ECE 4580 – Digital Image Processing
No. HW-004-4580

Homework Assignment #4 – Spatial Filtering

A. Project 3.7 – Lowpass filtering (60)

3.7 Lowpass filtering.

(a) Read the image **testpattern1024.tif** and lowpass filter it using a Gaussian kernel large enough to blur the image so that the large letter "a" is barely readable, and the other letters are not.

(b)* Read the image **testpattern1024.tif**. Lowpass filter it using a Gaussian kernel of your specification so that, when thresholded, the filtered image contains only part of the large square on the top, right. (*Hint:* It is more intuitive to work with the negative of the original image.)

(c) Read the image **checkerboard1024-shaded.tif** and reproduce the results in Example 3.18, keeping in mind that the above image is of size 1024×1024 pixels, so the checkerboard squares are 64×64 pixels. (*Hint:* to obtain

images like the ones in the example, scale the shading pattern and the processed image to the full [0, 1] intensity range—you can use project function **intScaling4e** for this.)

[Note that the images, testpattern1024.tif and checkborad1024-shaded.tif, can be downloaded from the Canvas system.]

B. <u>Project 3.8 – Unsharp Masking (40 points)</u>

3.8 Unsharp masking and highboost filtering.

(a)* Read the image **blurry-moon.tif** and sharpen it using unsharp masking. Use a Gaussian low-pass kernel of your choice for the blurring step. Display your final result.

(b) Improve the sharpness of your result using highboost filtering. Display the final result.

[Note that the image blurry-moon.tif can be downloaded from the Canvas system.]

You need to turn in **a written report** (in the pdf format), including the following sections: <u>(1) Approaches, (2) Experimental Results and (3) Discussion/Conclusion</u>. In addition, you need to turn in your **MATLAB implementation codes in a separate file**.