

# Seminar 1 - Processing of images

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## 1 Abstract

In this report I am going to explain my choice of seminar and introduce the task. I am also going to discuss the methods used and the results that I arrived at. At the end I sum up my findings.

## 2 Introduction

I have decided to do Processing of images for my first Seminar, as I am quite interested in the happenings behind the curtain when it comes to image processing. I have been using image processing software for many years already in the form of PhotoShop, or many of its open-source counterparts.

The task required me to; in the first part sharpen images using a smoothing filter, and in the second part sharpen images using second-order derivatives, obtained via Laplacian masks.

## 3 Methods

I completed the Task in MatLab, as we already used it during our exercises, where I learned many tips. The task is written as a function which requires the image and the factor of highboost filtering.

Part 1:

To use the smoothing I needed to create a kernel; a 3x3 matrix with  $\frac{1}{9}$  in every space. I blur the original image using the kernel with imfilter function. I then subtract the blurred image from the original. The result is added to the original image as many times as specified. This is called highboost filtering.

Part 2:

In this part I used Laplacian masks for second-order derivative image sharpening. I used two matrices to get Laplacian masks:

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{bmatrix} \text{ and } \begin{bmatrix} 1 & 1 & 1 \\ 1 & -8 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

I produce second-order derivative images by using convolution on these matrices and the original image. To get the final sharpened images I subtract the gotten second-order derivatives from the original.

## 4 Results

When using the highboost filter sharpening worked better on images with larger contrasts between colors. But sharpening using second-order derivatives works better overall. The difference between the two matrices is also visible, as one uses -4 and the other uses -8 in the center, thus producing sharper images.

## 5 Discussion

At the end of this task I feel like I now understand how image sharpening really works. I would however like to find out more about other sharpening filters, and image processing in general.