Technische Universität Berlin

DIGITAL IMAGE PROCESSING

Winter Semester 2018/19

Exercise 4:

Image Restoration

Group Z

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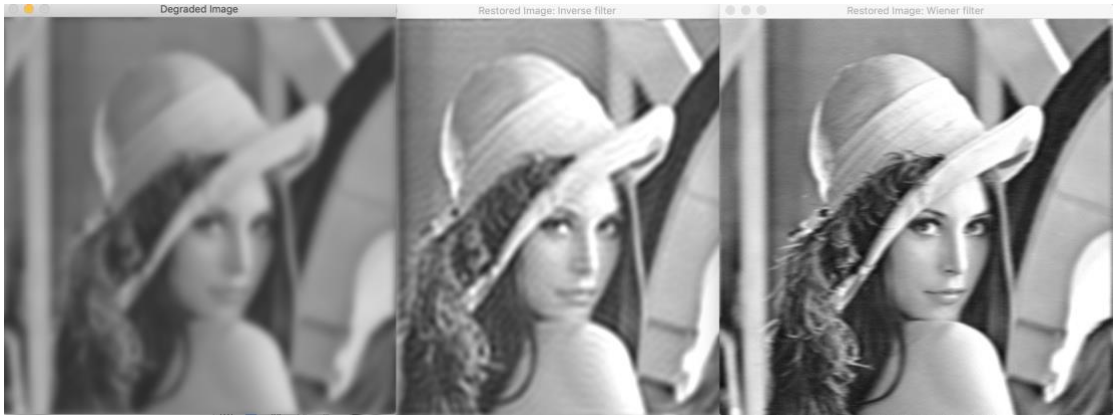
Part 1: Discussion of the Solution

By this exercise we learned how to implement Inverse Filter and Wiener Filter to restore degraded image. After DFT, we split different channels because the spectra are complex valued, computed the filter, multiplied, and merged them before IDFT. We found that with large SNR the results are similar, but with small SNR e.g.10 the result of Wiener Filter is much better than the other one.

SNR = 1000000



SNR = 10

Part 2: Theoretical Questions

i) What is the ringing effect in the context of image filtering? How is it caused and how can it be avoided?

The ringing effect is the artefacts that is introduced by the ideal low-pass filter or ideal high-pass filter due to the significant 'side-lobes' in the time domain which caused by the discontinuity in spectrum. When this effect happens, there will be 'ripples' near strong edges in the original image.

To avoid this effect, the ideal LPF/HPF can be replaced by the Butterworth filters, due to the absence of the discontinuity in spectrum.

ii) Figures a)-c) show three different images, while Figures i)-vi) depict the amplitude of six different Fourier spectra. State which of the given spectra corresponds to which of the images. Note: A spectrum can be assigned multiple times and not all spectra have to be used.

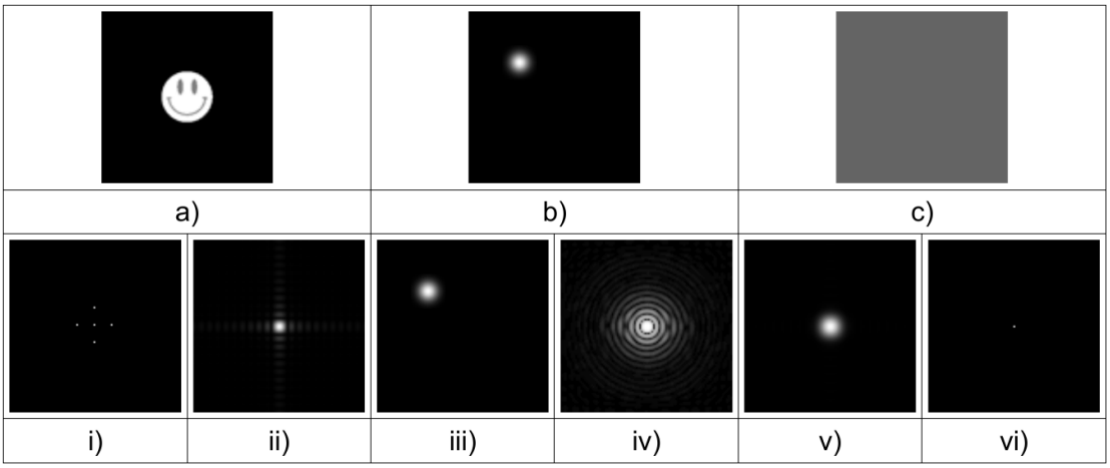


Figure a): iv)

Figure b): v)

Figure c): vi)