

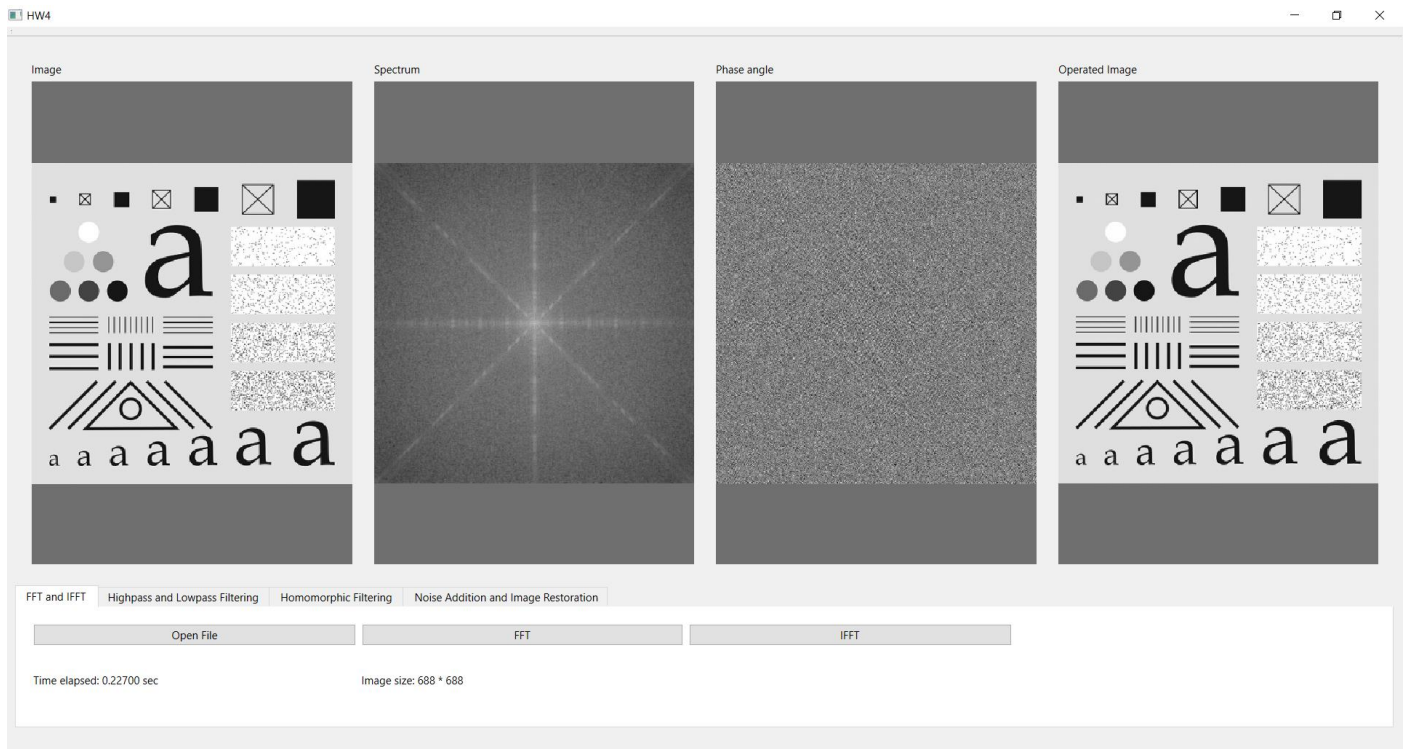
Principles and Applications of Digital Image Processing

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HW4

- Part 1: (25%), Part 2: (25%), Part 3: (25%), Part 4: (25%):

