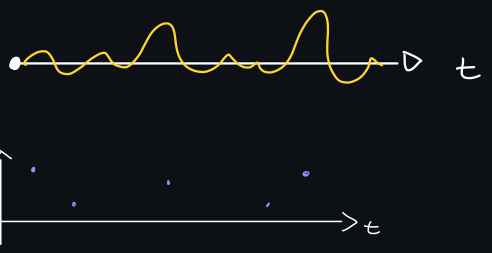
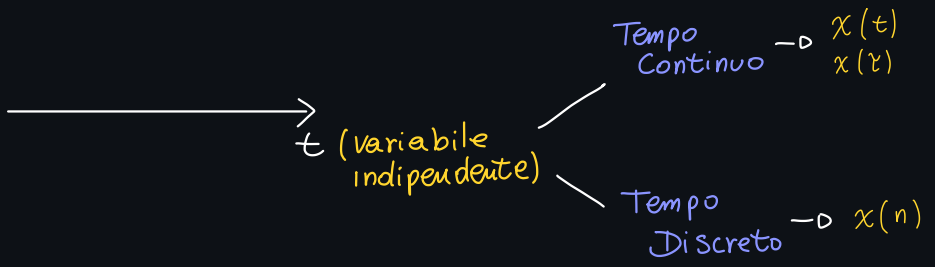
SEGNALI
- MONODIMENSIONALI
- BIDIMENSIONALI

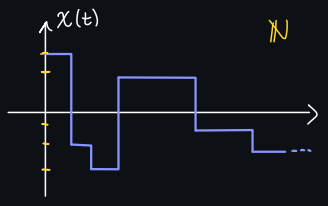


SEGNALI
- REALI → Assume valori reali
- COMPLESSI → Assume valori complessi

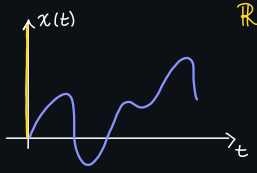
SEGNALI
- DETERMINISTICI → Conosciamo la variazione di grandezza (Funzione, tabella, plot, ...)
- ALEATORI → Quando lato Ricevitore non conosciamo come questo segnale viene modificato



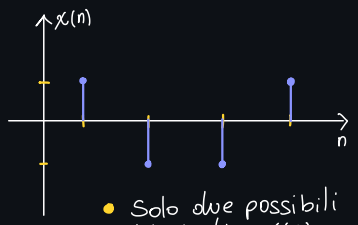
Tempo continuo
Ampiezze Discrete



Tempo Continuo
Ampiezze Discrete

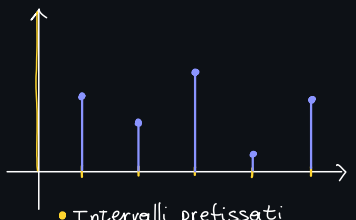


Tempo Discreto
Ampiezze Discrete



- Solo due possibili valori di $x(n)$

Tempo Discreto
Ampiezze Continue



- Intervalli prefissati con $x(\,)$ continuo

Trasformazioni / operazioni sui Segnali

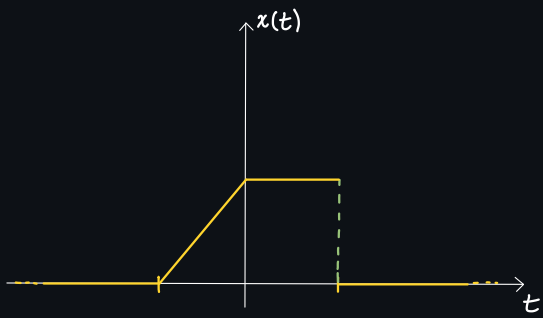
- OPERAZIONI
  - Ampiezza
    - Somma $x(\cdot) + y(\cdot)$
    - Prodotto$_1$ $x(\cdot) + y(\cdot)$
    - Prodotto$_2$ $a \cdot x(\cdot)$
  - Tempo
    - Traslazione Temporale
    - Cambiamento di Scala
    - Riflessione

Traslazione Temporale

$y(t) = x(t-T)$ con $T = \text{cost}$

↑ "RITARDO o ANTICIPAZIONE"

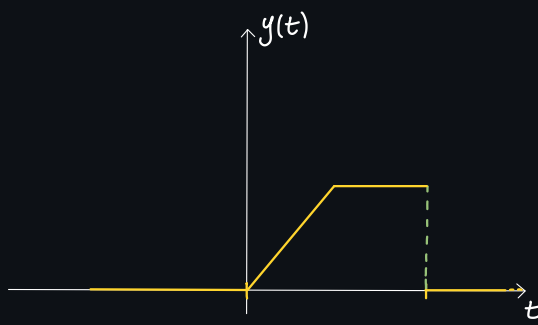
ES: $x(t) = \begin{cases} 2+t & -2 < T < 0 \\ 2 & 0 < T < 2 \\ 0 & \text{Altrove} \end{cases}$



$y(t) = x(t-2) =$ Cosa vuol dire?

