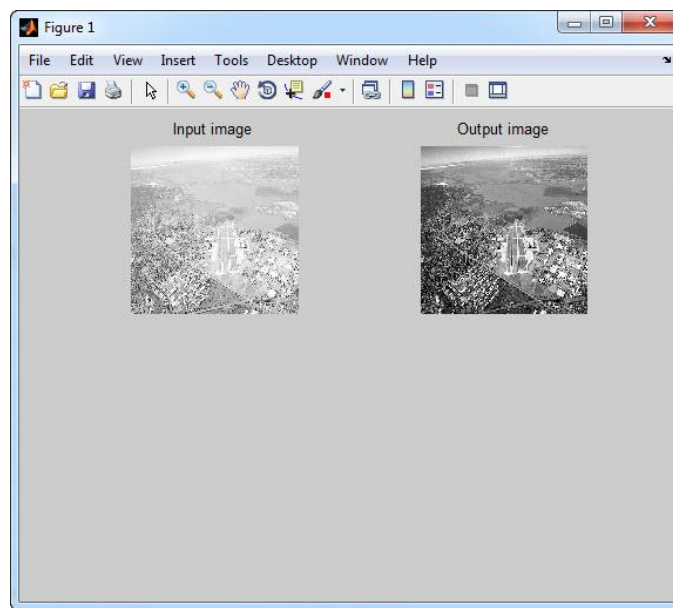


Figure 3: The result image of applying the power-law transformation (with gamma of 3) to obtain darkness image.

3) Image enhancement in spatial domain using gray level slicing

3.1 Write the user-defined function in MATLAB to highlight a specific range of gray-levels in original image, with the following function name: Mygrayls.m. When this program is used with the image “MRI.bmp” result as shown in Figure 4.

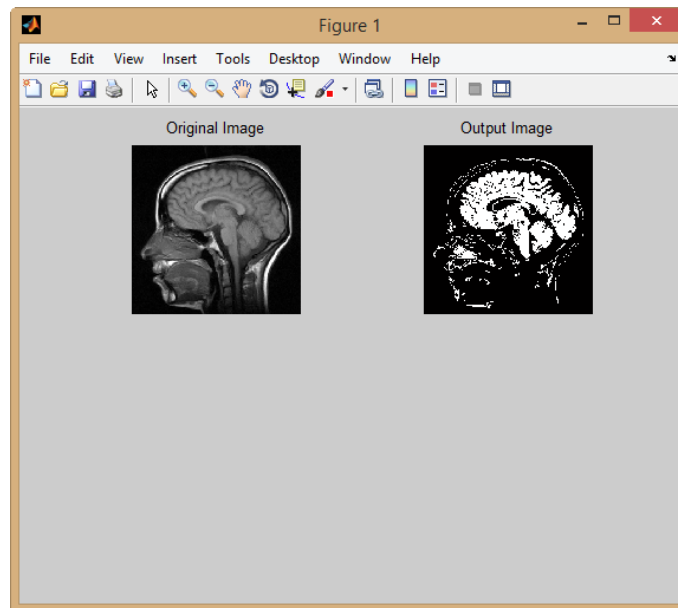


Figure 4: The result image of applying the gray level slicing in which a specific range of gray levels $[A,B]$ (with A of 100 and B of 140) is highlighted, while decreasing all other values to a constant low level.

3.2 By using your own function “Mygrayls.m” in section 3.1, highlight a specific range of gray-levels in original image. When this program is used with the image “MRI.bmp” result as shown in Figure 5.

