Matlab DSP Commands List

abs	Absolute value
angle	Phase angle
circshift	Shift array circularly
conv	Convolution
cconv	Circular convolution
eps	Matlab's numerical tolerance
figure	Create a new figure or redefine the current figure
fft	Determine the frequency content of a sequence of numbers
filter	Determine the output y of a system/filter
freqz	Determine the frequency response of a digital system
grid	Draw the grid lines on the current plot
gtext	Add a piece of text to the current plot, see also text
help	HELP!
hold	Hold the current graph, see also figure
ifft	Inverse fast Fourier transform
invfreqz	Identify discrete-time filter parameters from frequency response data
iztrans	Inverse Z-transform of the scalar sym F
legend	Graph legend
length	Length of a vector, see also size
fliplr	Flip matrix in left/right direction.
linspace	Returns a linearly spaced vector
ones	Returns a vector or matrix of ones, see also zeros
poly	Returns the characteristic polynomial
rand	Generate a sequence of random numbers
real	Returns the real part of a complex number, see also imag
residue	partial-fraction expansion.
roots	Find the roots of a polynomial
size	Gives the dimension of a vector or matrix, see also length
sqrt	Square root
subplot	Divide the plot window up into pieces, see also plot, figure
subs	Symbolic substitution.
text	Add a piece of text to the current plot
title	Add a title to the current plot
toeplitz	Builds a non-symmetric Toeplitz matrix
xlabel/ylabel	Add a label to the horizontal/vertical axis of the current plot,
zeros	Returns a vector or matrix of zeros
zplane	Zero-pole plot for discrete-time systems
ztrans	Z-transform of the scalar sym f

Ζεύγη MZ		
x[n]	**X(z)**	**ROC**
$\delta[n]$	1	z
$\delta[n-n_0]$	z^{-n_0}	Όλο το z, εκτός 0 ($n_0 > 0$) ή ∞ ($n_0 < 0$)
$a^n u[n]$	$\frac{1}{1-az^{-1}}$	|z|>|a|

Ιδιότητες MZ		
x[n]	$\boldsymbol{X(z) \triangleq \sum_{n=-\infty}^{\infty} x[n]z^{-n}}$	**ROC**
ax[n]+by[n]	aX(z)+bY[z]	Περιέχει $R_x \cap R_y$
$x[n-n_0]$	$z^{-n_0}X(z)$	R_x πιθανώς $\pm 0, \infty$

- Discrete Time Fourier Transform DTFT:

$$X(e^{j\omega}) = \mathrm{F\{x[n]\}} = \sum_{n=-\infty}^{\infty} x[n]e^{-j\omega n}$$

Ιδιότητες DTFT

Περιοδικότητα $X(e^{j\omega}) = X(e^{j(\omega+2\pi)})$

Γραμμικότητα $ax_1(n) + bx_2(n) \overset{DTFT}{\Longleftrightarrow} aX_1(e^{j\omega}) + bX_2(e^{j\omega})$

Μετατόπιση στο χρόνο $x(n-n_0) \overset{DTFT}{\Longleftrightarrow} e^{-jn_0\omega}X(e^{j\omega})$

- Απόκριση Συχνότητας:

$$H(e^{j\omega}) = \sum_{n=-\infty}^{+\infty} h(n)e^{-j\omega n}$$

- Εξίσωση Διαφορών που περιγράφει LTI σύστημα:

$$y(n) = \sum_{k=0}^{q} b(k)x(n-k) - \sum_{k=1}^{p} a(k)y(n-k)$$

- Discrete Fourier Transform DFT

DFT(x[n])=X$[k] = \sum_{n=0}^{N-1} x[n]e^{-j2\pi\frac{kn}{N}} = \sum_{n=0}^{N-1} x[n]{W_N}^{nk}$, $k = 0, \dots, N-1$

Κυκλική συνέλιξη:

- $x[n] \otimes h[n] = \sum_{k=0}^{N-1} x[k]h\big[(n-k) mod\ N\big] = \sum_{k=0}^{N-1} x\big[(n-k) mod\ N\big]h[k], \quad 0 \le n \le N-1$
- $DFT\big[x[n] \otimes h[n]\big] = X[k]H[k]$
- $y(n) = x(n) \otimes h(n) = IFFT\big[FFT[x(n)] \cdot FFT[h(n)]\big]$