Advanced Image Processing Lab

Lab. 6 - Statistical Image and Noise Models and Noise Diagnostics

Study of statistical image and noise models and methods of diagnostics of noise in images

6.1 Image noise models and noise diagnostics

6.1.1. Additive noise model.

Generate and observe additive Gaussian noise in images. Compare 1-D power spectra of noisy and noise less images. Observe image auto-correlation functions (program **corimg1d.m**). Evaluate noise variance (program **noisevar.m**) and investigate its accuracy for different SNR.

Generate periodic noise image, use program **detmoir1.m** to characterize it. Images **moire.img**, **jeep.img**, **magcrop.img** can be used along with those generated by you.

6.1.2. Impulse noise model.

Generate and observe impulse noise in images. Observe difference signal histograms of noisy and noise less images (program **pnoise.m**). Investigate, how noise variance estimation found by program **noisevar.m** is connected to the probability of errors.

6.2 Algorithmic models of texture images

6.2.1. Point-wise transformation (PWT-) models

Write a program for generating binary images with a given probability of ones. Generate an inhomogeneous pseudo-random field with local probability of ones controlled by an auxiliary image.

Generate an inhomogeneous pseudo-random field with local variance controlled by an auxiliary image.

6.2.2. Linear filter (LF-) models

Generate and observe Gaussian pseudo-random patterns with different power spectrum (programs **corrgauss.m**, **gtexture.m**).

Generate and observe model texture images with power spectrum defined by power spectrum of auxiliary images of detail and texture types.

Generate and observe inhomogeneous Gaussian pseudo-random field with local power spectrum defined by local power spectrum of an auxiliary image (program **lcdctrnd.m**).

6.2.3. Composite models

PWT-LF model. Generate a figure texture using the above program for generating binary image with a given probability of ones and program conv2.m.

LF-PWT model. Generate a pseudo-random binary images using programs for generating Gaussian pseudo-random fields with different power spectrum (programs **corrgauss.m**, **gtexture.m**).

6.2.4. Evolutionary models (optional)

Generate binary pseudo-random fields using programs **lifebin1.m**, **conway.m**, **dendrite.m** and observe their evolutionary behaviour.

Submit

1. Results of evaluating accuaracy of additive noise variance measurement for different images.
2. Results, with comments, of experiments with periodic noise.
3. Results, with comments, of generating texture images