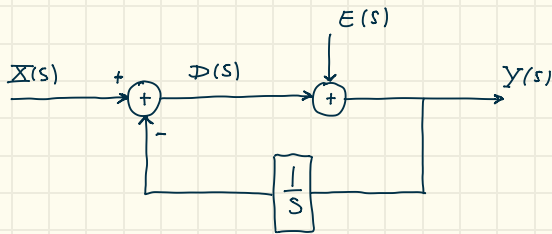


NOISE SHAPING



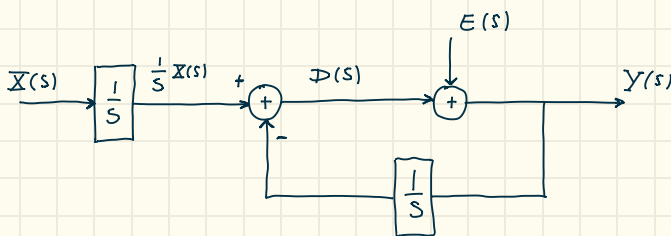
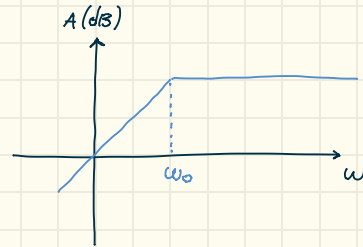
$$\begin{cases} Y(s) = E(s) + X(s) \\ D(s) = X(s) + \frac{1}{s} Y(s) \rightarrow X(s) = D(s) - \frac{1}{s} Y(s) \end{cases}$$

$$\rightarrow Y(s) = E(s) + D(s) - \frac{1}{s} Y(s)$$

$$Y(1 + \frac{1}{s}) = E(s) + D(s)$$

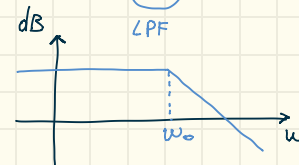
$$\frac{s+1}{s} \rightarrow Y(s) = \frac{s}{s+1} E(s) + \frac{s}{s+1} D(s)$$

Zero Pole



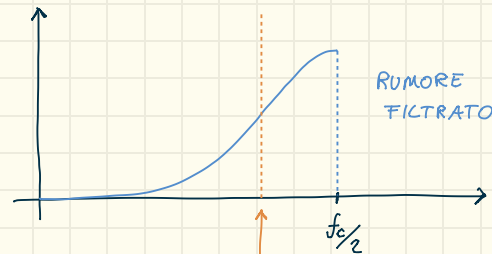
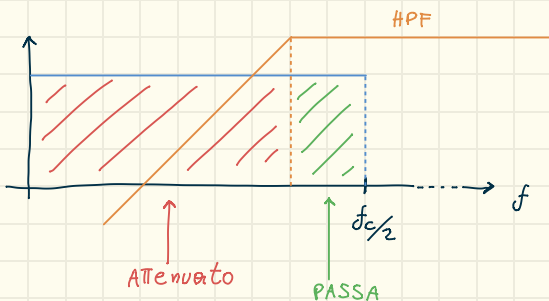
$$\begin{cases} Y = D + E \\ D = \frac{1}{s} X + \frac{1}{s} Y \end{cases} \rightarrow Y = \frac{1}{s} X + \frac{1}{s} Y + E \rightarrow Y(1 - \frac{1}{s}) = \frac{1}{s} X + E \rightarrow Y = \frac{1}{s-1} X + \frac{s}{s-1} E$$

$$\rightarrow Y(s) = \underbrace{\frac{1}{s-1}}_{\text{LPF}} X(s) + \underbrace{\frac{s}{s-1}}_{\text{HPF}} E(s)$$



Esempio Visivo

ERRORE $E(s)$



Il rumore si concentra solo sulle alte frequenze prossime a f_c . Dopo $\frac{f_c}{2}$ non "assimilano" più niente

SEGNALE $X(s)$

