Lab 5 Frequency Domain Filtering

- Implement the Sobel filter to the input images Q5_1.tif in both spatial domain and frequency domain. Compare the results. Refer to slides 78 to 81 of Lecture 4.

- Implement the Gaussian low pass and high pass to the input image Q5_2.tif. Compare the results for $D_0 = 30, 60, \text{and } 160$, respectively.

- Implement the Butterworth notch filters to the input images Q5_3.tif. Refer to slides 110 to 114 of Lecture 4. .

- Making clear the following:

  1. Explain why perform a shift in Step 4 on slide 81 of Lecture 4 in the first Exercise, and compare the filtered results, your observations, comments and analysis.
  2. The effect of D_0 in Gaussian lowpass and highpass filter, and the general guideline of the choice of D_0 for different applications.
  3. In the above question 3, how the parameters in the notch filters are selected, and why.
  4. Explain why $H(\mu, \nu)$ has to be real and symmetric in the Step 5 on slide 71 of Lecture 4, which is also the case for all the filter used in this laboratory.