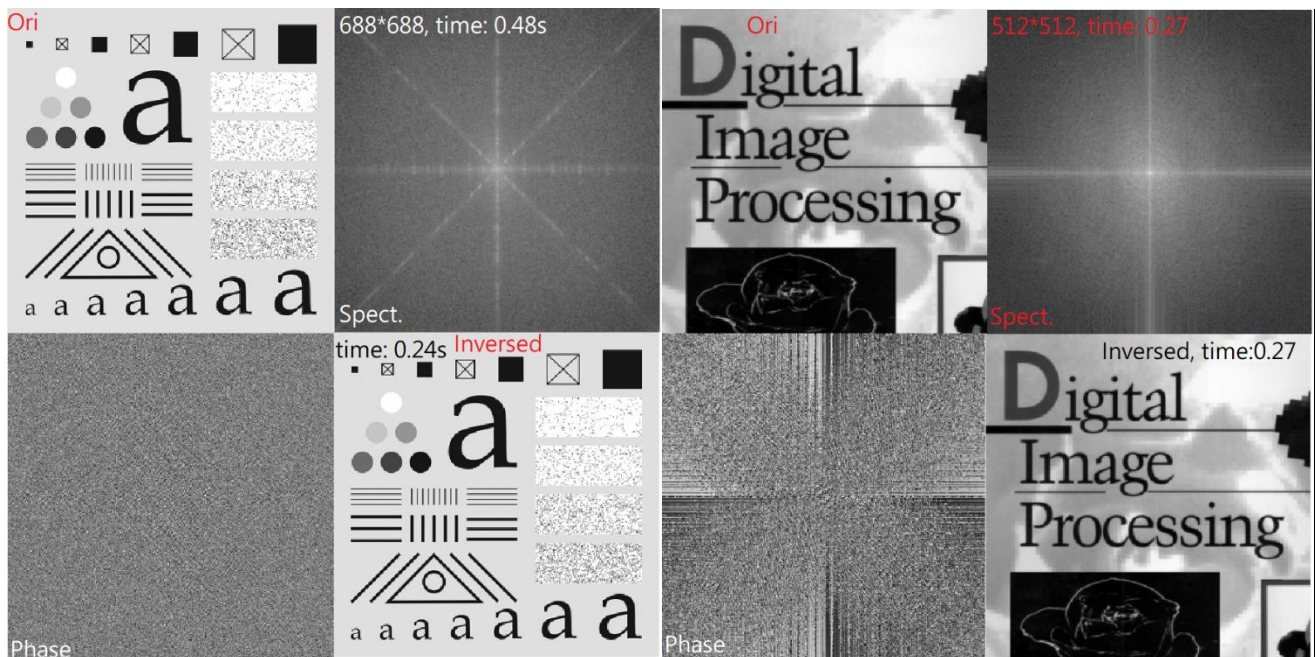
■ UI:



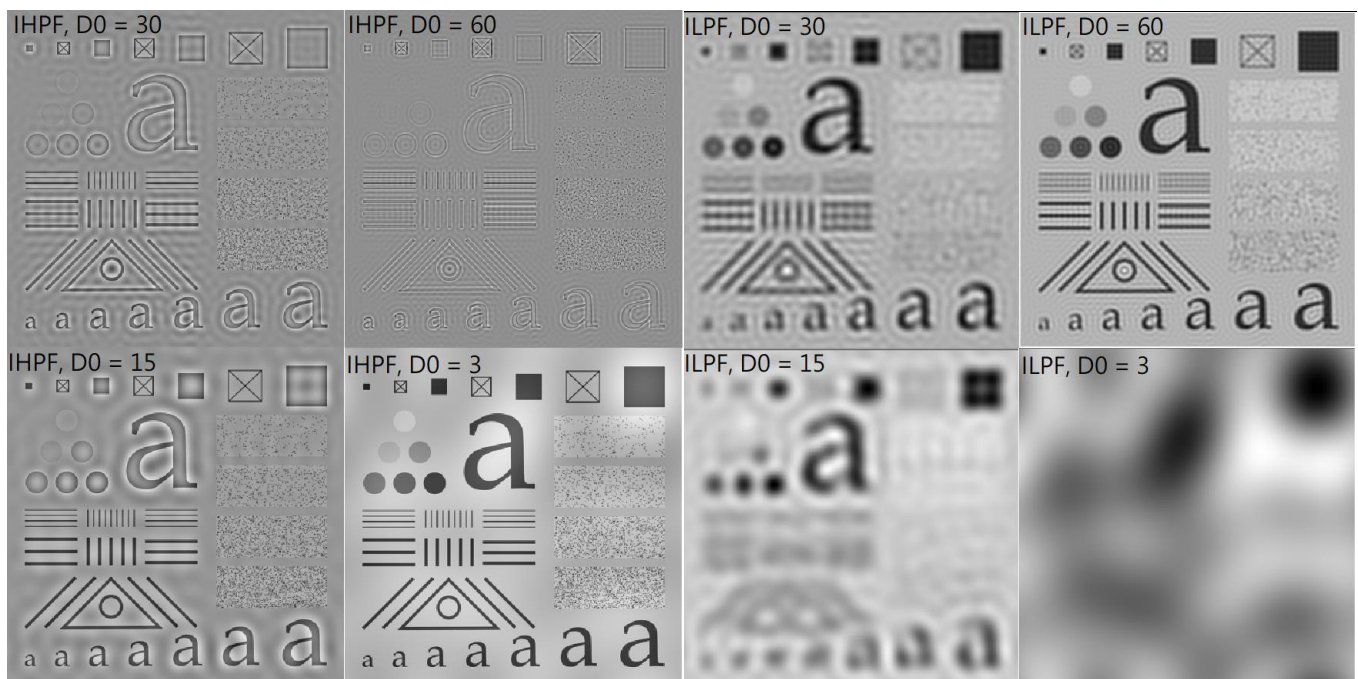
Use tab to switch between parts. When doing FFT and IFFT image, the cursor would turn into busy; when the operation is done, the application would beep in “La” for 500 ms, at the same time the calculation time and image size would be shown in label. The user could use slider to adjust the size of tab and figure to have a better experience.

