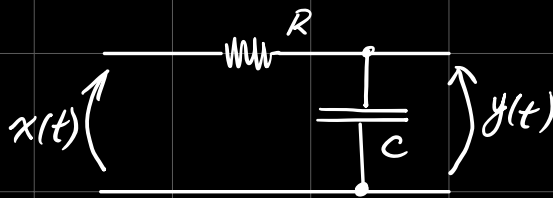


Aproximação s em z



$$R = 1\Omega \text{ e } C = 1F$$

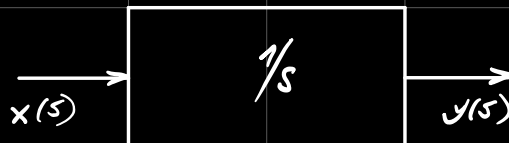
modelo físico

$$y(s) = \frac{1/s}{R + 1/s} \cdot x(s)$$

$$\underbrace{y(s)/x(s)}_{\text{saída/entrada}} = \frac{1}{sRC + 1} = \frac{1}{s} \quad \text{função de transferência}$$

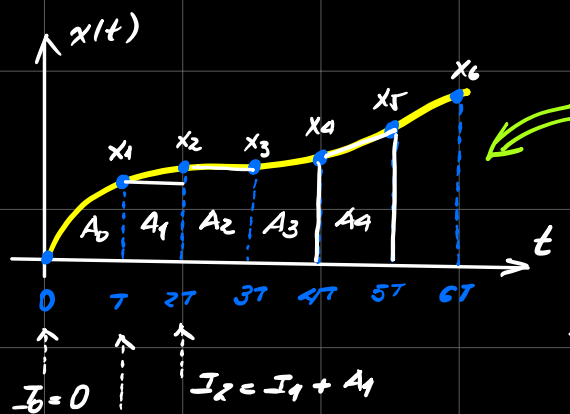
? modelo no domínio da frequência

z



$$y(t) = \int_0^t x(\tau) d\tau$$

área



$$I_k = I_{k-1} + A_{k-1}$$

$$A_1 = x_1 \cdot T \quad \text{retângulo}$$

$$A_2 = x_3 \cdot T \quad \text{retângulo}$$

Trapezoidal  $A_1 = \frac{(x_4 + x_5)}{2} \cdot \frac{T}{2}$   
 Aprox. 2      Aprox. 3

$$I_K = I_{K-1} + x_{K-1} \cdot T$$

$$I_K = I_{K-1} + x_K \cdot T$$

$$I_K = I_{K-1} + \frac{(x_K + x_{K-1}) \cdot T}{2}$$

$$I(z) = I(z) \cdot \bar{z}^{-1} + x(z) \cdot \bar{z}^{-1} \cdot T$$

$$I(z) - I(z) \cdot \bar{z}^{-1} = x(z) \cdot \bar{z}^{-1} \cdot T$$

$$I(z)(1 - \bar{z}^{-1}) = x(z) \cdot \bar{z}^{-1} \cdot T$$

$$\frac{I(z)}{x(z)} = \frac{\bar{z}^{-1} \cdot T}{(1 - \bar{z}^{-1})} =$$

$$\frac{I(z)}{x(z)} = \frac{T}{z - 1} \quad \Rightarrow \quad \frac{I(5)}{x(5)} = \frac{1}{5}$$

$$\therefore \quad 5 = \frac{z - 1}{T}$$

$$I_K = I_{K-1} + x_K \cdot T$$

$$I(z) = I(z) \bar{z}^{-1} + x(z) \cdot T$$

$$I(z)(1 - \bar{z}^{-1}) = x(z) \cdot T$$

$$\frac{I(z)}{x(z)} = \frac{T}{(1 - \bar{z}^{-1})} = \frac{Tz}{z - 1} \quad \therefore \quad 5 = \frac{z - 1}{Tz}$$

$$I_k = I_{k-1} + \frac{(x_k + x_{k-1}) \cdot T}{2}$$

$$I(z) = I(z) \cdot z^{-1} + \frac{(x(z) + x(z) z^{-1}) \cdot T}{2}$$

$$I(z) \cdot (1 - z^{-1}) = x(z) (1 + z^{-1}) \cdot T/2$$

$$I(z)/x(z) = \frac{(1 + z^{-1})}{(1 - z^{-1})} \cdot \frac{T}{2} = \frac{T}{2} \cdot \frac{z+1}{z-1}$$

$$S = \frac{2}{T} \cdot \frac{z-1}{z+1}$$

programa

$$\frac{1}{SRC + 1} \dots \text{circuito}$$

$$S = \frac{z-1}{T} \quad (\text{ap. 1})$$

$$\frac{z-1}{T} \cdot RC + 1 \Rightarrow \frac{T}{z-1 + T} = I(z) = \frac{y(z)}{x(z)}$$

$$z^{-1} \{ \} : y(z) \cdot (z^{-1} + T) = T x(z) \rightarrow y(k+1) - y(k) + T y(k) = T x(k)$$

$$y(k+1) = y(k) - T y(k) + T x(k) \rightarrow \text{preditor (SW)}$$

future present

$$y(k) = y(k-1) - T y(k-1) + T x(k-1) \rightarrow \text{filtro (SW)}$$

presente passado



$$\frac{1}{s+1} \xrightarrow[\text{F.P.B.}]{\mathcal{Z}} \frac{1}{j\omega+1}$$

$$(1) \underset{\substack{\uparrow \\ \text{presente}}}{y(k)} = \underset{\substack{\uparrow \\ \text{passado}}}{y(k-1)} - \tau y(k-1) + \tau x(k-1) \rightarrow \underbrace{\text{filtro}}_{(\text{sw})}$$

$$(2) y(k) = x(k) \cdot \frac{\tau}{1+\tau} + y(k-1) \frac{1}{\tau+1} \dots \text{filtro}$$

$$(3) y(k) = \frac{1}{(2/\tau+1)} \cdot x(k) + \frac{1}{(2/\tau+1)} x(k-1) - \frac{(1-2/\tau)}{(1+2/\tau)} y(k-1)$$

$$\begin{matrix} \xrightarrow{\omega} \\ (.) \end{matrix} \text{ Impulso } \longleftrightarrow \begin{matrix} \xleftarrow{\omega} \\ (.) \end{matrix} \text{ Senoidal}$$

$$(.) \text{ Degrau (transitório)}$$