

Lab 3 – Exercise on Filter Techniques for Image Enhancement

**Warm-up Demo:**

Play with the “firdemo” program in Matlab to see the effect of different highpass and lowpass filters on an image.

**(If boundary extension is needed, please pad the boundary with 0’s. Your functions should be general enough to accommodate any filter with odd numbers of rows and columns.)**

- a) Implement a **MeanFilter** function to perform a filtering operation on the input image. [Note: Both input and output of the **MeanFilter** function should be an array with data type uint8.]

Call this function to process the noisy image *Circuit* by using a **weighted** 3-by-3 averaging filter and a **standard** 5-by-5 averaging filter, respectively. You are not allowed to simply use the Matlab “filter2” or “conv2” or “fspecial” or “imfilter” or other built-in functions in your function implementation. Display original image and two processed images in figure 1 with the appropriate titles.

- b) Implement a **MedianFilter** function to perform a filtering operation on the input image. [Note: Both input and output of the **MedianFilter** function should be an array with data type uint8.]

Call this function to process the same noisy image *Circuit* by using a standard 3-by-3 median filter and a standard 5-by-5 median filter, respectively. You are not allowed to simply use the Matlab “medfilt2” or other built-in functions in your function implementation. Display original image and two processed images in figure 2 with the appropriate titles.

- c) Use appropriate Matlab function calls to repeat steps a) and b). Use if/else statements to compare each of your processing results with the corresponding result obtained by calling a Matlab function and display a message to indicate whether your processing result is the same as the one got from Matlab.

- d) Use the **strong** 3-by-3 Laplacian mask to filter the image *Moon*. Use the formula **Enhanced Image = Original Image – Filtered Image** to get the final enhanced image. Use **imshow** to display four images including the original image, the filtered image, the scaled filtered image, and the enhanced image, in a new figure with the appropriate titles.

- e) Close all figures and all variables in the workspace.