Medical Image Analysis Exercises: Session 06

http://physics.medma.uni-heidelberg.de/cms/

Contents

- 25: skeleton
- 27: iterative denoising

25: skeleton

input: `text.png` from MATLAB

a. detect the letters 'y'

- select one morphological operation for the purpose
- apply the filter to the image
- calculate the skeleton of the detected letters
- display 4 axes in one figure, including the original image, the designed structuring elements, the filtered image and the skeleton image

27: iterative denoising

input: `cameraman.tif` from MATLAB

a: add noise

- convert the image to double precision
- add Gaussian white noise of mean 0 and variance 0.02 to the image

b: denoising with different parameters

- denoise the image with the Gaussian filters with different standard deviations: `0.5:0.5:5`
- denoise the image with the median filters with square neighborhood of different sizes: `1:2:9`
- calculate the Peak-Signal-to-Noise-Ratio (PSNR) for every denoised image
- display 2 axes in one figure, including 2 plots of PSNR over the parameter of the denoising methods
- specify the same y-axis limits for all axes
- add titles and labels to the axes

c: iterative denoising

- denoise the image using the Total-Variation based gradient descent algorithm (`func_denoising_tv_grad_desc()`) with time step 0.01, regularization parameter 0.1 and number of iterations 5000.
- denoise the image with the best Gaussian filter selected from the above step
- denoise the image with the best median filter selected from the above step

d: compare the results

- display 5 axes in one figure, including the original image, the noisy image, and the (best) outputs of the 3 denoising methods
- add titles with the corresponding PSNR values to the axes