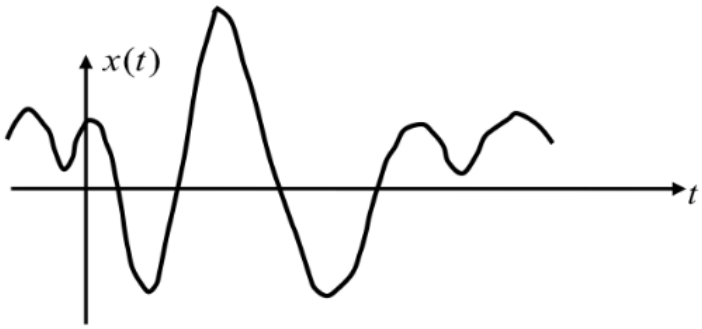
SEGNALI

Un SEGNALE è una quantità fisica che VARIA nel TEMPO e porta le informazioni

$$x(t), \quad -\infty < t < +\infty$$

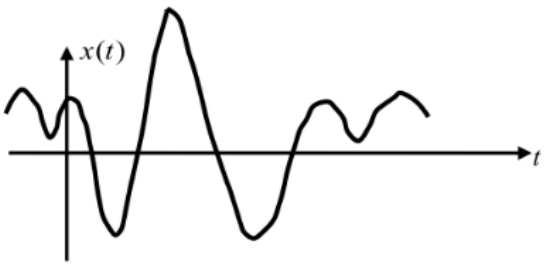


CLASSIFICAZIONE

Un segnale può essere espresso da una FUNZIONE $f(x)$ REALE o COMPLESSA : $x(t) = x_R(t) + j\,x_I(t)$

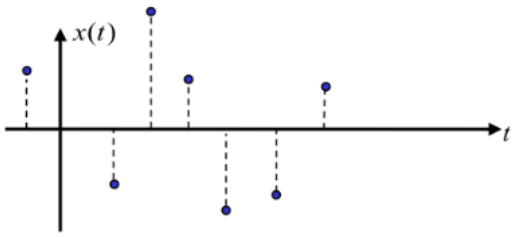
SEGNALE CONTINUO

Analogic signal



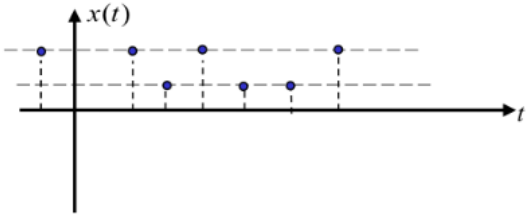
The signal is a continuous function (real or complex) of a continuous vaariable

Sampled signal



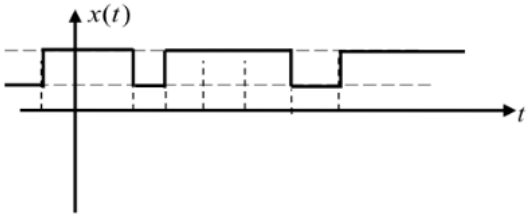
The signal is represented by a continuous function but the t-variable can have only discrete values

Digital signal



t is a discrete variable and it can have only discrete values

Discrete signal

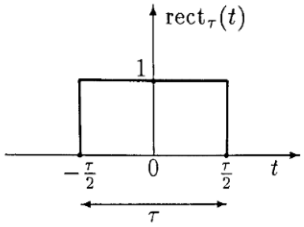


t is a continuous variable but it can have only discrete values

Example of signals

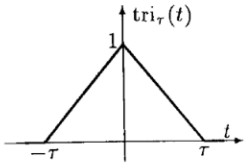
- Rettangolo

$$x(t) = rect(t) = \begin{cases} 1 \text{ if } |t| \le \frac{\tau}{2} \\ \frac{1}{2} \text{ if } |t| = \frac{\tau}{2} \\ 0 \text{ otherwise} \end{cases}$$



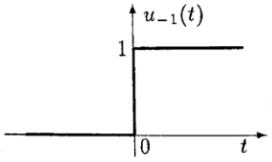
- triangolo

$$x(t) = tri(t) = \begin{cases} \frac{t}{\tau} + 1 \text{ if } t \in [-\tau, 0] \\ -\frac{t}{\tau} + 1 \text{ if } t \in [0, \tau] \\ 0 \text{ otherwise} \end{cases}$$



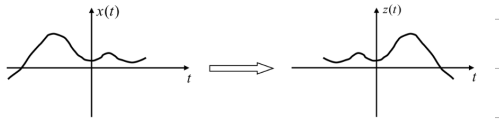
- Gradino unitario

$$x(t) = u_{-1}(t) = \begin{cases} 1 \text{ if } t \ge 0 \\ 0 \text{ otherwise} \end{cases}$$

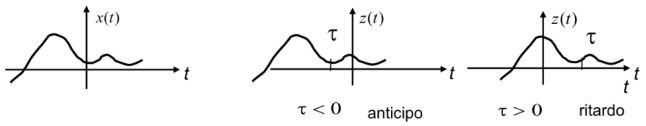


OPERAZIONI TRA SEGNALI

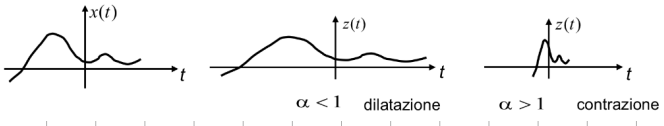
- SOMMA, PRODOTTO: $z(t) = x(t) + y(t)$, $z(t) = x(t) \cdot y(t)$
- PRODOTTO CON COSTANTE: $z(t) = c \cdot x(t)$ ⇒ AMPLIFICATION
- RIBALTAMENTO (FLIPPING) (SIMMETRICO SU Y): $z(t) = x(-t)$



- TRASLAZIONE: $z(t) = x(t - \tau)$

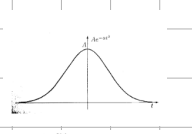


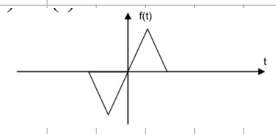
- AXIS WARPING (DILATAZIONE/CONTRAZIONE): $z(t) = x(\alpha t)$, $\alpha > 0$



SIMMETRIA

- Dato un SEGNALE REALE (o SEQUENZA)
  - SIMMETRIA PARI $f(t) = f(-t)$
  - SIMMETRIA DISPARI $f(-t) = -f(t)$





- Dato un SEGNALE COMPLESSO:
  - SIMMETRIA HERMITIANA:
    - parte reale e MODULO: SIMMETRIA PARI
    - parte immaginaria e FASE: ⇒ DISPARI

ESEMPI:

- $x(t) = rect\left(\frac{t}{3}\right)$
- $x(t) = 2\, rect\left(\frac{t}{3}\right)$
- $x(t) = tri(2t - 3)$
- $x(t) = rect\left(t + \frac{1}{2}\right) \cdot 3\, tri\left(\frac{t}{2}\right)$
- $x(t) = rect\left(\frac{t}{2} - 4\right) + tri(t + 2)$