■ Discussion

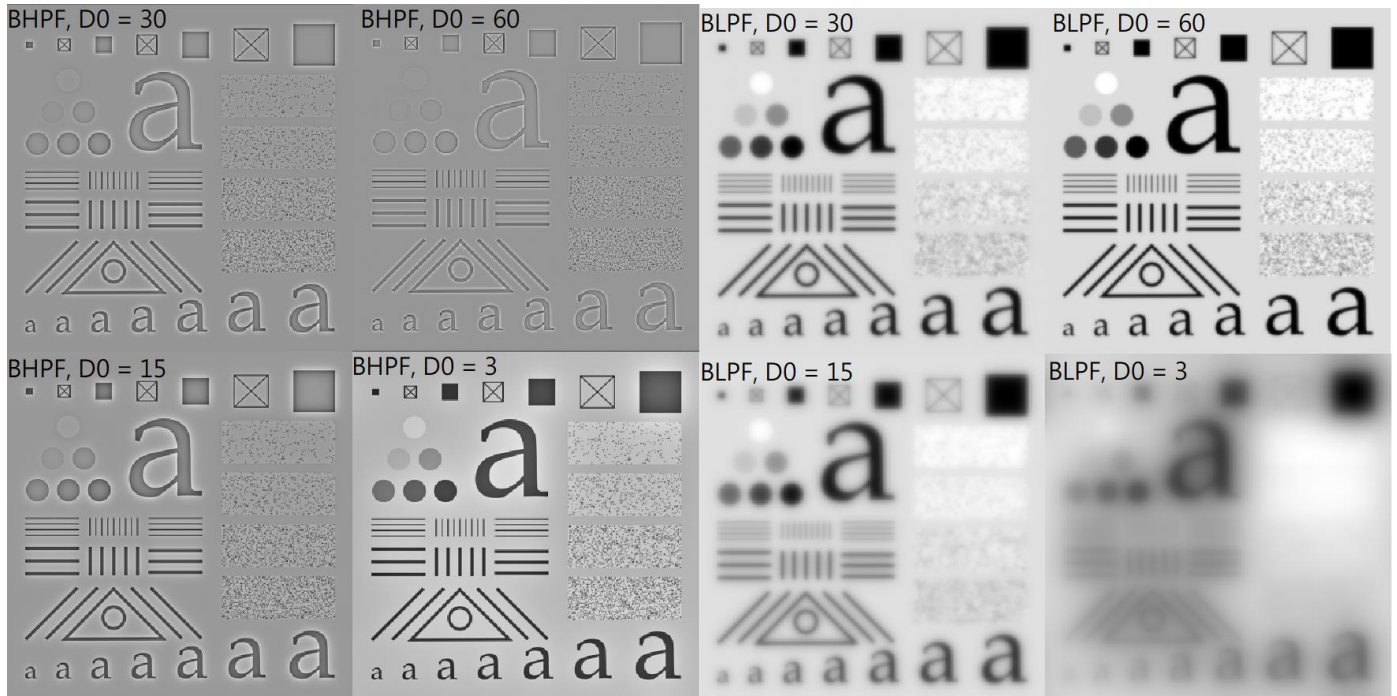
- ◆ The inversed image and the original image have no obvious differences. The operation time of larger image is longer.



