TEL411 – Digital Image Processing

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Assignment 2

Due date: Sunday, November 21, 2021

Exercise 1

Create a function Compute_Mean() that takes as an input an image I and a kernel K. The output of this function should be an image $\tilde{I}$ (of the same size as I) which shows the impact of the mean filter. This function should work as follows:

1. Compute the size $n \times n$ of the kernel K.
2. Compute the size $m \times m$ of the input image I.
3. Add zeros around your image using padarray(). The size of the new image I' should be $(m + 2\lfloor n/2 \rfloor, m + 2\lfloor n/2 \rfloor)$.
4. With respect to the size of kernel n you should extract a small patch P (of size $n \times n$) of your image centered on the $I'(i + n/2, j + n/2)$ where $i, j = 1, \dots, m$.
5. Find the mean value (You are allowed to use the default function mean() but it would be appreciated more if you compute it manually).
6. Repeat the steps 4-5 for each pixel.

Test your code for 3 different kernel sizes 3x3, 5x5 and 9x9 using the 2 input images that have been shared on eclass at the following directory Lab2/Mean_Image1 and Mean_Image2. Illustrate all your results.

Exercise 2

Do all the necessary modifications of the aforementioned algorithm in order to create a different function that compute the median filter (Compute_Median()). Consider the following changes in the 3rd step of your algorithm:

- Compute a replicate padding

Test your code for 3 different kernel sizes 5x7, 3x3 and 9x11 using the 2 noisy images that have been shared on eclass at the following directory Lab2/Median_Image1 and Median_image2. Illustrate all your results.

Exercise 3

Do all the necessary modifications of the aforementioned algorithm in order to create 2 different functions that compute the max filter (Compute_Max()) and the min filter (Compute_Min()), respectively. Consider the following changes in the 3rd step of your algorithm:

- Compute a symmetric padding.

Test your code for 3 different kernel sizes 3x5, 5x5 and 7x7 using the 2 noisy images that have been shared on eclass at the following directory Lab2/MinMax_Image1 and MinMax_Image2 for both the Min and Max filters. Illustrate all your results.

What to turn in

You should turn in both your code and a report. For every different case (24 in total = 3 mean * 2 images + 3 median * 2 images + 3 max * 2 images + 3 min * 2 images) you should provide the filtered images and a short discussion.