Lab2 - Report

Sinatra Gesualdo

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1 Introduction

After have learned demosaicing , convolution and how to sample a signal, in the previous lab, in the second we were asked to process images. Particularly,

- Add noises to images and how to obtain better resolution.
- Fourier transformation, and visualize magnitude spectrum.
- Linear filters, Gaussian low pass filter, Convolution

2 Noisy Images

Gaussian and Salt and Pepper noises are phenomena in which the image has low sharpness (Gaussian) or white and black pixels are spread in the image (Salt and Pepper). As it will be soon noticed moving average, low-pass Gaussian filter and a median filter are tools for leverage histograms and improve the overall quality of the image.

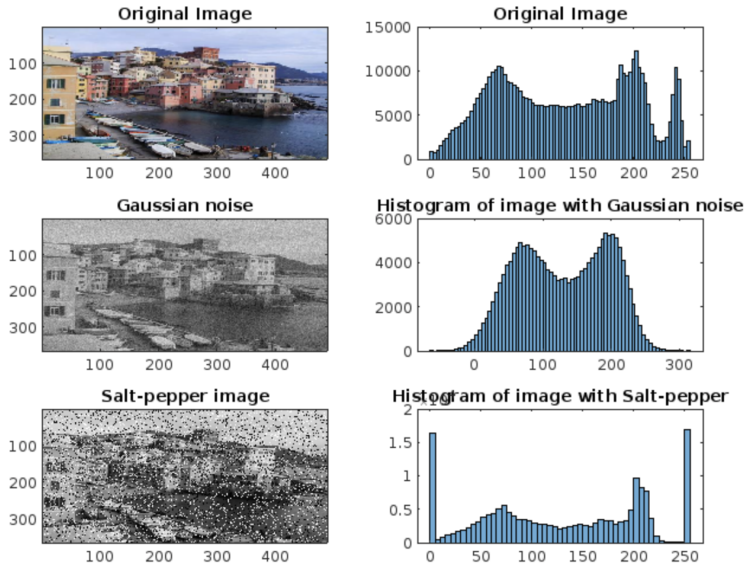

Figure 1: Comparing the same image with different noises.

3 Filters

The linear filter is a matrix of ones divided to the mean so that the amplitude is the same as the original. The median and Gaussian filter were implemented with special functions of Matlab. After having the filters of size different than the original image we convolve them. The filters take action in the little-sized neighborhood compare to the size of the original image and manipulate the signal in input letting the processed pixel in the output image. The filters were tested with a different size (3x3 and 7x7), both have better results in the median and Gaussian filter whereas the linear lowered the quality increasing the size of the matrix. After have tested linear, median and Gaussian filter I noticed how the median works perfectly with Salt-Pepper noise as well as the Gaussian filter with the Gaussian noise.