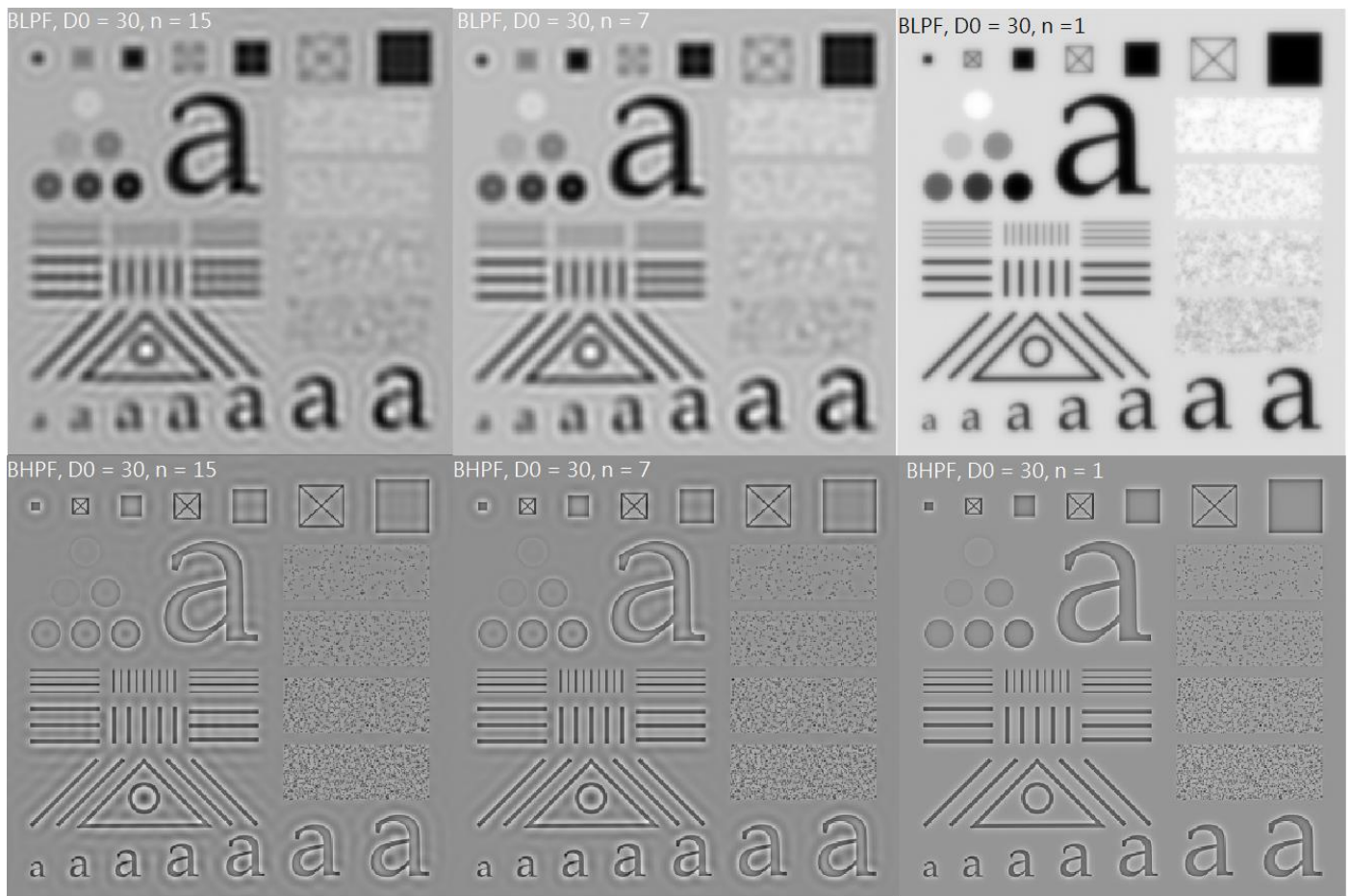
- ◆ When using Ideal Highpass/Lowpass filter, the ringing effect of the filter is obvious, because the filter has discontinuity in nature. As the D_0 goes up, the highpass filter preserved less edge since the edge in the image exceed the D_0 is less and less; the lowpass filter preserved more edge, it means it includes more high freq. components. The illumination can be regarded as low frequency, so at $D_0 = 3$ we can see the highpass filter filtered out the illumination whereas lowpass preserved only illumination.