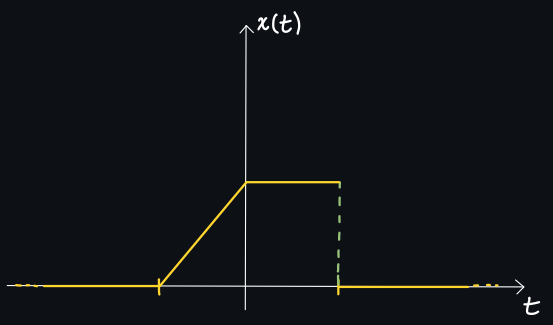
-D Il valore che avevamo in $t = t_0$, Dopo aver applicato la trasformazione, sarà in $t = t_0 - 2$

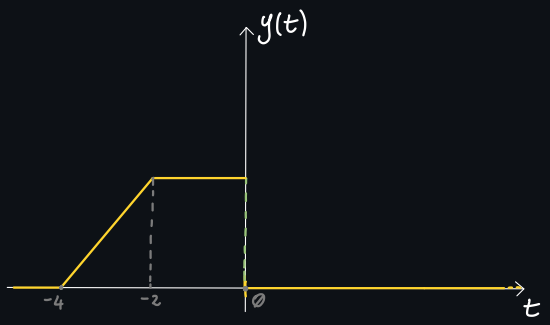
=D $\bar{t}_0 = t + 2$ =D Il segnale $y(t)$ sarà spostato a DESTRA di $+T$, in questo caso:



- Con $T > 0$ il grafico si sposta a Destra

- $y(t) = x(t+2)$ $\Rightarrow$ $T<0$ $\Rightarrow$ Trasla a Sinistra





Cambiamento di Scala

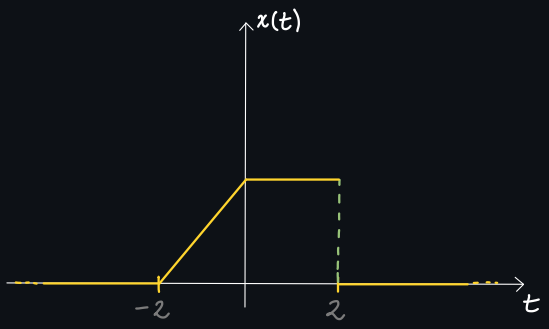
$y(t) = x\left(\frac{t}{a}\right)$

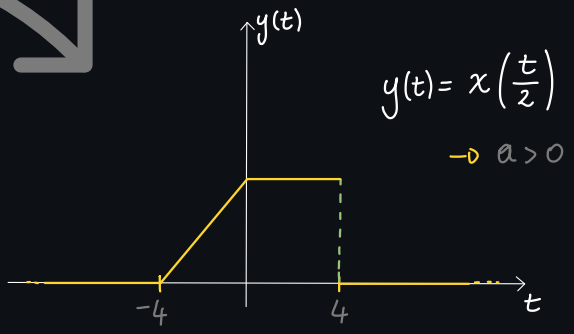
- $a > 1$ $\rightarrow$ ESPANSIONE
- $0 < a < 1$ $\rightarrow$ COMPRESSIONE

} Dell'asse del tempo

In Altre Parole:

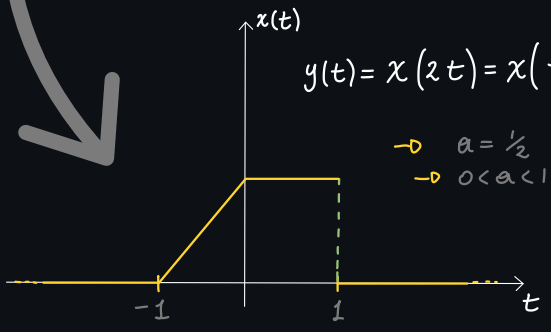
Quello che avevamo in $t = t_0$, Dopo la Tr. lo avremo in: $t = \frac{t_0}{a} \Rightarrow t_0 = at$





