CS-E4850 Computer Vision
Exercise Round 3

The following instructions are for the Matlab version. The instructions for the Python version are in github. Matlab is available on Aalto computers and also for students' own computers via `https://download.aalto.fi`.

The problems should be solved before the exercise session and solutions returned via the MyCourses page. Upload TWO files: (1) a PDF file illustrating your results with images and a few lines of text, and (2) a zip file which contains your Matlab source code files.

Get the example `m`-files by downloading `Exercise03.zip` from the MyCourses page.

Exercise 1. Image denoising.
Run the example file `imagedenoising.m` and see the instructions in the comments of the source code. In this task you will need to denoise the two example images using
a) Gaussian filtering,
b) median filtering,
c) bilateral filtering. (The latter two are explained in Section 3.3.1 of Szeliski's book.)

Exercise 2. Hybrid images.
Run the example file `hybridimage.m` and see the instructions in the comments of the source code. In this task you will need to construct a hybrid image that combines facial images of a wolf and a man. In addition, visualize the log magnitudes of the Fourier transforms of the original images and their low-pass and high-pass filtered versions (i.e. constituents of the hybrid image).
(Hint: You can use the Matlab functions `fft2` and `fftshift` as shown in lecture slides.)

Exercise 3. Image blending via Laplacian pyramids.
Run the example file `imageblending.m` and see the instructions in the comments of the source code. The example implements Laplacian pyramid blending and blends facial images of a wolf and a man. The blending process is described in Section 3.5.5 of Szeliski's book. You need to implement the generation procedure for Gaussian and Laplacian image pyramids and the reconstruction procedure for reconstructing an image from its Laplacian pyramid.
(Hint: You can use two 1D convolutions with the binomial filter kernel $g = [1\ 4\ 6\ 4\ 1]/16$ to implement the low-pass filter before downsampling. Interpolation in the reconstruction procedure can be performed by adding zeros between the rows and columns of the lower resolution image using Matlab function `upsample` and then filtering horizontally and vertically with the kernel $2g$ as mentioned in Figure 3.33 of Szeliski's book.)