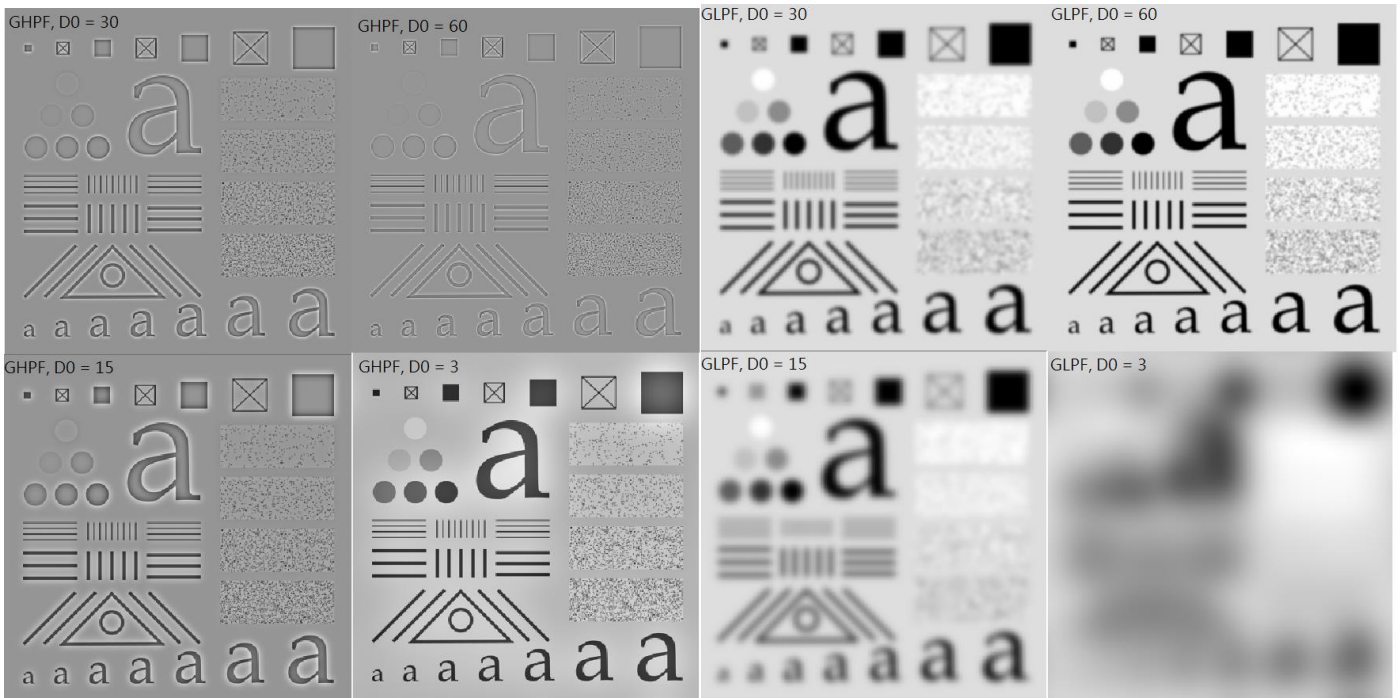
- ◆ For Butterworth filter, we can see similar result regard to D0. The ringing effect of the filter is considerably lesser than the ideal filter.



