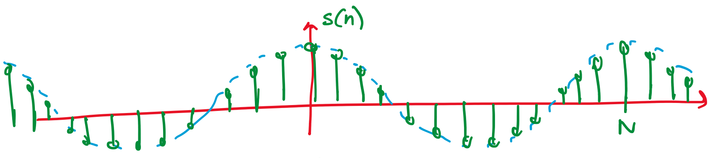
Le6

Friday, 8 March 2024 10:38

Es3 $s(n) = A\cos(2\pi f_0 nT)$ periodico $N \leftrightarrow f_0NT = K$ intero

CALCOLARE $A_S(N)$, m_s, $E_S(N)$, P_S



$$A_S(N) = \sum_{n=0}^{N-1} s(nT)\, A\cos(2\pi f_0 nT)$$

$$= \sum_{n=0}^{N-1} \frac{A}{2} e^{j2\pi f_0 nT} + \frac{A}{2} e^{-j2\pi f_0 nT} \quad \leftarrow \text{EULERO}$$

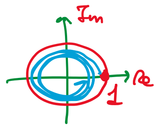
$$\left(e^{j2\pi f_0 T}\right)^n = a^n \qquad \left(e^{-j2\pi f_0 T}\right)^n = b^n$$

$$= \sum_{n=0}^{N-1} \frac{A}{2} a^n + \frac{A}{2} b^n$$

$$= \frac{A}{2}\frac{1-a^N}{1-a} + \frac{A}{2}\frac{1-b^N}{1-b}$$

$$e^{j2\pi f_0 TN} = e^{j2\pi K} = 1$$

$$e^{-j2\pi f_0 TN} = 1$$



$= 0$

$m_s = 0$

$$|s(n)|^2 = |A\cos(2\pi f_0 nT)|^2 = A^2\cos^2(2\pi f_0 nT)$$

$$= \frac{A^2}{2} + \frac{A^2}{2}\cos(2\pi\, 2f_0 nT) \leftarrow \text{periodico } N$$

$2f_0NT = 2K$ INTERO!

$(2f_0)T = \frac{2K}{N}$

$$E_S(N) = \sum_{n=0}^{N-1} \frac{A^2}{2} + \frac{A^2}{2}\cos(2\pi\, 2f_0 nT)$$

$$= \frac{A^2}{2}\cdot N + \frac{A^2}{2}\cdot 0$$

$$P_S = \frac{E_S(N)}{N} = \frac{A^2}{2}$$

Es 4 $s(n) = e^{j2\pi f_0 nT}$ con f_0 generico, $f_0 \neq 0$ → NOTARE CHE SIA PERIODICO

$f_0 \neq \frac{K}{T}$

CALCOLARE m_s, P_S

$$m_S = \lim_{N\to\infty} \frac{\sum_{n=-N}^{N} e^{j2\pi f_0 nT}}{1+2N}$$

$$e^{j2\pi f_0 nT} = a^n \qquad a = e^{j2\pi f_0 T}$$

$$\sum_{n=-N}^{2N} a^n = \sum_{m=0}^{2N} a^{m-N}$$

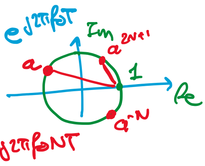
$$= a^{-N}\sum_{m=0}^{2N} a^m$$

$$= a^{-N}\cdot\frac{1-a^{2N+1}}{1-a}$$

$$m_S = \lim_{N\to\infty} \frac{a^{-N}(1-a^{2N+1})}{(1-a)(1+2N)} = 0$$

$1-a \neq 0$

$a = e^{j2\pi f_0 T}$



$a^{-N} = e^{-j2\pi f_0 NT}$

$$a = e^{j2\pi f_0 T} \overset{?}{=} 1 \longleftrightarrow f_0T = \text{INTERO } K$$

$f_0 = \frac{K}{T}$

$$|s(n)|^2 = |e^{j2\pi f_0 nT}|^2 = 1$$

$P_S = 1$

$s(n) = A\, e^{j2\pi f_0 nT}$

$m_s = 0$

$P_S = |A|^2$

come nel continuo