Y parameters

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Objectives:

1. Implement Y parameters
2. Generate Y parameters from TL model.
3. Code Y parameters with different frequencies.
4. Final FYP report

Let’s consider the following example to code this in MATLAB, assume the rational approximation for (denominators must match):

So,

To make it proper (numerator degree < denominator degree) we can say:

To make this proper we can use the following method:

If deg(N) deg(D), perform polynomial division:

Then the proper form is:

Where deg(R) < deg(D). In MATLAB, this can easily be implemented as follows using deconvolution

clear all

clc

N = [-2 -3];% Define the numerator coeff

D = [1 6]; % Define the den coeff

[Q,R]=deconv(N,D);% Perform polynomial division

R = tf(R,D);

Then, the state space model is as follows:

Then, AWE can be implemented to get the response and compare it to the actual one.

The following code will generate state space representation with Y21 and Y22:

clear all

clc

% Define numerator coefficients of Y21 and Y22, and common denominator

num\_Y21 = [2 3];

num\_Y22 = [1 6];

den = [1 4 5];

N = -num\_Y21;

D = num\_Y22;

% Perform polynomial division to make it strictly proper

[Q, R] = deconv(N, D);

% check leading coefficient (assumed to be 1)

if D(1) ~= 1

D=D/D(1);

N = N/D(1);

[Q, R] = deconv(N, D);

end

% Extract coefficients for state-space representation

g = D(2:end); % Exclude leading coefficient ( g terms )

% f terms

if R(1) ==0

f=R(2:end);

else

f = R;

end

% Construct state-space matrices

n = length(g); % Order of system

A = [zeros(n-1,1), eye(n-1); -flip(g)];

B = [zeros(n-1,1); 1];

C = flip(f);

D = Q;

* Generate Y parameters from TL model and compare it to the actual one.

A diagram of a parallel diagram

AI-generated content may be incorrect.

From the exact solution, we can say that:

From the Y parameters if :

Where,

So,

At s=iw

Let’s plot this at different values for :