% Carlos Lazo

% ECE 503

% Homework #2

% Due: 2/1/10

function [y Ty] = HW02\_convolution (x,Tx,h,Th)

close all;

% Compute the # of elements in each of the vectors.

nx = length(x);

nh = length(h);

% The length of the output will be nx + nh - 1 in size.

ny = nx + nh - 1;

% Create new vectors with padded 0's for computational purposes.

% This will force both vectors to be of equal length.

X = [x, zeros(1,nh)];

H = [h, zeros(1,nx)];

% Now perform the convolution loop, going from 1 to ny:

for ii = 1 : ny

% Set each element in the output initially to 0.

y(ii) = 0;

% Iterate across the first signal.

for jj = 1 : (nx)

% Define kk, which will determine the existance of signal H.

kk = ii - jj + 1;

% Assuming that the index is valid location for the current step,

% compute the convolution sum at that specific step.

if (kk > 0)

y(ii) = y(ii) + X(jj) \* H(kk);

end

end

end

% Define the time-step of the new output variable,

% and adjust the time vector by the signal k offsets.

k = 0 : length(y) - 1;

k = k - (Tx + Th - 2);

figure;

% Define the new signal origin in terms of the original signal times.

Ty = Tx + Th - 1;

%Plot the convolution result, and post all information to the plot.

stem (k, y);

xlabel({'k'; ' '; ['y(k) = ' num2str(y)]; ['k = 0 located @ MATLAB array index: ' num2str(Ty)]; });

ylabel('y(k)');

title({'Convolution of x \* h '; ['Tx = ' num2str(Tx) ', Th = ' num2str(Th)]});

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function [X\_z] = HW02\_zplot (a)

close all;

% Define the area for which to plot the magnitude

% and create the surface which maps both the real

% and imaginary parts of the z plane.

z\_plane = -5 : .1 : 5;

for ii = 1 : length(z\_plane)

for jj = 1 : length(z\_plane)

z(ii,jj) = z\_plane(ii) + j\*z\_plane(jj);

end

end

% The known Z-transform of x(k) = a^k \* u(k)

% is Z(x) = 1 / 1 - a\*z^(-1));

X\_z = 1./(1-a\*z.^(-1));

% Plot the magnitude of the Z-transform.

figure;

mesh(z\_plane, z\_plane, abs(X\_z));

title('x(k) = a^k \* u(k) <===> X(z) = 1 / [1 - a\*(z^-1)], |z|>a for a = 0.5');

xlabel('Re(Z)');

ylabel('Im(Z)');

zlabel('|Z-Transform|');