

Opdrag 2

Ruimtelike filters

Inhandigingsdatum:
Vrydag, 30 Augustus 2019

Instruksies: Dieselfde as vir Opdrag 1.

Vraag 1

Gebruik in hierdie vraag funksie-definisies soos hieronder:

```
function g = smoothen( f, mask_dim )
```

(a) Pas die volgende ruimtelike filters,

$$(i) \frac{1}{9} \times \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix},$$

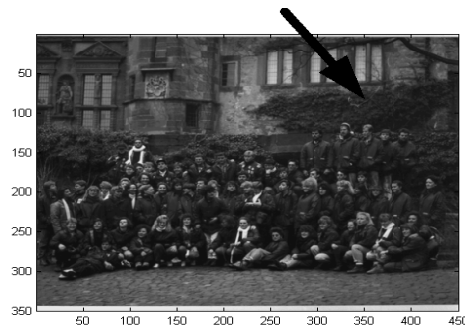
op `lenna256.jpg` toe. Bespreek u resultate.

(b) Herhaal nou (a) met drie groter ruimtelike filters. Bespreek u resultate.

(c) Vertoon die histogramme van die oorspronklike en gefiltreerde beelde in (a) en (b). Interpreteer.

Vraag 2

(a) Gebruik beeldverbeteringstegnieke van u keuse en verwyder die aangeduide rafel in `choir.jpg`. Maak seker dat die piksels, wat nie deel van die rafel is nie, onveranderd bly. Die gebruiker mag aanvanklik 'n boksie spesifiseer wat die rafel begrens, waarna die algoritme so ver as moontlik outomaties moet wees.



`choir.jpg`

(b) Beskou nou die beeld in (a), sonder die rafel, en gebruik onder meer 'n geskikte "high-boost"-filter ten einde hierdie beeld, in sy geheel, skerper en meer aanneemlik te maak.

Assignment 2

Filtering in the spatial domain

Due date:
Friday, 30 August 2019

Instructions: The same as for Assignment 1.

Question 1

In this question, use function definitions as specified below:

```
function g = sharpen( f, mask_dim )
```

(a) Apply the following spatial filters,

$$(ii) \frac{1}{9} \times \begin{bmatrix} 1 & 1 & 1 \\ 1 & -8 & 1 \\ 1 & 1 & 1 \end{bmatrix},$$

to `lenna256.jpg`. Discuss your results.

(b) Now repeat (a) with three larger spatial filters. Discuss your results.

(c) Display the histograms of the original and filtered images in (a) and (b). Interpret.

Question 2

(a) Use image enhancement techniques of your choice and remove the indicated thread in `choir.jpg`. Make sure that the pixels, that do not form part of the thread, remain unchanged. The user may initially specify a bounding box for the thread, after which the algorithm has to be as automatic as possible.

(b) Subsequently consider the image in (a), without the thread, and use, amongst other things, a suitable high-boost filter to render this image, as a whole, sharper and more presentable.

Gebruik 'n funksie-definisie soos:

Use a function definition like:

```
function g = high_boost( f, mask_dim, k )
```

Vertoon uiteindelik die beelde, met en sonder die rafel, en die finale (verbeterde) beeld op dieselfde bladsy (groot en duidelik).

Eventually display the images, with and without the thread, and the final (enhanced) image on the same page (large and clear).

Vraag 3

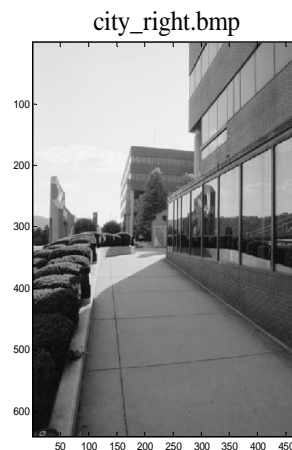
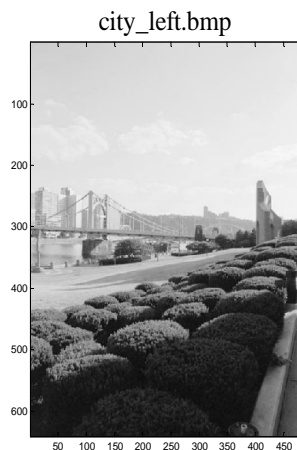
Die subbeeld regs in `city_left.bmp` is amper identies aan die subbeeld links in `city_right.bmp`.

Question 3

The right hand side of `city_left.bmp` is almost identical to the left hand side of `city_right.bmp`.

Die beelde korreleer goed in die vertikale rigting, is nie groter ten opsigte van mekaar nie en het ongeveer dieselfde skaal.

The images are well aligned in the vertical direction, are not rotated with respect to each other and have more or less the same scale.



(a) Ontwikkel 'n algoritme wat **outomaties** vasstel waar die beelde ooreenstem en dan die een beeld op die ander een plaas sodat 'n enkele, groter beeld verkry word. Illustreer u metode grafies.

Wenk: Gebruik formule (12.2-8) op bladsy 892 van G&W, of iets soortgelyks.

(b) Gebruik vervolgens beeldverbeteringstechnieke van u keuse om die vashegtingslyn minder sigbaar te maak.

(a) Develop an algorithm that **automatically** determines where the images coincide and then places the one image onto the other so that a single, larger image is obtained. Illustrate your method graphically.

Hint: Use formula (12.2-8) on page 892 of G&W, or something similar.

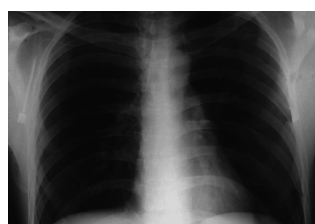
(b) Subsequently use image enhancement techniques of your choice to make the stitch line less visible.

Vraag 4

Gebruik **ruimtelike** beeldverbeteringstechnieke van u keuse ten einde die ribbes in `chest_xray.tif` meer prominent te maak. Die strategie op bladsy 312 van G&W mag as 'n riglyn gebruik word.

Question 4

Use **spatial** image enhancement techniques of your choice in order to render the ribs in `chest_xray.tif` more prominent. The strategy on page 312 of G&W may be used as a guideline.



chest_xray.tif