IMAGE PROCESSING (RRY025)

Studio Exercises

Discrete 2D Fourier Transform

EX. 1

- Load the `cameraman.tif` image.
- Display the image.
- Take the 2D discrete (fast) Fourier transform.
- Do you get a warning? If so, why? What should you do?
- Take the inverse transform.
- Display the resulting image.
- Does it look OK?
- Now, instead of taking the inverse transform as above, take again the 2D discrete (fast) Fourier transform.
- Display the resulting image.
- Why does the bloody computer warn you (again)?
- What should you do?
- Display the 'good' part of that image.
- What does it look like in comparison with the original (`cameraman.tif`) image? Why?
- Display the 'bad' part of that image.
- What does it look like? What does it mean? Should we get worried or not?

EX. 2

- Load the `cameraman.tif` image, and display it (remember EX. 1).
- Take the 2D fast Fourier transform.
- Take the amplitude and the phase.
- Display the amplitude in the usual way.
- Can you display the amplitude in a better way?
- Is this a billiard-table, or maybe you should centre ...?
- What does the centred image tell you? Explain!
- Display now the phase.
- What does this image tell you? Explain!
- In the matlab files for the course, there is a file `ftlogamp.m`. Look at this file. What can it be used for? And how? Experiment with the images `saturn.tif` and `tire.tif` ....

EX. 3

- This is a continuation of EX. 2 (image `cameraman.tif`).
- Reconstruct (inverse 2D fast Fourier transform) using only the information contained in the amplitude, and display appropriately the result.
- Reconstruct now using only the information contained in the phase, and display appropriately the result.
- What do you conclude?
- What happens if we consider the real and the imaginary parts of the transformed image, rather than its amplitude and phase, and reconstruct?
- Can you prove this result? Help: solve problem B4.