

# Frequency domain processing

## Exercises in Matlab

1. Calculate and visualize a spectrum of an image (see slide 10 of the presentation):
  - 1) create and visualize a simple image – white rectangle on a black background;
  - 2) calculate and visualize its Fourier spectrum;
  - 3) obtain and visualize its centered Fourier spectrum;
  - 4) visualize the visually enhanced spectrum.
2. Create an ideal lowpass filter and apply it to the image *MRI\_snapshot.jpg*.  
Visualize the following:
  - 1) the initial image;
  - 2) the image of the filter transfer function;
  - 3) the transfer function as a surface with the `mesh` or `surf` function (for `mesh`, the values of the transfer function should be of the data class “double” – use `double`; you may try to use `shading interp` for the plot made by `surf`);
  - 4) the resulting image.
3. Create an ideal highpass filter and apply it to the image *MRI\_snapshot.jpg*.  
Visualize the same data as in the previous task:
  - 1) the initial image;
  - 2) the image of the filter transfer function;
  - 3) the transfer function as a surface with the `mesh` or `surf` function;
  - 4) the resulting image (use `imshow(f, [])`).
4. Vary the cutoff frequency parameter in the lowpass filter created in the task 2. For example, take values of  $D_0$  equal to 0.01, 0.05, 0.5. The initial image is the same as above. Visualize the transfer functions and the resulting images. Explain the results.
5. The same task as the task 4 above, but use the highpass filter instead of the lowpass one.