**FIR System Identification**

You need to model an unknown FIR system. You have placed a random noise signal, **x**, at the input of the system and observed the resulting signal, **y**. All that is known about the FIR system is that it is **9 points long**. This means the **order Q is 8.**

Since it is an FIR system, A(z) = 1 and the order of **A(z) is P = 0**. This also means you will need to modify the **system identification code** so that D is now **D = X** and the estimate of the **B** **coefficients** is the **thetls** result.

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Estimate the **impulse response**, **h**, of this system.

The signals, x and y, are in the file FIRSystemIDHwk.

Turn in your Matlab code and your estimated h values (numbers, not a plot).

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**Solution:**

Since

We also have

Then impulse response h[n] coefficients are simply coefficients of B(z), we don’t have to do the Inverse Z-transform of the system's frequency response H(z).

Matlab Code:

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| % This is similar to AR signal but we observe both the input x (Q-order) and  % output y (P-order)  load('FIRSystemIDHwkData.mat')  N=length(x);  P = 0; % A has 0 order  Q = 8;  L = max(P,Q);  yvec= y((L+1):N);  xFirstCol = x((L+1):N);  xFirstRow = x((L+1):(-1):(L-Q+1));  X=toeplitz(xFirstCol,xFirstRow);  % since we are dong FIR system ID, we ignore Y=toeplitz(yFirstCol,yFirstRow);  D=X;  theta = pinv(D)\*yvec;  A=1;  B=theta |

Table

Description automatically generated