Introduction to Image and Video Processing

Lab2: Spatial Filtering

Spring 2022

1 Linear Spatial filtering

1. Create your own 1st order $3 \times 3s$ edge detector by applying an appropriate kernel to an image with inbuilt filtering functions.

2. Repeat by implementing (a) spatial correlation and (b) convolution, using zero padding. Compare your results. What do you observe?

3. Repeat with a smoothing filter.

2 Nonlinear Spatial filtering

1. Create your own Salt and Pepper noise and add it to an image.

   (a) Display the histogram of the original and two noisy images: one with a small and one with a large amount of noise. What do you observe?

   (b) Create your own spatial filter to remove the noise. Apply it for two different sizes of spatial mask and two different levels of noise. Display and discuss your results.

3 Correlation

The correlation operation is used for template matching, i.e. finding the location of a subimage inside an image. In this example, consider looking for an apple in an apple tree, using the images provided. Use an inbuilt function (e.g. corr2 in Matlab, cv.matchTemplate) to create a correlation map between the image template and the original image, and find the location of the template (in this case an apple). Display the result of the correlation and the location of the apple in the original image (appletree image).