

Advanced Image Processing Lab

Lab. 11 - Rank Filters for Image Restoration, Enhancement and Segmentation

Study, evaluation and comparison of rank filters for edge preserving image noise suppression, image enhancement and segmentation.

11.1 Study of pixel neighbourhoods

Observe segmentation capability and compare *EV*-, *KNV*-, *ER*-, *Flat*-neighbourhoods for different images, different spatial windows and different neighbourhood parameters. Compare corresponding neighbourhoods for noiseless images and images with additive Gaussian noise (programs **test_ev.m**, **test_knv.m**, **test_er.m**, **flat_nbh.m**, images **ango**, **brain1**).

11.2 Filtering additive noise

Generate a test image "a rectangle on an uniform background". Test additive noise suppression and edge preserving capability of rank filters on the test image (programs **mean_ev.m**, **medn_ev.m**, **mean_er.m**, **medn_er.m**). Apply these filters to real life images with and without noise. Apply the filtering iteratively. Observe residual error.

11.3 Filtering impulse noise

Generate an image with impulse noise (image **jerus.img**) with probability of error $P_e=0.05 - 0.5$. Test rank filtering algorithm for different probability of error (program **rfltrimp.m**). Observe restoration of visibility of image details. Test iterative application of the filter. Evaluate performance of the filters in terms of probability of noise missing and false alarms (program **certfimp.m**). Compare with median filtering (program **lc_medn.m**).

11.4 Image segmentation, enhancement and feature extraction

11.4.1 Test image segmentation capability of iterative application of smoothing rank filters (program **mneviter.m**, images **ango**, **brain**).

11.4.2 Test image enhancement edge enhancement, and feature selection by unsharp masking with rank filters, (programs **mean_ev.m**, **medn_ev.m**, **maxminev.m**, **mx_mn_er.m**, **size_ev.m**, **std_ev.m**, images **ango**, **brain1**).

Submit: Experimental results, with comments, and programs