Sensibilidad: dependencia de una variable con respecto a parámetros Físicos

$$T(s) = \frac{k\,w_0^2}{s^2 + s\frac{w_0}{Q} + w_0^2}$$, especificando un valor de $R = R_0$

Aproximando variaciones pequeñas pero sensibles

$$T(s,R) = T_0(s,R_0) + \frac{\partial T(s,R)}{\partial R} \longrightarrow \frac{\Delta T(s,R_0)}{\Delta R} = \frac{\partial T(s,R)}{R}$$

$$\frac{\Delta T(s,R_0)}{T(s,R_0)} = \underbrace{\frac{\Delta R}{R}}_{\text{calidad de } R} \cdot \underbrace{\frac{R}{T(s,R_0)} \cdot \frac{\partial T(s,R)}{\partial R}}_{S_R^T}$$

$$S_B^A = \frac{B}{A(B,\dots)} \cdot \frac{\partial A(B,\dots)}{\partial B}$$

En la estructura Sallen-Key

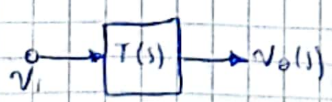
$$Q = \frac{1}{3-k} \quad ; \quad k = 1 + \frac{R_B}{R} \Rightarrow S_k^Q = \frac{k}{Q} \cdot \frac{\partial Q}{\partial k} = +\frac{1}{(3-k)^2} \cdot \frac{k}{\frac{1}{\cancel{3-k}}}$$

$S_k^Q = \frac{k}{3-k} = kQ \longrightarrow$ por cada imprecisión en k, Q se ve muy afectada

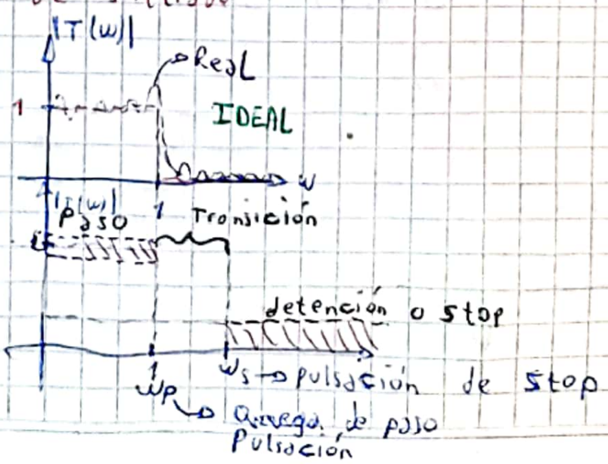
para comprobar se utiliza el método montecarlo

se toman componentes al azar y se van mostrando las transferencias

Clase 03: Teoría moderna de filtrado

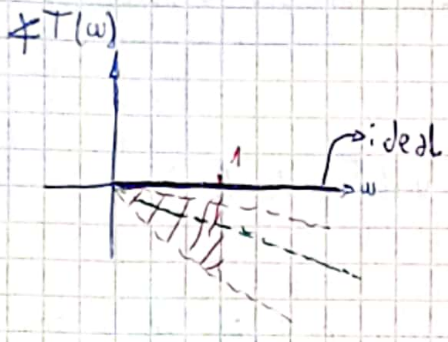


$$T(w) = \left.\frac{V_o(s)}{V_i(s)}\right|_{s=jw}$$

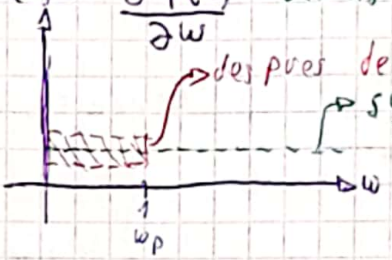


$$|\alpha(\omega)| = \frac{1}{|T(\omega)|} \Rightarrow |\alpha(\omega)|_{dB} = 20\log\left(\frac{1}{|T(\omega)|}\right) = -20\log|T(\omega)|$$

No se tiene en cuenta



$$\tau(\omega) = -\frac{\partial \varphi(\omega)}{\partial \omega}$$ → demora o retardo de grupo

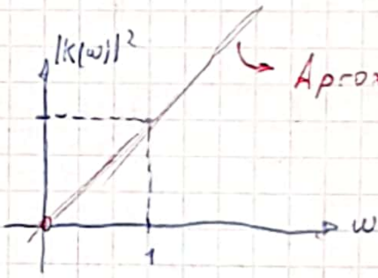


Filtro de máxima planicidad → Butterworth

$$|T(\omega)|^2 = \frac{A(\omega^2)}{B(\omega^2)} = T(j\omega)\cdot T(-j\omega) = T(j\omega)\cdot {}^*T(j\omega)$$

Polinomios

Par



$$T(s) = \frac{1}{s^2 + s\,\frac{1}{Q} + 1} \Rightarrow |T(\omega)|^2 = \frac{1}{1 + |K(\omega)|^2}$$

$$|K(\omega)|^2 = \frac{B(\omega^2) - A(\omega^2)}{A(\omega^2)} \quad ; \quad A(\omega^2) = 1$$

$B(\omega) = B_0 + B_1\omega^2 + B_2\omega^4 + \dots \quad ; \quad B_0 = 1$

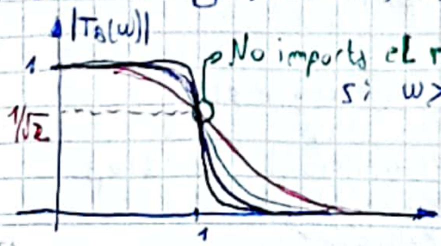
PARA Máxima planicidad $\left.\frac{\partial^n |K(\omega)|^2}{\partial^n \omega^2}\right|_{\omega=0} = 0 = B_1 + 2B_2\omega^2 + 3B_3\omega^4\Big|_{\omega=0} \Rightarrow B_1 = 0$

si guiendo derivando llegamos a que

$$B(\omega^2) = 1 + B_n\,\omega^{2n}$$

$$|T(\omega)|^2 = \frac{1}{1 + B_n\,\omega^{2n}} = \frac{1}{1 + \varepsilon^2\,\omega^{2n}}$$ Máxima planicidad

si $\varepsilon^2 = 1$ → Butterworth $\Rightarrow |T_B(\omega)|^2 = \frac{1}{1+\omega^{2n}} \Rightarrow |T_B(\omega)| = \frac{1}{\sqrt{1+\omega^{2n}}}$



si $\omega >> 1 \Rightarrow |T_B(\omega)| \cong \frac{1}{\omega^n}$

a mayor n más me acerco al ideal.

NOTA