Model Matching

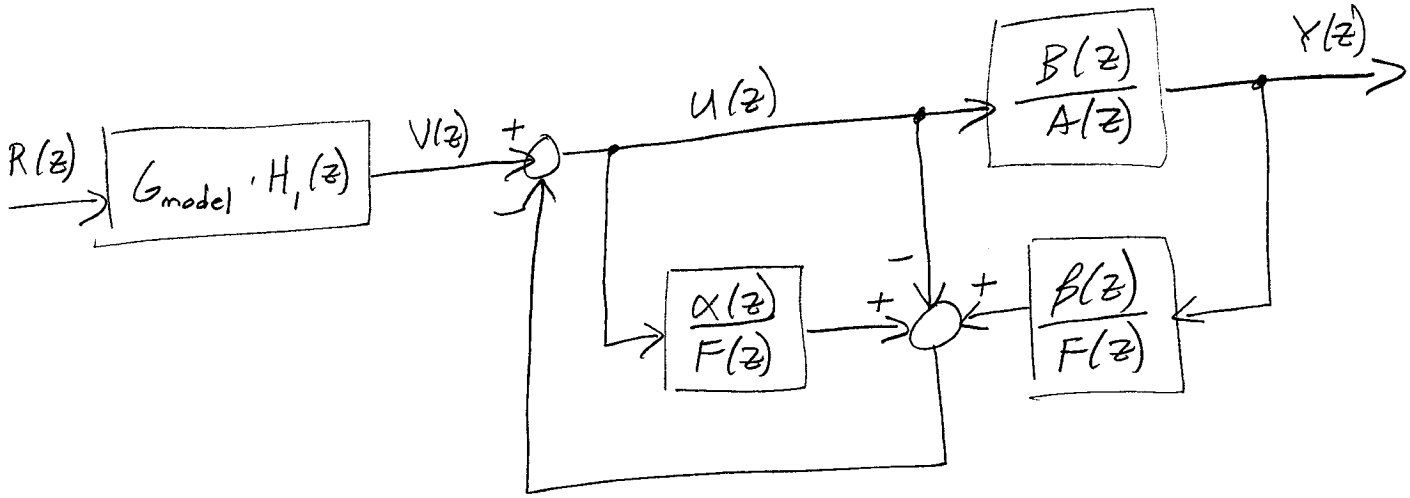
10/15/13

[Ogata 532]

$$G(z) = \frac{B}{A} = \frac{0.3679z + 0.2642}{(z - 0.3679)(z - 1)} \qquad T = 1$$

$$G_{model} = \frac{Y_m(z)}{R_m(z)} = \frac{0.62z - 0.3}{z^2 - 1.2z + 0.52}$$

($H(z)$ to achieve)



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$\alpha A + \beta B = D$ (Diophantine)

$(2n-1)$

$n = 2$

$m = 1$

$D = H \cdot F$

$(n) \quad (n-1)$

$= F \cdot B \cdot H_1$

$(n-1) \quad (m) \quad (n-m)$

H_1 can be any stable $(n-m)$ order polynomial

Let

$H_1(z) = z + 0.5$

F can be any stable $(n-1)$th degree polynomial

Let

$F(z) = z$

$D(z) = F \cdot B \cdot H_1$

$= z(0.3679z + 0.2642)(z + 0.5)$

$= 0.3679 z^3 + 0.4481 z^2 + 0.1321 z$

$= d_0 z^3 + d_1 z^2 + d_2 z + d_3$

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Setup and solve using Diophantine

$$\frac{B}{A} = \frac{0.3679 z + 0.2642}{z^2 - 1.3679 + 0.3679}$$

$$= \frac{b_0 z^2 + b_1 z + b_2}{a_0 z^2 + a_1 z + a_2}$$

$$E = \begin{bmatrix} a_2 & 0 & b_2 & 0 \\ a_1 & a_2 & b_1 & b_2 \\ a_0 & a_1 & b_0 & b_1 \\ 0 & a_0 & 0 & b_0 \end{bmatrix}$$

$$= \begin{bmatrix} 0.3679 & 0 & 0.2642 & 0 \\ -1.3679 & 0.3679 & 0.3679 & 0.2642 \\ 1 & -1.3679 & 0 & 0.3679 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

$$D = \begin{bmatrix} d_3 \\ d_2 \\ d_1 \\ d_0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.1321 \\ 0.4481 \\ 0.3679 \end{bmatrix}$$

$$E^{-1} \cdot D = \begin{bmatrix} \alpha_1 \\ \alpha_0 \\ \beta_1 \\ \beta_0 \end{bmatrix} = \begin{bmatrix} 0.264 \\ 0.368 \\ -0.368 \\ 1.868 \end{bmatrix}$$

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$$\frac{\beta}{\alpha} = \frac{\beta_0 z + \beta_1}{\alpha_0 z + \alpha_1}$$

$$\frac{\beta}{\alpha} = \frac{1.87 z - 0.368}{0.368 z + 0.264}$$

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