EE7150 Computer Project III

Spatial Filtering (Chapter 3)

Due Date: September 27, 2021

Note: In all parts of this project, you may use your own code for block processing, or you may use matlab's in-built function "blkproc.m" or "blockproc.m". Alternately, you may also use matlab built-in function, nlfilter. In case of Matlab 2013 and later versions either of these two built-in functions will work although the use of blkproc.m may generate a Warning that can be ignored. blockproc.m is only available in Matlab 2013 and later versions, and may not be recognized by earlier versions of Matlab.

1. **Compare Effectiveness of Averaging Filter vs. Median Filtering for Salt-Pepper Noise**

Write a program to perform spatial filtering of the image in Figure 3.49(a) [Figure 3.35(a) of 3rd Edition] to show that a median filter outperforms averaging filters in general.

2. **Enhancement Using the Laplacian**

Duplicate the results in Fig. 3.52 [Figure 3.38(a) of 3rd Edition] to sharpen the blurry moon image.

3. **Unsharp Masking and Highboost Filtering**

   a) For the same blurry moon image used in Problem-2, sharpen it using unsharp masking. Use a Gaussian lowpass kernel of your choice for the blurring step.

   b) Improve the sharpness of the image using high-boost filtering. Enhance the image by proper choice of *k*.

4. Download Fig. 3.63(a) [Figure 3.43(a) of 3rd Edition] and enhance the image with the objective of approximating the result in Fig. 3.63(h) [Figure 3.43(h) of 3rd Edition].

Provide explanation and justification of choice of filter mask size and any other parameter choices you make.

Note: I would like to discourage the use of the matlab built-in "imsharpen" for Problems 3 and 4. You may choose to compare your results with it (optional).

Project Report Guidelines

Page 1. Cover Page. Typed or printed neatly.

Project title
Project number
Course number
Student's name
Date due
Date handed in

Abstract (not to exceed 1/2 page) **Page 2.** Technical discussion. One to two pages (max). This section should include the techniques used and the principal equations (if any) implemented. **Page 3 (or 4).** Discussion of results. One to two pages (max). A discussion of results should include major findings in terms of the project objectives, and make clear reference to any images generated.

Results. Includes all the images generated in the project. Number images individually so they can be referenced in the preceding discussions. Include titles, labels and legends in the figures, as appropriate.

Appendix. Program listings. Includes listings of all programs written by the student. Standard routines and other material obtained from other sources should be acknowledged by name, but their listings need not be included.

A note on program implementation: The objective of the computer programs used in the projects is to teach the student how to manipulate images. There are numerous packages that perform some of the functions required to implement the projects. However, the use of "canned" routines as the only method to implement an entire project is discouraged. For example, if a student is using MATLAB and the Image Processing Toolbox, a balanced approach is to use MATLAB's programming environment to write M functions to implement the projects, using some of MATLAB's own functions in the process. A good example is the implementation of the 2-D Fourier Fast Transform. The student should use the MATLAB function that computes the 2-D FFT directly, but write functions for operations such as centering the transform, multiplying it by a filter function, and obtaining the spectrum.