

Assignment 4
Deadline: 10th Nov 4PM.

Q1. Perform denoising for the leftmost image titled “Noise-lines.jpg”. The middle and rightmost images are the ones that are obtained after denoising in Fourier domain and spatial domain. You should get output close to these images.

- Show the Fourier domain filtering process and display output image
- Convert the filter to spatial domain, and show the spatial domain filtering process and display output image
- Verify that both give equivalent results
- Show the obtained noise
- Show the magnitude spectrum of filter, and filtered image. Remember for filtering, do not filter out DC component and AC components very close to DC.



Q2.

$$h(x, y) = \begin{bmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

Bold indicates origin. Write the corresponding filter which can be used to perform Laplacian filtering of “Barbara.bmp” in Fourier domain.

- Show how the filter h would look like when considered only in the positive quadrant. Recall for DFT, we only take from (0,0) to (M-1,N-1).
- Perform filtering in Fourier domain and show the Laplacian output image.
- You cannot use any inbuilt library to directly perform Laplacian filtering in Fourier domain, that is, you must create your own filter.

Q3. Implement a Fourier domain Gaussian LPF with cut-off $D_0 = 20$.

- Show the Fourier domain filtering process and display output image
- Show the magnitude spectrum of filter, and filtered image
- You cannot use any inbuilt library to directly perform Gaussian LPF, that is, you must create your own filter.