Advance Image Processing Lab
Lab. 12 - Image Perfecting and Enhancement
Exercises in calibration of the imaging system dynamic range and point-spread function and in image enhancement.

12.1 Calibration of the imaging system dynamic range

12.1.1 Write a program for image calibration by reducing image mean and standard deviation to certain standard values (program mean.m, std2d.m). Write a program for image calibration by reducing image mean and standard deviation to those of a certain reference image. Observe the results.

12.1.2 Observe image histogram standardization (program histosta.m). Compare the results with standardization by mean and standard deviation.

12.2 Calibration of the imaging system point spread function

12.2.1 Test aperture correction of image scanning and display devices for different images (program invapert.m). Observe amplification of noise when correcting noisy images. Determine admissible signal-to-noise ratio (SNR).

12.2.2 Test “frequency response of the image point spread function blind” calibration (program apcortst.m) for different amplification factor g of high spatial frequencies and different threshold thr for the additive correcting term. Observe image aperture correction effects using program apertcor.m.

12.3 Image enhancement

12.3.1 Unsharp masking Test image high frequency component enhancement by “unsharp masking”:

\[ \text{OUTIMG} = g_1 \text{IMPIMG} + g_2 (\text{INPIMG} - \text{conv2(INPIMG, ones(L)/L^2)} ) \]

with \( g_1, g_2, \) and \( L \) as enhancement parameters. Generate several versions of unsharp masking and synthesize and observe artificial color image preparations (program coldispl.m).

12.3.2 Nonlinear modification of image spectra Test image high frequency component enhancement by a nonlinear \( P \)-th low transformation of image spectra (program dctspenh.m).

12.3.3 Histogram modification. Test image enhancement by \( P \)-histogram equalization (program phistequ.m). Compare histogram equalization with \( P \)-histogram equalization.

12.3.4 Image "homogenization" Test image local calibration by local mean and variance (program lcstanda.m) and local maximum and minimum (program lcmxmnst.m).

12.3.5 Local histogram modification. Test image enhancement by local histogram and \( P \)-histogram equalization in a running window (programs lchstequ.m and lcphsteq.m) for different window size and different nonlinearity index \( P \).

Submit: Experimental results, with comments, and programs