Technische Universität Berlin

DIGITAL IMAGE PROCESSING

Winter Semester 2018/19

Exercise 3:

Unsharp Masking

Group Z

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29.11.2018

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Part 1: Discussion of the Solution

By this exercise we learned how to avoid border issue with wrapping technique and use discrete Fourier transform to achieve convolution by multiplication with Gaussian kernel for obtaining enhanced image by unsharp making. Moreover, we realized that the convolution costs computation badly. Time consumption increases rapidly with larger size of filter in spatial domain. Otherwise, it spent similarly processing in each size of filter.

Part 2: Theoretical Questions

i)   **Explain which assumptions lead to the "unexpected" border values in each image and why they are different for both methods?**

In Fig. 1b), we assume the filter will never pass over the image, so each pixel is only determined by the value of its neighbors. In Fig. 1c), we equally assign the filter onto corners, that's why the result presents in aliquot. Convolution in spatial domain is applied by a certain sequence from left to right and top to bottom so pixels affect each others. On the other hand, convolution is carried out as multiplication in frequency domain and processing directly without sequence.

ii)   **What steps are necessary for the convolution in spatial domain to produce the result in Fig. 1c)?**

In this case, we need to consider the border handling situation and apply wrapping techniques to fulfill the result in Fig. 1c).

iii) **What steps are necessary for the convolution by multiplication in frequency domain to produce the result in Fig. 1b)?**

It cannot fulfill the result with convolution in frequency domain.