

SIGNAL PROCESSING

Home work in Octave

The file `Hw.m` has to be completed and returned in time on Moodle (deposit will be possible until December 3). The file should execute without errors, produce and/or display the answers to the tasks detailed below. It should contain comments of the code.

One more file with explanations/comments and/or description of problems will be allowed (any text format, PDF preferred). You need Octave and the files you will find in the home work directory on Moodle.

Exercise 1 [Moiré pattern in radiography images]

1. Load the file `Im1.jpg` in `Im1`. Display the image and describe the problem with this image.
2. Use a mean filter of size 3×3 and 5×5 to denoise. Display and comment the results.
3. Compute and display the amplitude of the Fourier Transform of `Im1`.
4. Detect in the amplitude of the spectrum the noise patterns which might be due to the Moiré effect. Write the commands to detect/display these zones of the matrix. (Inspect the position by hand in the matrix/image, then check in the matrix of the amplitude, there should be 4 “anomalies”).
5. Propose a filter h , which will be defined in the frequency domain and which should allow to discard the problematic frequencies. Construct $\mathcal{F}(h)$ and display $|\mathcal{F}(h)|$.
6. Compute $\mathcal{F}(h * Im1)$ and display $|\mathcal{F}(h * Im1)|$.
7. Compute and display $h * Im1$.

Remark: when displaying data in frequency domain, put the low frequencies as usual in the center.

Exercise 2 [FT versus WFT]

1. Load the file `signal_hw.bin` in `f`. Display the signal f . What is its length N ?
2. Compute the `fft` of f by zero-padding to obtain a signal of length 2^{10} . Display the amplitude and phase in the usual way.
3. Create a new signal `fr` by time inversion. Display the signal fr and repeat question 2. for fr .
4. What does the preceding tell you about the two signals?
5. Use `stfft` to compute the WFT for common windows sizes of f and fr .
6. What does this tell you about the signals?
7. Can you propose a definition of f (and thus fr)?