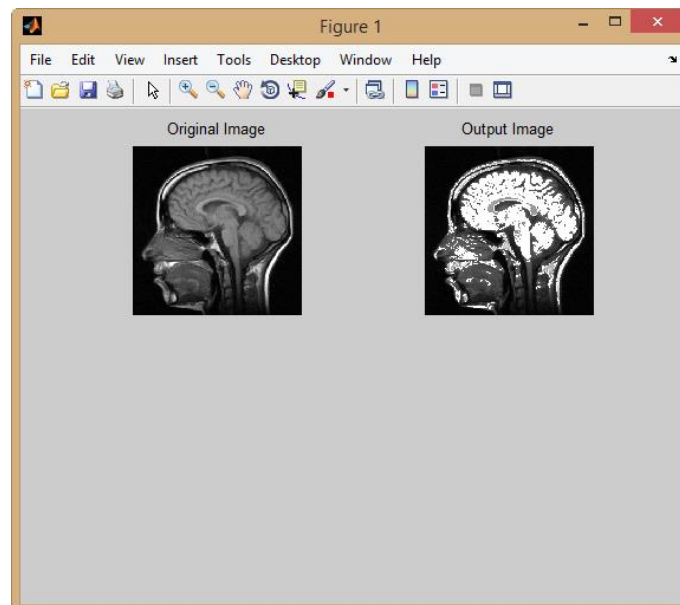


Figure 5: The result image of applying the gray level slicing in which a specific range of gray levels $[100,140]$ is highlighted, while leaving all other values unchanged.

4) Image enhancement in spatial domain using bit plane slicing

4.1 Write the user-defined function in MATLAB for extracting the original image into 8 bit-planes image, with the following function name: Mybitps.m. Using this program on the image “100-dollars.tif” should give you result as shown in Figure 6.

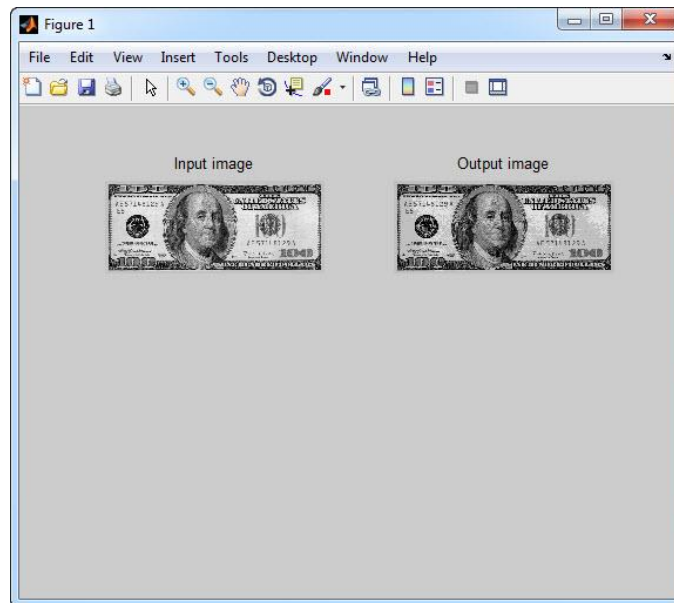


Figure 6: The reconstructed image by putting together 7, 6 and 5 bit-planes.

5) Image enhancement in spatial domain using histogram equalization

5.1 Write the user-defined function in MATLAB to calculate and display the histogram of the original image, with the following function name: Myimhist.m. Using this program on the image “cameraman.tif” should give you result as shown in Figure 7.

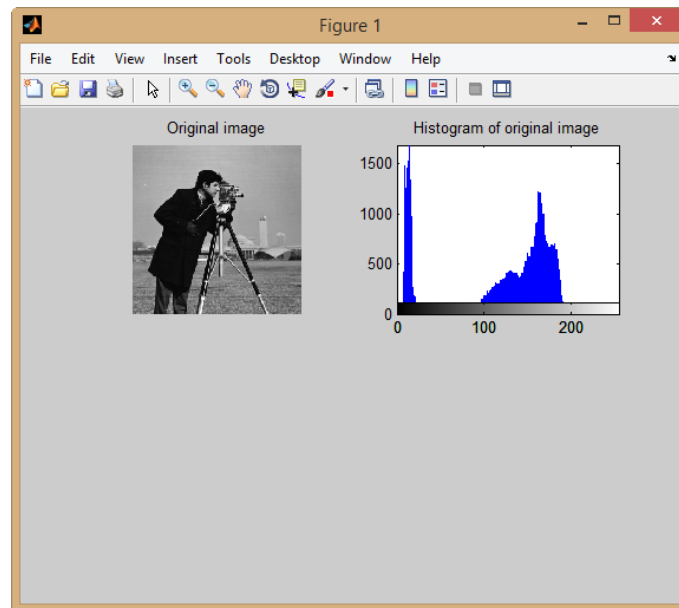


Figure 7: The histogram of original image with 256 gray levels.

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.