

Opdrag 3

Filters in die frekwensie-ruimte en beeldherstel

Inhandigingsdatum:
Vrydag, 27 September 2019

Instruksies: Dieselfde as vir Opdrag 1.
Vraag 2 is 'n bonusvraag.

Vraag 1

Die filters, `ilpf.bmp`, `blpf.bmp`, `ihpf.bmp` en `bhpf.bmp` het afsnyfrekwensieradiusse van 10 piksels. Dit is nie nodig om van nul-opvulling in (a), (b) en (c) gebruik te maak nie.

- Pas die ideale laag- en hoogdeurlaatfilters (`ilpf.bmp` en `ihpf.bmp`) op `lenna256.jpg` toe en bespreek jou resultate.
- Doen dieselfde as in (a) vir die Butterworth laag- en hoogdeurlaatfilters (`blpf.bmp` en `bhpf.bmp`). Vergelyk jou resultate met dié van (a). Verklar moontlike verskille volledig. Plot onder meer profiele van die ruimtelike ekwivalente van hierdie filters waar nodig.
Do the same as in (a) for the Butterworth lowpass and highpass filters (`blpf.bmp` and `bhpf.bmp`). Compare your results with those of (a). Explain possible differences in detail. Plot, for example, profiles of the equivalent spatial filters when appropriate.
- Konstrueer nou self laag- en hoogdeurlaatfilters met drie verskillende afsnyfrekwensieradiusse en herhaal (a) en (b). Eksperimenteer ook met drie verskillende ordes (hellings) vir een van die drie Butterworth filters.
- Pas vervolgens die filters in (b) op `lenna256.jpg` toe, **met** nul-opvulling. Verskil hierdie resultate met dié wat in (b) verkry is? Bespreek.

Vraag 2

Beskou die beeld `mystery.tif` wat deur lineêre beweging bederf is. Die parameters vir die aftakelingsfunksie is $a = b = 0.05$ en $T = 0.5$. Herstel en identifiseer die beeld na die beste van jou vermoë. *Consider the image `mystery.tif` that was spoiled by linear motion. The parameters for the degradation function are $a = b = 0.05$ and $T = 0.5$. Restore and identify the image to the best of your ability.*

Assignment 3

Filters in the frequency domain and image restoration

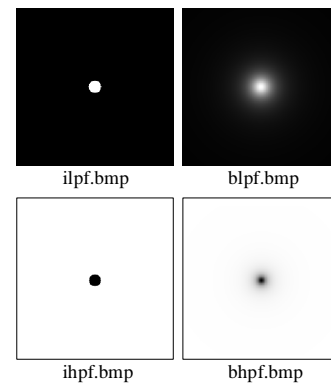
Due date:
Friday, 27 September 2019

Instructions: The same as for Assignment 1.
Question 2 is a bonus question.

Question 1

The filters, `ilpf.bmp`, `blpf.bmp`, `ihpf.bmp` and `bhpf.bmp` have cutoff frequency radii of 10 pixels. It is not necessary to make use of zero padding in (a), (b) and (c).

- Apply the ideal lowpass and highpass filters (`ilpf.bmp` and `ihpf.bmp`) to `lenna256.jpg` and discuss your results.



- Subsequently construct lowpass and highpass filters with three different cutoff frequency radii and repeat (a) and (b). Also experiment with three different orders (slopes) for one of the three Butterworth filters.
- Subsequently apply the filters in (b) to `lenna256.jpg`, **with** zero padding. Do these results differ from those obtained in (b)? Discuss.

Question 2



`mystery.tif`

Vraag 3

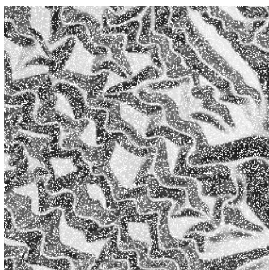
Beskou die beeld `superconductor.tif`.

- (a) Onttrek die beeld se ruishistogram. Vertoon die histogram en klassifiseer die ruisdigtheidsfunksie. Gebruik die onttrekte histogram en bepaal die ruisparameter(s).
- (b) Gebruik die parameter(s) wat jy in (a) bepaal het en genereer progressief meer en meer eksemplare van die ruistipe. Vertoon telkens die histogram van die eksemplare. Vergelyk hierdie histogramme met die histogram in (a).

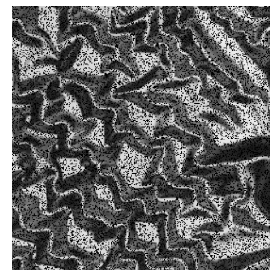
Use the parameter(s) that you determined in (a) and progressively generate more and more samples of the noise type. Display the histogram of the samples each time. Compare these histograms with the histogram in (a).

Vraag 4

Die beelde, `salt_only.tif` en `pepper_only.tif`, is bederf deur sout- en peperruis onderskeidelik. Gebruik geskikte aanpasbare mediaanfilters om van die ruis in die beelde ontslae te raak. Die oogmerk moet wees om beelde te verkry wat so skoon as moontlik is, met so min as moontlik distorsie.



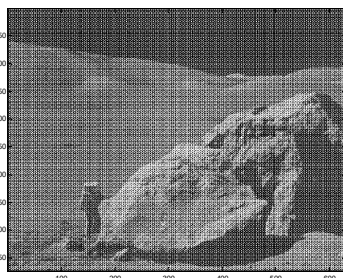
`salt_only.tif`



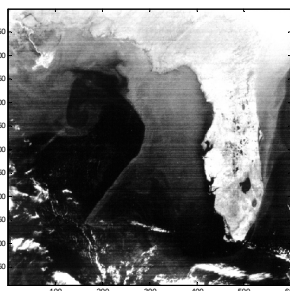
`pepper_only.tif`

Vraag 5

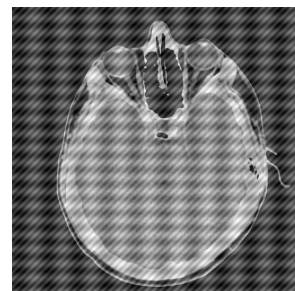
Verwyder die periodiese ruis in `moon_walk.jpg`, `florida.jpg` en `head_ct.tif`. Let op dat, in die geval van `moon_walk.jpg`, die voorgestelde filter in G&W (p. 358) nie werk nie. Probeer dus iets anders.



`moon_walk.jpg`



`florida.jpg`

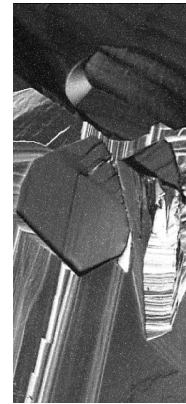


`head_ct.tif`

Question 3

Consider the image `superconductor.tif`.

- (a) Extract the noise histogram for the image. Display the histogram and classify the noise density function. Determine the noise parameter(s) using the histogram you extracted.



`superconductor.tif`

Question 4

The images, `salt_only.tif` and `pepper_only.tif`, are corrupted by salt noise and pepper noise respectively. Use suitable adaptive median filters to denoise the images. The objective must be to obtain images that are as clean as possible, with as little image distortion as possible.

Question 5

Remove the periodic noise in `moon_walk.jpg`, `florida.jpg` and `head_ct.tif`. Please note that, in the case of `moon_walk.jpg`, the suggested filter in G&W (p. 358) does not work. Therefore try something else.