

SISTEMI LTI

Per lavorare con i sistemi LTI si usano i numeri complessi o derivate.

$$\frac{dx}{dt} = Ax + Bu$$

$$y = Cx + Du$$

$$u \longrightarrow \boxed{\begin{array}{c} E \\ x \end{array}} \longrightarrow y$$

u = ingressi;
 y = uscite;
 x = stato

Variazione di un sistema LTI

-derivate:

$$x = \frac{dx}{dt} = \frac{x_2 - x_1}{t_2 - t_1}$$

-sistema:

-“ x ” e “ u ” variabili
-“ A, B, C, D ” parametri
-“ X ” e “ y ” uscite

$$X = (A)(x) + (B)(u)$$
$$y = (C)(x) + (D)(u)$$

Esempio:

$$X = (A)(x) + (B)(u)$$

$$y = (C)(x) + (D)(u)$$

$$\begin{aligned} y &= (x_1) \\ X_1 &= (2 x_2) \\ X_2 &= (u_1) \end{aligned} \quad \begin{aligned} \begin{pmatrix} X_1 \\ X_2 \end{pmatrix} &= \begin{pmatrix} 0..2 \\ 0..0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + \begin{pmatrix} 0 \\ 1 \end{pmatrix} (u_1) \\ y &= \begin{pmatrix} 1 \\ 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + (0)(u) \end{aligned}$$

esempio partendo dall'equazione:

$$X_1 = 3x_1 + 2x_2 + 5u_1 \quad X = (A)(x) + (B)(u)$$

$$X_2 = 7x_2 + 3u_2$$

$$y_1 = x_2$$

$$y_2 = 0$$

$$y = (C)(x) + (D)(u)$$

$$\begin{pmatrix} X_1 \\ X_2 \end{pmatrix} = \begin{pmatrix} 3..2 \\ 0..7 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + \begin{pmatrix} 5..0 \\ 0..3 \end{pmatrix} \begin{pmatrix} u_1 \\ u_2 \end{pmatrix}$$

$$\begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = \begin{pmatrix} 0..1 \\ 0..0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + \begin{pmatrix} 0..0 \\ 0..0 \end{pmatrix} \begin{pmatrix} u_1 \\ u_2 \end{pmatrix}$$