$\dot{x} = f(x, u)$ liniar -> $f(x,u) = ax + bu + \cancel{c}$

$\Delta(x_1, u_1)$

(vecinătate)

$$f(x,u) = f(x_1, u_1) + \frac{\partial f}{\partial x}\Big|_{\Delta} (x - x_1) + \frac{\partial f}{\partial x}\Big|_{\Delta} (u - u_1)$$

Δx Δu

m_1 m_2

$$+ \frac{\partial^2 f}{\partial x^2}\Big|_{\Delta} (x - x_1)^2 - - - -$$

TOS $\simeq 0$

$$f(x,u) - f(x_1, u_1) = \Delta f$$

$$\Delta f = m_1 \Delta x - m_2 \Delta u$$

Aproximarea liniară

-> superpoziție

-> omogenitate

Modele cu funcții de transfer

$$H(s) = \frac{N(s)}{\Delta(s)}$$

order of $\Delta(s) \geq$ order of $N(s)$

roots → poles $\Delta(s)$ zeros $N(s)$

grad $\Delta(s)$ → gradul sistemului

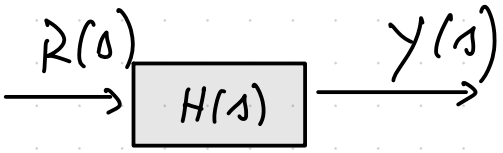
$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}^{-1} = \frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

$$\dot{x}_1 = 5x_1 - 2x_2 + u$$
$$\dot{x}_2 = -6x_1 + 3x_3 - 5u$$
$$\dot{x}_3 = 6x_2 - 4x_3$$
$$y = 5x_3$$

$$\begin{cases} s\,x_1 = 5x_1 - 2x_2 + u \\ s\,x_2 = -6x_1 + 3x_3 - 5u \\ s\,x_3 = 6x_2 - 4x_3 \end{cases} \Rightarrow x_3$$

$$y = \frac{\text{---}}{\#\#} \circ u$$

Funcții de transfer

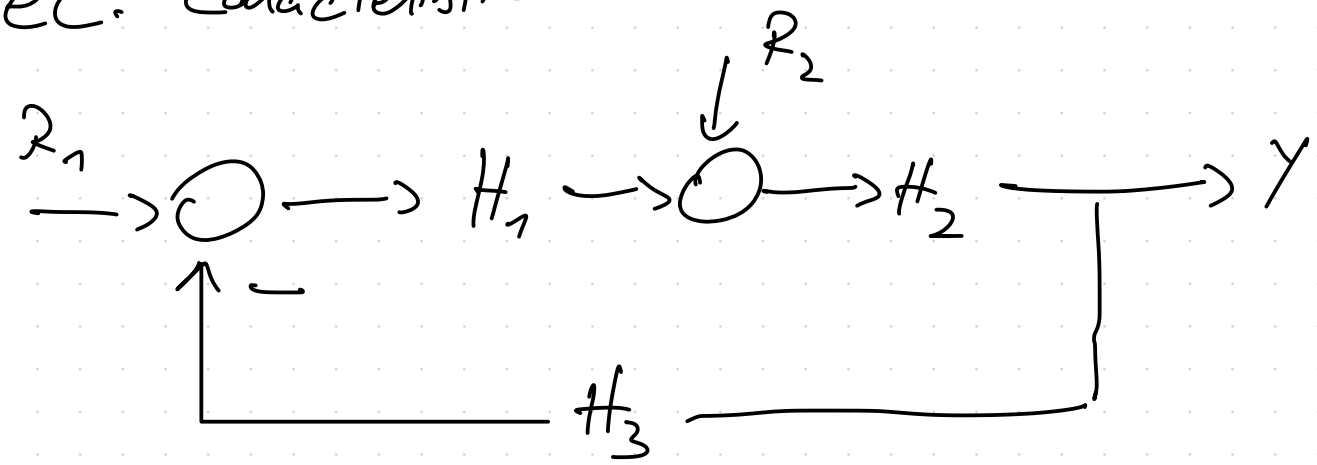


$$y(t) = \mathcal{L}^{-1}\left[H(s) \cdot R(s)\right]$$

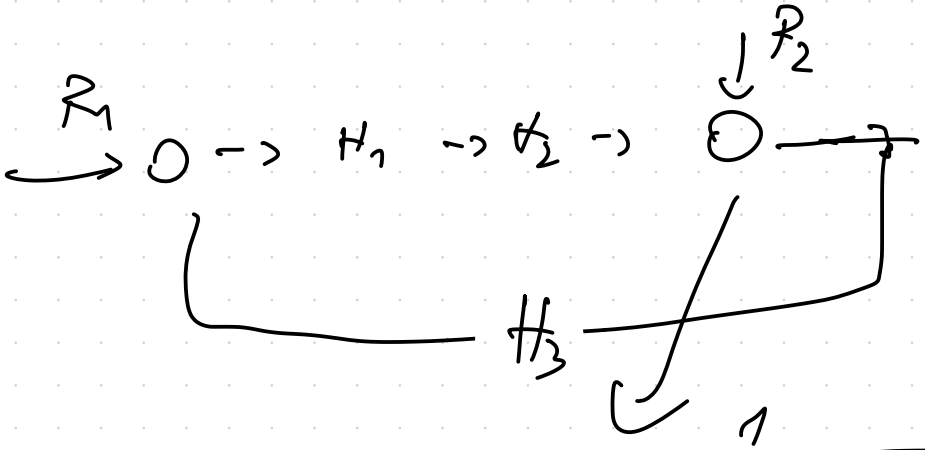
Eigenvalues

$(-1)^n \det(A - \lambda I) = 0$

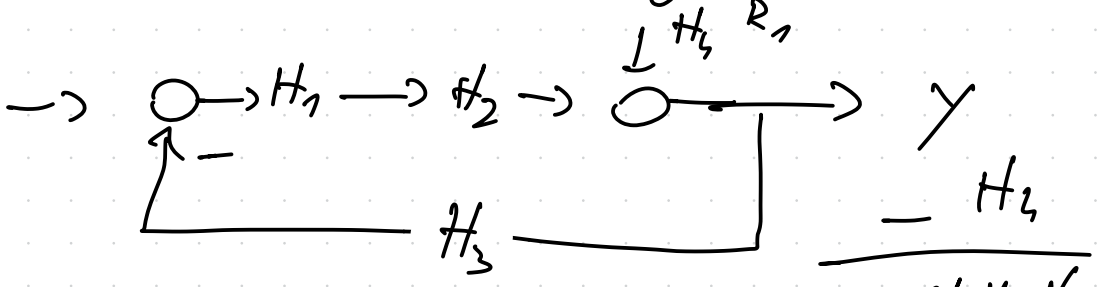
ec. caracteristică



$$Y(s) = \frac{H_1 H_2}{1 + H_1 H_2 H_3} R_1(s) + \frac{H_2}{1 + H_1 H_2 H_3} R_2(s)$$



$$\frac{1}{1 + H_1 H_2 H_3}$$



$$\frac{-H_1}{1 + H_1 H_2 H_3}$$

Matrici de transfer

$$Y = H \cdot R$$