Advanced Image Processing Lab

Lab. 10 - Linear Filters for Image Restoration and Enhancement

Comparison of linear inverse, ideal Wiener and empirical Wiener filters for image de-noising and deblurring and local adaptive linear filters for image de-noising and enhancement.

10.1 Image de-blurring by the pseudo-inverse filter

Generate a rectangle point spread function for the image blur. Test image de-blurring by pseudo-inverse filter for different degree of blur and different level of additive noise (program **invfiltr.m**; image **text256** is recommended). Observe the sensitivity of the filter to the noise level. Optimize the threshold level for eliminating zeros of the filter frequency response. Evaluate potential restoration capability of the pseudo-inverse filter in terms of trade off between the degree of blur and noise level.

10.2 Image de-noising and de-blurring by the ideal Wiener and empirical Wiener filters

Test and compare image de-noising capability of the ideal Wiener and empirical Wiener filters (program **wiener.m** with the image blur parameter RD>1000. Optimize parameter "gamma" of spectrum estimation for the empirical Wiener filter. Observe blur in restored images.

Test and compare image de-blurring capability of the ideal Wiener and empirical Wiener filters (program **wiener.m** with the image blur parameter RD=1 - 10, image **text**). Optimize parameter 'gamma'' of spectrum estimation for the empirical Wiener filter.

Test image de-noising capability of the adaptive empirical Wiener filter for suppressing additive narrow-band noise (program demoire1.m, images: **moire**, **jeep**, **magcrop**).

10.3 Signal and image de-noising capability of local adaptive linear filters

Test signal de-noising capability of local adaptive linear filtering in the domain of DCT in a moving window (program **recdct1d.m**; signal **ecg1.mat**). Determine optimal window size and thresholds.

Generate an image with additive Gaussian noise. Test image de-noising capability of local adaptive linear filtering in the domain of DCT in a moving window (program lcdct2.m). Observe edge preserving capability of the filtering.

Submit: Experimental results, with comments, and programs