$y(t) = x\left(\frac{t}{2}\right)$

$\rightarrow a > 0$



$y(t) = x(2t) = x\left(\frac{t}{1/2}\right)$

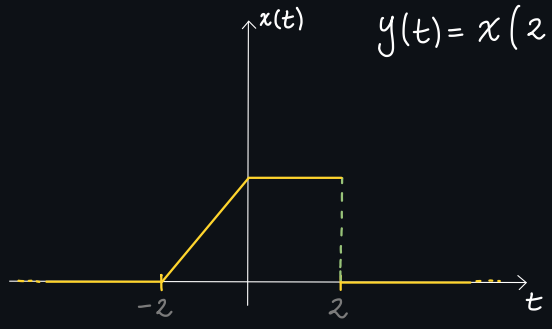
$\rightarrow a = 1/2$

$\rightarrow 0 < a < 1$

Riflessione

$y(t) = x(-t)$ → otteniamo un segnale "RIBALTATO" rispetto all'asse "y"

Combinazione di piu' operazioni



$y(t) = x(2t-4)$ →

Traslazione → $T = 4$ ⇒ Destra

\+

Scala → $a = \frac{1}{2}$ ⇒ $0 < a < 1$ ⇒ Si Restringe di $\frac{1}{2}$

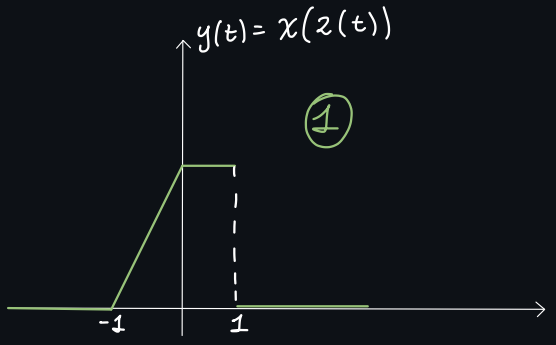
Come combinare

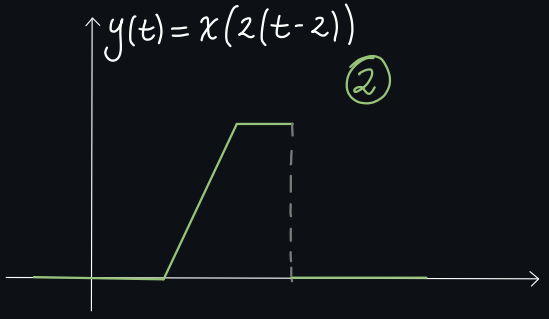
1) Liberare la t dal coefficiente moltiplicativo o dalla riflessione

⇒ $x(2t-4) = x[2(t-2)]$

- Il segnale viene prima compresso

2) Traslazione



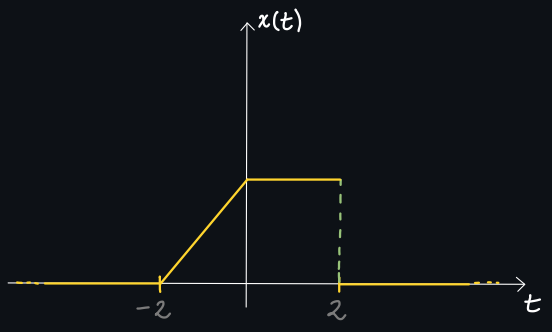


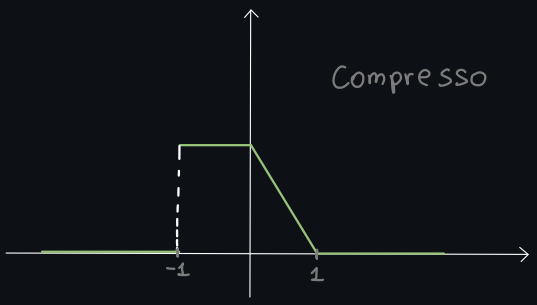
- $y = x(-4-2t) = x[-2(t+2)] = x[2(t+2)]$

