Digital Image Processing: Assignment #1

Due on Friday, May 22, 2015

Olaf Hellwich, Ronny Hänsch 08:30am

Jacob Bräutigam, Nicolas Nostheide, Jens Kai Owczarczak, Robert Schäfer

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Part I - Theory

Question 1

When should the median filter be applied to an image and when the moving average filter?

If we can make an assumptions about the kind of distortion in the present case, we can choose weither to use median or moving average filter. So let's say the sensor of our camera exposes a behaviour similar to shot noise. We would favour the median filter over moving average.
Otherwise, if the image processing must be very fast or we have only limited resources we would prefer the moving average filter.

Question 2

Explain your answer to question 1.

The median filter effectively rejects outliers. That's why the median filter is very appropriate to tackle shot noise.
Unfortunately, the median filter is not a convolution filter, so it's not as easy to implement and not as fast as the moving average filter. Convolution filter are implemented using matrices and matrix operations can be handled very efficiently by the GPU. So if performance is crucial it's better to use moving average filter.

Question 3

Is there a *general* better choice than the moving average filter?

Yes. We would favour an adaptive filter over the ordinary average filter in general.

Question 4

Explain your answer to question 3.

The downside of the average filter is the blurring of the image. The adaptive filter is almost the same as the average with one crucial difference: Whenever a part of an edge is being processed, the algorithm switches to a small kernel. Thus, it preserves edges or rather it doesn't blurr the image unnecessarily.