

$U \rightarrow$ input
 $x \rightarrow$ state
 $y \rightarrow$ output

$$u \begin{bmatrix} u_1 \\ u_2 \\ \vdots \\ u_n \end{bmatrix} \quad x \dots$$

MM - isi
 SS - MM

$$\begin{cases} \dot{x}(t) = Ax(t) + b u(t) & \rightarrow \text{state eg} \\ y(t) = c^T x(t) + d u(t) & \rightarrow \text{output eg.} \end{cases}$$

IO - MM input \rightarrow output

$$\sum_{v=0}^n a_v f^{(v)}(t) = \sum_{\mu=0}^m b_{\mu} u^{(\mu)}(t) \quad m \leq n$$

\rightarrow representare functionale a unui sistem poses

Clasificarea

- continuous (s)
- discret (z)

System dynamic
In Time Continuous

$$\begin{aligned} \dot{x}(t) &= f(t, x(t), u(t)) && \rightarrow \text{state} \\ y(t) &= g(t, x(t), u(t)) && \rightarrow \text{output} \end{aligned}$$

$x(t_0)$ specificat

$x(t) \rightarrow \text{starea}$ $(t, x(t)) \rightarrow \text{fase sistemului}$

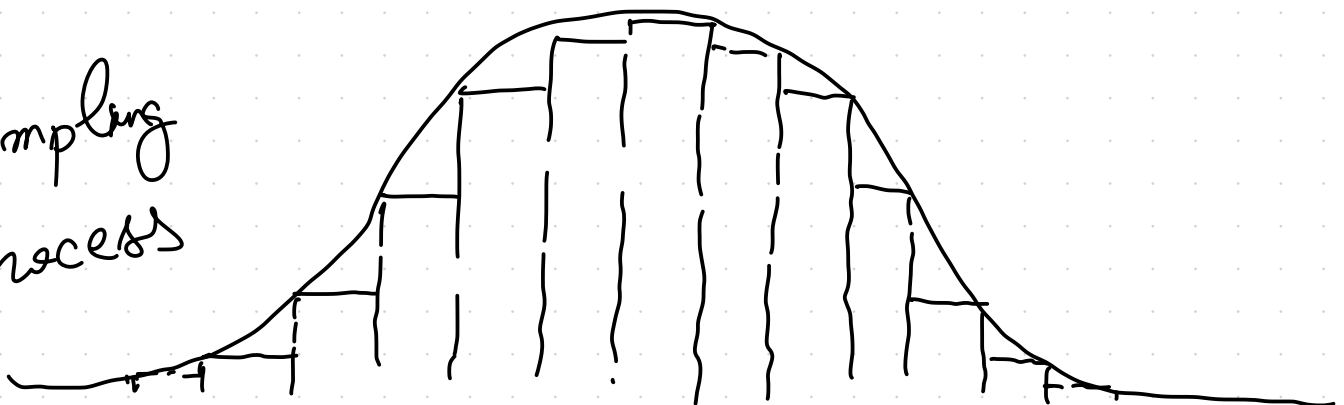
Sisteme multivariable Multi Input Multi Out

System in time discret

t_k (la momentul T_e / T_s) \rightarrow sampling period

$u(t_k) = u_k$ $y(t_k) = y_k \rightarrow$ samples

Sampling
Process



$$x(k+1) = f(k, x(k), u(k)) \rightarrow \text{state}$$

$$y(k) = g(k, x(k), u(k)) \rightarrow \text{output}$$

$$k \in \mathbb{Z}(x) \quad \text{m. de momente de timp discret}$$

$$t_k = k T_e$$

$$k \equiv t$$

(Proportional Integrator)

Controller PI

$$u(t) = k_p e(t) + k_i \int_0^t e(\tau) d\tau$$

$$e(t) = y_n(t) - y(t) \quad \text{eroarea de control}$$

$$\text{parametrii} \left\{ \begin{array}{l} k_p \rightarrow \text{proportional gain} \\ k_i \rightarrow \text{integral gain} \end{array} \right.$$