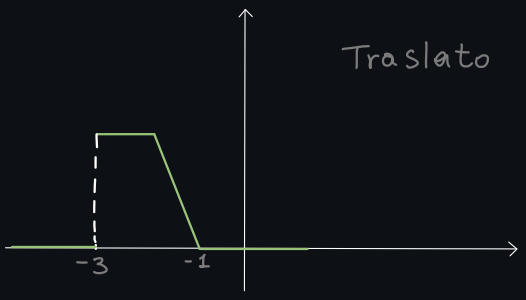
  Riflessione + Amplificazione

  Riflessa

- $a = \frac{1}{2} \Rightarrow t = \frac{1}{2}t$
- $T < 0 \Rightarrow$ SX







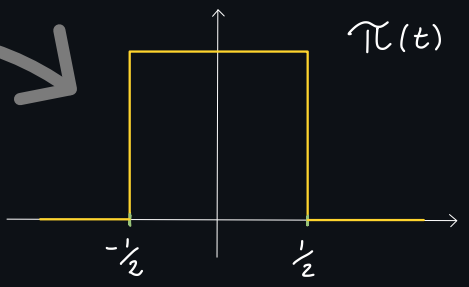
Segnali elementari Deterministici

Questi segnali, trasformati e combinati, ci permettono di modellare i SISTEMI.

IMPULSO o FINESTRA RETTANGOLARE

- TEMPO CONTINUO

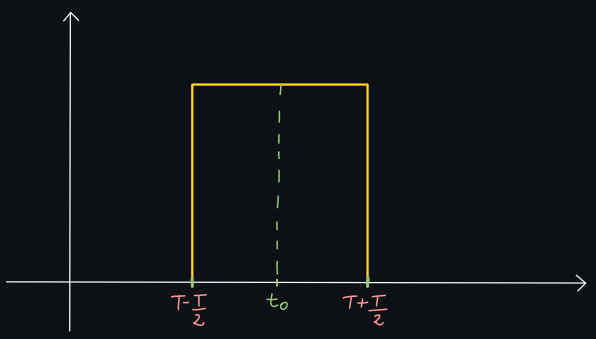
$$\Pi(t) = \begin{cases} 1 & -\frac{1}{2} < T < \frac{1}{2} \quad \text{oppure} \quad |T| \leq \frac{1}{2} \\ 0 & \text{Altrimenti} \end{cases}$$



→ Possiamo Trasformarla:

$$x(t) = A\,\Pi\left(\frac{t - t_0}{T}\right)$$

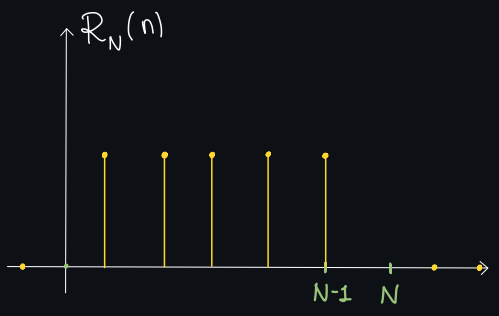
(t_0: Traslata; A: Ampiezza $\neq 1$; T: Scalata)

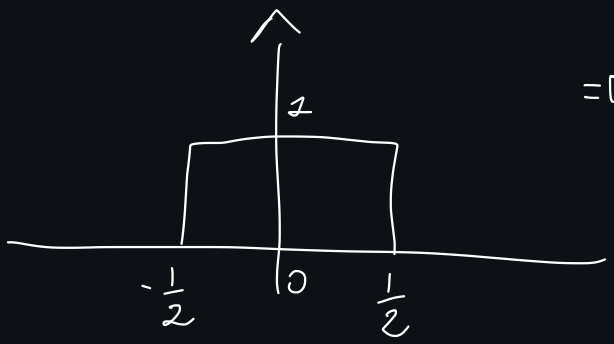


⇒ Centrata in t_0
Di ampiezza T

- TEMPO DISCRETO

$$\mathcal{R}_N(n) = \begin{cases} 1 & 0 < n < N-1 \\ 0 & \text{Altrimenti} \end{cases}$$





$\Rightarrow$ $t_0 = 0$, $T = 1$, $A = 1$ $\Rightarrow$ $\begin{cases} 1 & -\frac{1}{2} < x < \frac{1}{2} \\ 0 \end{cases}$

$-\frac{1}{2} = \frac{T}{2}$ $\quad$ $\frac{1}{2} = \frac{T}{2}$

$\Rightarrow t_0 = \dfrac{-\frac{T}{2} + \frac{T}{2}}{2} = 0$

$T = 1$ $\quad t_0 = 2$

$A = 1$

$\frac{1}{2} = t_0 - \frac{T}{2} = 2 - \frac{1}{2} = \frac{3}{2}$

$\frac{5}{2} = t_0 + \frac{T}{2} = 2 + \frac{1}{2} = \frac{5}{2}$