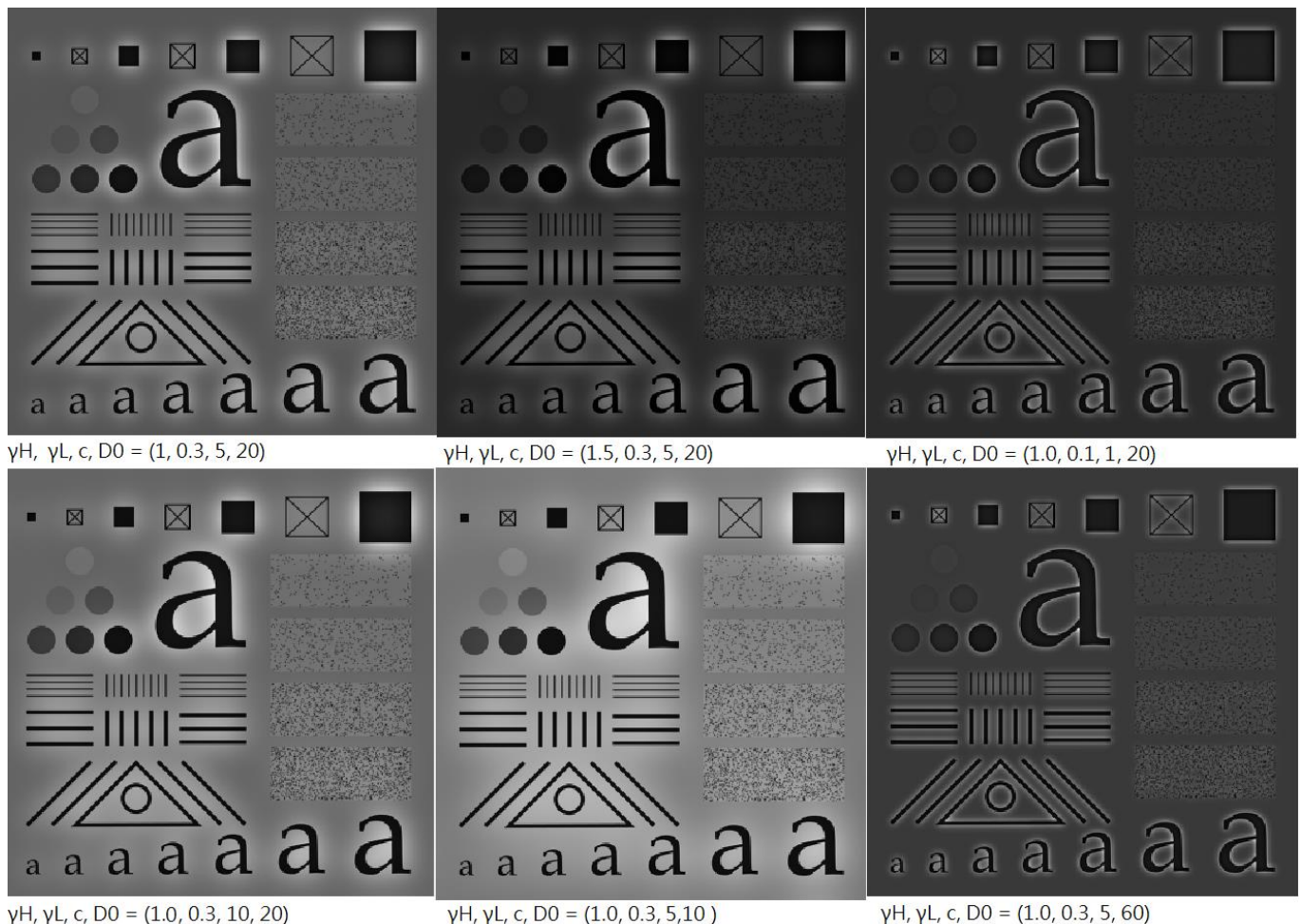
As the order of the Butterworth filter goes up, the filter behaves more like an Ideal filter, so the ringing effect becomes more obvious.



- ◆ For Gaussian Filter, the filtering effect is lower than Ideal filter but higher than Butterworth filter.



- ◆ Below are several parameter combo of Homomomorphic filter. The difference between gamma H and gamma L determines the contrast of the image. The c determines the intensity of the “glowing effect” around the edge. The D0 as mentioned above determines the illumination of the image since illumination can be regarded as low freq. components.



- ◆ For Motion noise, I use different speed ratio to generate different direction effect. A negative velocity should be also included in the future version. As T goes lower, the noise components becomes stronger, so as to veil the original image.



$a = 0.1, b = 0.1, T = 1.0$

$a = 0.1, b = 0.2, T = 1.0$



$a = 0.3, b = 0.1, T = 1.0$

$a = 0.1, b = 0.1, T = 0.2$

- ◆ Future work would focus on Wiener filter, Inverse filtering, and Gaussian white noise. If only I have had more time to finish the homework.