Lab 5 Frequency Domain Filtering

1. Implement the Sobel filter to the input images Q5_1.tif in both spatial domain and frequency domain. Compare the results. Refer to slides 76 to 79 of Lecture 4.

2. Implement the ideal lowpass filter with $D_0 = 10, 30, 60, 160$ and 460 to filter the input image Q5_2.tif, respectively.

3. Implement the Gaussian low pass and high pass with $D_0 = 30, 60,$ and 160, to the input image Q5_2.tif, respectively.

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

- Write report regarding the exercises 1 and 4. Make clear the followings:

  In general, for the results, compare your results, describe what you observed, explain reasons behind, and comments if any.

  In particular,

  1. Explain why perform a shift in Step 4 on slide 79 of Lecture 4 in the first Exercise.
  2. In the above implementation 4, how the parameters in the notch filters are selected, and why.
  3. Explain why $H(\mu, \nu)$ has to be real and symmetric in the Step 5 on slide 69 of Lecture 4, which is also the case for most of the filters used in this laboratory. However, there is an exception. Explain the exception.