Università degli Studi di Brescia, Facoltà di Ingegneria

Multimedia Communication Services, A.Y. 2012/2013

02/10/2012 - Lab experience n.2

1 2D Fourier Transform

Write a Matlab function **MCS_FT** that computes the Fourier Transform of a one-dimensional signal, given as inputs the vector of signal values, the vector of their associated time instants (sampling points), and the vector of frequency values at which the transform is to be evaluated. If possible, write this function using the vectorial operations available in Matlab.

Write a function **MCS_FT2** that computes the two-dimensional Fourier Transform of an image. It is possible to exploit the separability of the transform by using the function **CMP_FT** of the previous point, or by extending to the two-dimensional case the vectorial operation used in the previous point (hint: left and right matrix multiplications)

2 Deformations in Space

Use the Matlab command **ndgrid** to generate two-dimensional domains in space and frequency. Using the set [**-6:0.05:6**] for both the x and y domains, and the set [**-4:0.05:4**] for the f_x and f_y domains, compute and display (using commands **imagesc** or **surf**) the Fourier Transform of the signals $s_1(x,y) = \mathrm{rect}(x)\mathrm{rect}(y)$, $s_2(x,y) = \mathrm{rect}(x/2)\mathrm{rect}(y)$ e $s_3(x,y) = \mathrm{rect}(x/2)\mathrm{rect}(y - x/4)$. Repeat the experiment with the signals $s_4(x,y) = \sin(\pi x)$, $s_5(x,y) = \sin(\pi y)$, $s_6(x,y) = \sin(\pi x - 2\pi y)$, gaussian signals etc...

3 Real Images

Compute the Fourier Transforms of real images (luminance only), comparing the spectrum of natural images with that of periodic pattern texture images (use a logarithmic scale for the transform amplitude if necessary)