Università degli Studi di Brescia, Facoltà di Ingegneria
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16/10/2012 - Lab. experience n.3

1 2D cylindric signals

Compute the 2D Fourier Transform of the signal $s_1(x, y) = \mathrm{rect}(x/\Delta)/\Delta$ for "vanishing" values of Δ (smaller and smaller). Ripeat the experiment with the signal $s_2(x, y) = \mathrm{rect}(\cos\alpha x + \sin\alpha y)$ for different values of α.

Compute then the transform of the signal $e^{j2\pi(\bar{u}x+\bar{v}y)}$ for varying $\bar{u}$ and $\bar{v}$. Compute the transform of $\cos(2\pi(\bar{u}x + \bar{v}y)$ and $\cos(2\pi(\bar{u}_1x + \bar{v}_1y))\cos(2\pi(\bar{u}_2x + \bar{v}_2y)$ for varying $\bar{u}_1$, $\bar{v}_1$, $\bar{u}_2$ and $\bar{v}_2$. Compute the transform of the signal $e^{-\pi x^2}\cos(2\pi(\bar{u}x + \bar{v}y)$.

2 3D cylindric signals

Create a video static sequence by repeating n times a single still image (use for example a Gaussian function or a rectangle). Compute the 3D Fourier transform of the sequence using the matlab command (**fftn**). Display different sections of the transform volume.

Create a video sequence by letting the original image move as a speed v_x and v_y in vertical and horizontal directions, respectively. Compute the 3D Fourier transform and display different sections of the volume.

3 [Extra] 3D Fourier

Write a function that compute the 3D Fourier transform over an arbitrary set of points in the frequency domain and use it to display different and more useful sections of the previously computed transforms.