University of Potsdam

Assignment No. 4

Institute for Physics and Astronomy

Handed out on: 23/05/2014

Digital Image Processing in Astronomy

Please write your results in a textfile or m-file and send it to me by e-mail at the latest on 09/06/2014. Group work is permitted but text and programs should be written by yourself.

Exercise 1: *Padding in frequency domain [2 Points]*

Create a 256×256 image with an intensity of $'1'$ in the upper half and $'0'$ in the lower half.

   (a) Filter the image using a 'Gaussian' filter with and without padding amd compare the filtered images.

   (b) Write briefly about the need for padding in frequency domain filtering.

(Note: The size of the filter changes with padding and so the sigma value of gaussian filter needs to be changed to get the similar filtering.)

Exercise 2: *High-pass filters [2.5 Points]*

Take a high-contrast grayscale image and do the following:

   (a) Filter it with a high-pass filter.

   (b) Enhance the image with a butterworth high-frequency emphasis filter. Perform histogram equalisation on filtered image. Do the combination of frequency domain processing and spatial domain processing yields a better result?.

(Note: Filters has to be generated directly in the frequency domain.)

Exercise 3: *Estimation of noise parameters [2 Points]*

Take an image and add a noise to it.

   (a) Plot a histogram of the region of interest (ROI) in the image using *roipoly* and *histroi*[1] functions.

   (b) Now estimate the mean and variance of that noise in ROI.

Exercise 4: *Band-pass filter [3.5 Points]*

Remember the noisy image of astronaut in moon. The noise present in that image is periodic noise.

   (a) Pick out an image and apply a periodic noise to it using the m-file, imnoise3.

   (b) Remove the periodic noise using a band-pass filter.

   (c) Display the unfiltered image, the spectrum of the image, an image of the band-pass filter, an image of the noise and the filtered image.

For questions or problems with the exercise, contact us at:

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[1]m-files can be found at: /home/weber/pavalli/gonzlazmfiles