Technische Universität Berlin

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Digital Image Processing

Exercise 02

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1 Theory

1. **When should the median filter be applied to an image and when the moving average filter? Explan your answer.**

   The median filter should be applied when the image is affected by shot noise (specific amount of pixels are black (greyscale value = 0) or white (greyscale value = 255)). This kind of filter calculates the median in a local area. The median will not be affected by a value that differs extremely from the rest of the neighbourhood (Figure 1). We have to assume that the the amount of correct pixels per local area is higher than the amount of noisy pixels in the same area. Otherwise the median filter might replace the correct pixel with a noisy pixel.

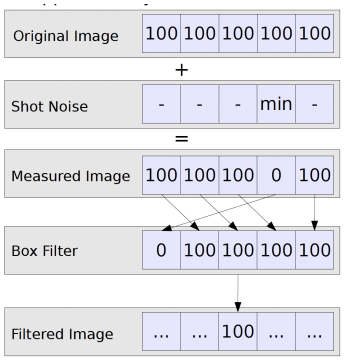

Figure 1: Median filter on shot noise

The moving average filter should be used for gaussian noise. In this kind of noise the pixel intensity oscillates around its actual value. Caluclating the average of a local neighbourhood gives us a good result for the actual pixel value, if we assume that the local area is homogenous (Figure 2).

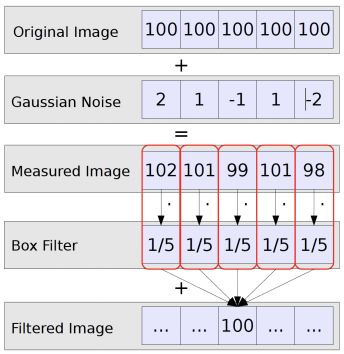

Figure 2: Moving average filter on gaussian noise

2. **Is there a general better choice than the moving average filter? Explain your answer**

   The disadvantage of the moving average filter is, that it blurs edges (Figure 3). The bilateral filter can deal with gaussian noise and additionally it perceives edges by using a spatial and a radiometric kernal (Figure 4).

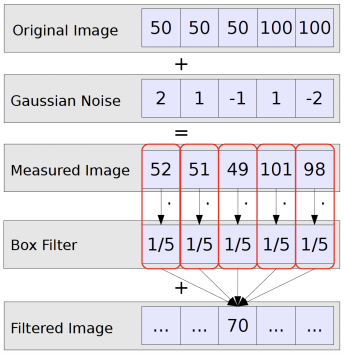

Figure 3: Moving average filter on gaussian noise

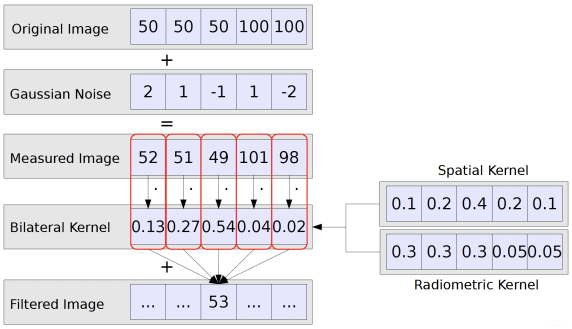

Figure 4: Bilateral filter on gaussian noise

Image Sources

- *Figure 1*: Digitial Image Processing - Exercise Sheet 02 - Page 12
- *Figure 2*: Digitial Image Processing - Exercise Sheet 02 - Page 07
- *Figure 3*: Digitial Image Processing - Exercise Sheet 02 - Page 08
- *Figure 4*: Digitial Image Processing - Exercise Sheet 02 - Page 18