Computer Vision Exercises

4: Filters

24th October 2019

To perform this tutorial, use the images provided in 2nd lecture. Please select different grey scale images (e.g., high contrast, and low contrast) and apply the procedures to each.

1. Load the image (e.g., *lena.jpg*) as a grayscale image, as in previous lessons (load also other images);

2. Add, separately, salt-an-pepper and gaussian noise to the images; Play with the parameters of these noises (e.g., variance)

3. Implement a function that applies a moving average (box) filter, without recurring to Matlab®'s *imfilter()*, and use it on the original images. What is the result?

4. Use the Matlab® functions to perform correlation (*imfilter*) and convolution (*conv2*) using the moving average kernel. Apply them to the gaussian noise and salt-an-pepper image. What is the difference between both procedures? Is the end-result the same?

5. Use a gaussian kernel and perform smoothing on the gaussian noise and salt-and-pepper image. What happens? Do not use Matlab®'s *imfilter()* and *fspecial* functions.

6. Repeat the operations with different kernel sizes (5, 10, 20) and different variances (sigma = 2, 5, 10); What combination of window size and standard deviation reduce the greatest amount of noise?

7. Check the image borders before and after filtering. Is there any difference? With *imfilter* use different types of boundary interpolation methods;

8. Use Matlab®'s implementation of a median filter on the noisy images and compare it to the gaussian and box filters - which better removes the noise?

9. Perform high frequency emphasis on the original image, using a gaussian filter and the suggested sharpening filter in the class; Which one better enhances the image edges?