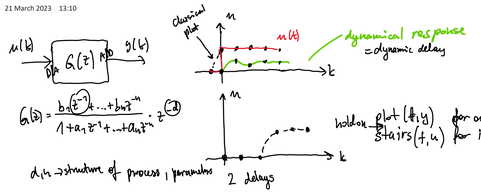
Lab_vaja_2

21 March 2023 13:10



use lowest possible order (we have 2nd order)

first order $G(z) = \frac{b_1 z^{-1}}{1 + a_1 z^{-1}} \cdot z^{-1} = \frac{Y(z)}{U(z)}$

$y(k) + a_1 y(k-1) = b_1 u(k-2)$ difference equation

$y(k) = \underline{-a_1} y(k-1) + \underline{b_1} u(k-2) = \begin{bmatrix} -y(k-1) & u(k-2) \end{bmatrix} \begin{bmatrix} a_1 \\ b_1 \end{bmatrix}$

known and unknown regressors

most delayed sample

$k = 1, \dots 256$

solve $k = 3$

$k = 3$
$\vdots$
$k = 256$

$Y = y(3:256)$; $PSI = [-y(2:end-1) \quad u(1:end-2)]$;

$\underline{\theta} = (\underline{\Psi}^T \underline{\Psi})^{-1} \underline{\Psi}^T \cdot \underline{y}$ pseudoinverse

$\underline{\Psi}^T \cdot \underline{\theta} = \underline{y}$

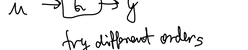
$th = PSI \backslash y$

a_1 and b_1 to construct transfer function

$G(z) = \frac{3}{1 - 0.1 z^{-1}}$ sampling time $T_s = 0.1$

$\cdot z$ $\rightarrow \frac{3z^1 (+0.7^0)}{1z^1 - 0.1 z^0}$

G = tf([3 0], [1 -0.1], 0.1)



try different orders

for loop adding new columns

this code is needed for next week

covariance matrix (2x2)

variance of first parameter

diag(A)

$G(z) = \frac{b_1 z^{-1} + b_2 z^{-2}}{1 + a_1 z^{-1} + a_2 z^{-2}} \cdot \cancel{z^1} = \frac{Y(z)}{U(z)}$ $\cdot z^2 \rightarrow = \frac{b_1 z + b_2}{z^2 + a_1 z + a_2}$

$Y(z) \cdot (1 + a_1 z^{-1} + a_2 z^{-2}) = U(z) \cdot (b_1 z^{-1} + b_2 z^{-2})$

$y(k) = b_1 u(k-1) + b_2 u(k-2) - (a_1 y(k-1) + a_2 y(k-2))$

$y(k) = \begin{bmatrix} -y(k-1) & -y(k-2) & u(k-1) & u(k-2) \end{bmatrix} \cdot \begin{bmatrix} a_1 \\ a_2 \\ b_1 \\ b_2 \end{bmatrix}$

$th = PSI \backslash Y$

(4x256) (256x1)