

$$\vec{x} = f(x, u)$$

$$\text{linear} \rightarrow f(x, u) = ax + bu + \cancel{c}$$

$$\Delta(x_2, u_2)$$

↓
rectificare

$$f(x, u) = f(x_2, u_2) + \underbrace{\frac{\partial f}{\partial x} \bigg|_{\Delta x}}_{m_1} (x - x_2) + \underbrace{\frac{\partial f}{\partial u} \bigg|_{\Delta u}}_{m_2} (u - u_2) + \underbrace{\frac{\partial^2 f}{\partial x^2} \bigg|_{\Delta} (x - x_2)^2 + \dots}_{\text{TOS} \approx 0}$$

$$f(x, u) - f(x_2, u_2) = \Delta f$$

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

Aproximarea liniară

→ superpoziție
→ omogenitate

Modele cu funcții de transfer

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

order of $D(s) \geq$ order of $N(s)$
 roots \rightarrow poles $D(s)$ zeros $N(s)$

grad $D(s) \rightarrow$ gradul sistemului

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

$$\dot{x}_1 = 5x_1 - 2x_2 + u$$

$$\dot{x}_2 = -6x_1 + 3x_3 - 5u$$

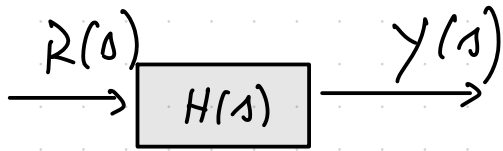
$$\dot{x}_3 = 6x_2 - 4x_3$$

$$y = 5x_3$$

$$\begin{cases} sX_1 = 5X_1 - 2X_2 + u \\ sX_2 = -6X_1 + 3X_3 - 5u \\ sX_3 = 6X_2 - 4X_3 \end{cases} \Rightarrow X_3$$

$$y = \frac{\dots}{s} \cdot u$$

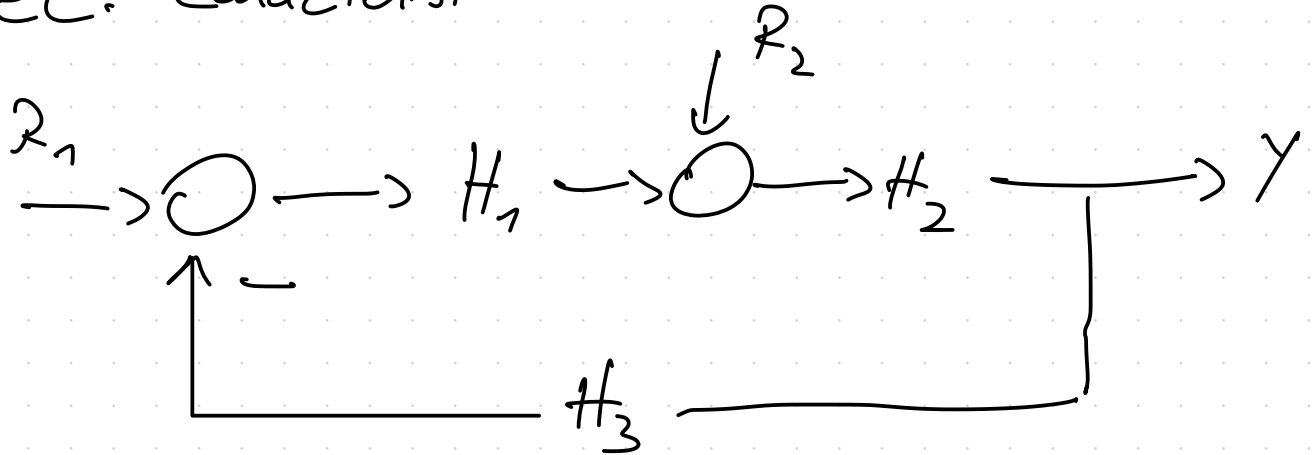
Funcții de transfer



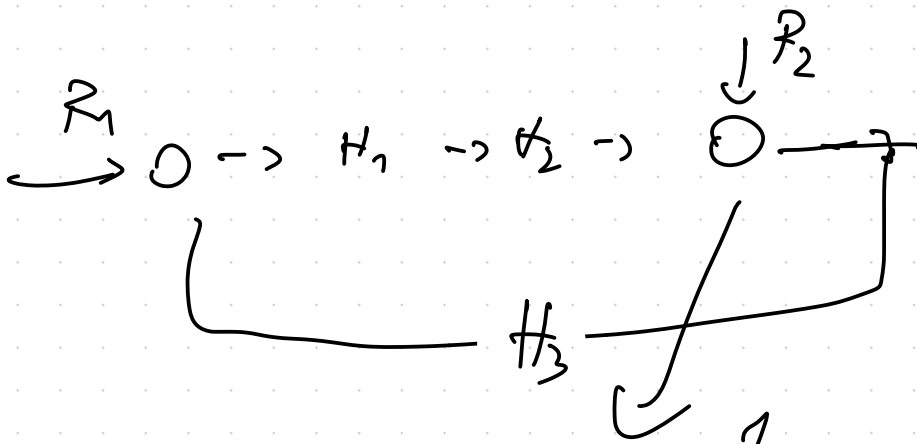
$$y(t) = \mathcal{L}^{-1} [H(s) \cdot R(s)]$$

Eigenvalues

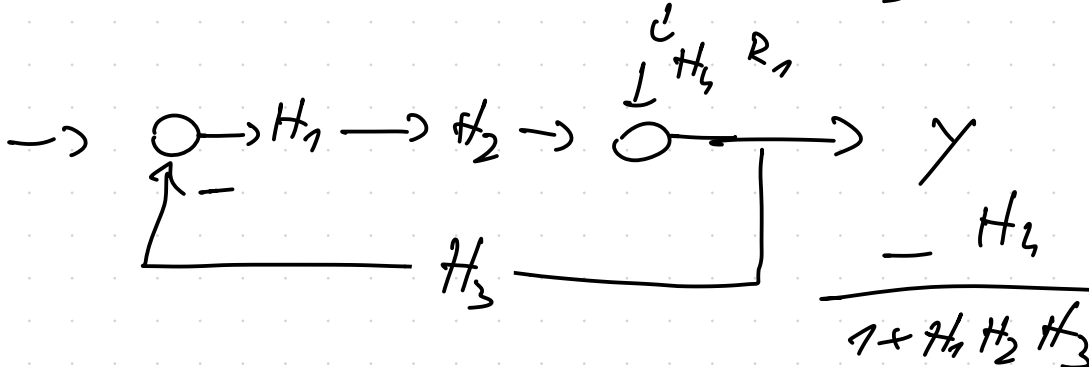
$(-1)^n \det(A - \lambda I) = 0$
ec. caracteristică



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



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



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

Matrici de transfer

$$y = H \cdot R$$