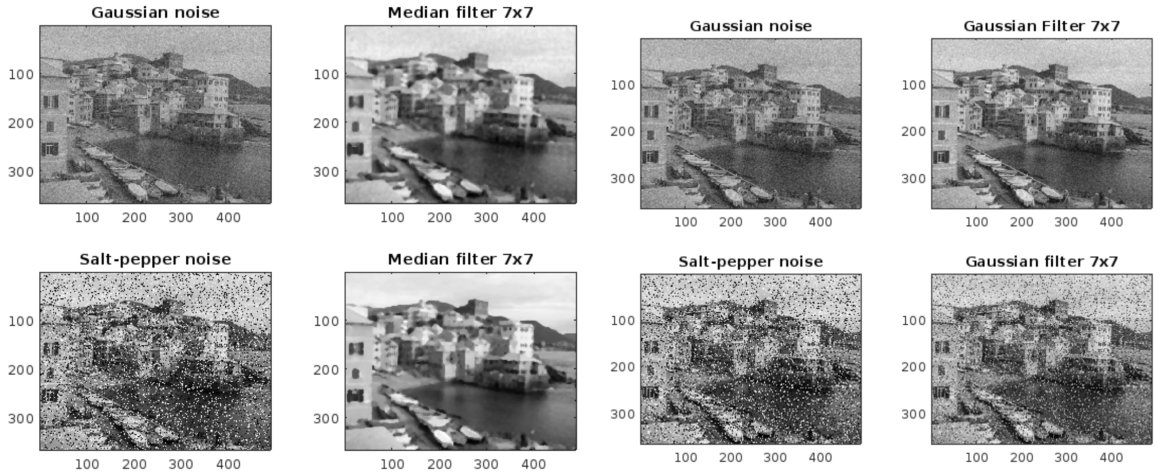

Figure 2: Processing with Median and Gaussian filter

Moreover, we have seen methodology for emphasize detailed edges, smoothing, sharpening a picture by using linear calculations.

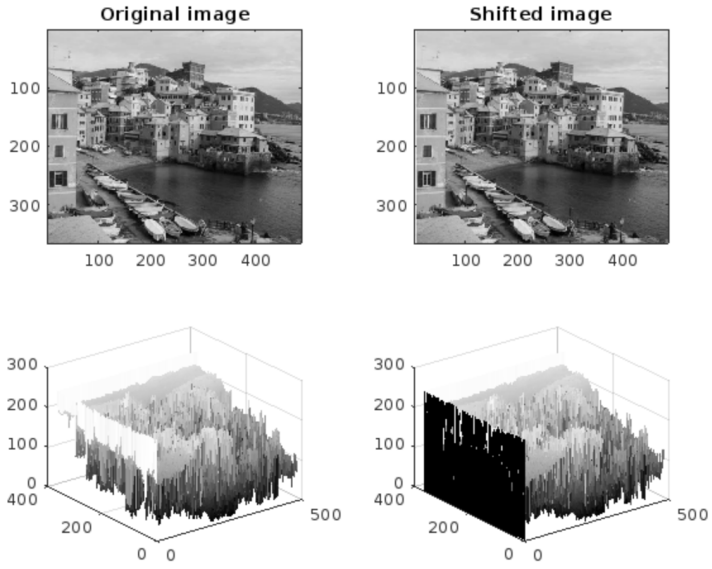

Figure 3: Comparing the same image with different noises.

An example is shifting to the left,result obtained by convolving a simple matrix with the image.

4 Fourier transform

The fourier transform is very important in image processing, it makes a signal continual in time, discrete in frequency domain and the results is a complex matrix.The real part is the amplitude whereas the imaginary part is the phase. Below the logarithmic plot of the magnitude of the Fourier transform of a blurred image compared to the original one.

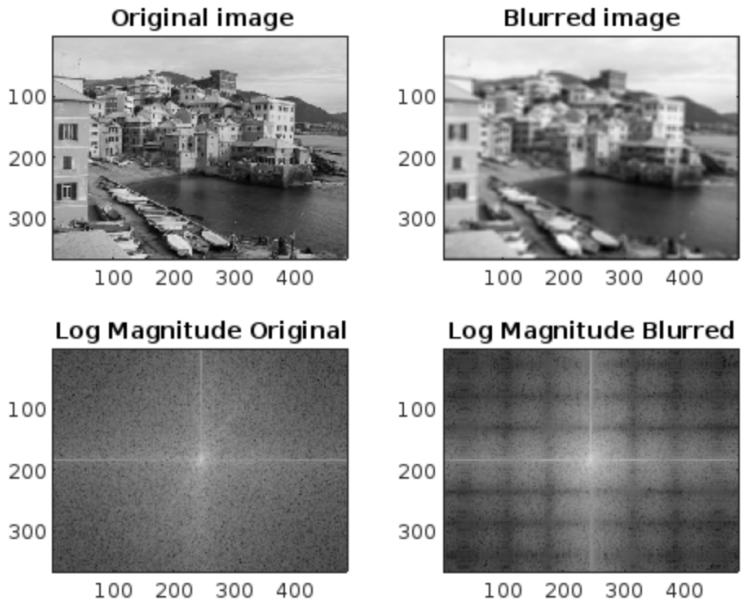

Figure 4: Fourier transformation of the images