# 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 07/07/2014. Group work is permitted but text and programs should be written by yourself.

**Exercise 1:** *Wavelet transforms [3 Points]*

(a) Compute the four-scale two-dimensional wavelet transform of an image.

(b) Perform a progressive reconstruction on the wavelet-transformed image using the m-file, *waveback*()[1].

(c) Add "Gaussian" noise to the image and denoise it using a linear filter.

**Exercise 2:** *Morphology [2 Points]*

Pick an image of lightning and convert it into a binary image.

(a) Obtain a morphological skeleton of the image.

(b) Compute the end points and view it using the m-file, *endpoints*().

**Exercise 3:** *Morphological operators [5 Points]*

Take the *mars.bmp*[2] image and etimate the characteristics of the planet.

(a) Convert the image into a grayscale image and obtain a 3-level (size of the colourmap) indexed image. The image now contains only space, planet and planet's polar ice (seen at the top of the image).

(b) Merge the two highest levels (planet and ice) and convert it into a binary image. Remove the isolated points and noise using *open* method. Find the center of the planet, by shrinking it, using the *bwmorph*() function.

(c) Isolate the polar ice and convert it into a binary image. Compute the center of polar ice.

(d) Estimate the distance of ice cap from the equator of the planet.

(e) Compute the area ratio of the ice cap and planet.

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

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