Esercitazione 11: Sintesi del controllore

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Fondamenti di Automatica
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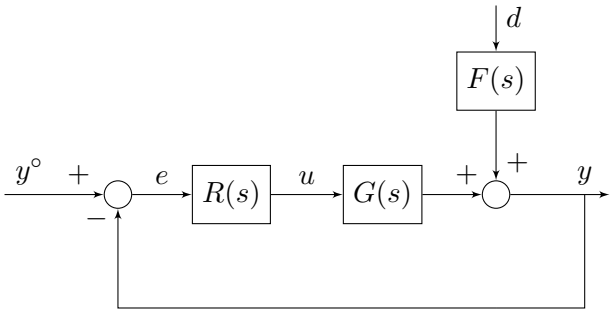
1 Sistema a fase minima

Si consideri il seguente schema di controllo:



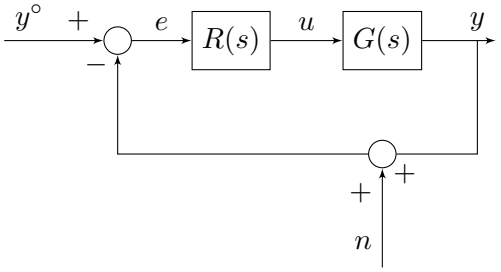
dove

$$G(s) = \frac{50}{(1+0.1s)(1+s)(1+10s)} \quad F(s) = \frac{5}{1+0.01s}$$

Si vuole progettare $R(s)$ in modo tale che:

$$\begin{aligned} |e_\infty| \leq 0.025, \quad & y^\circ(t) = 10\,\mathrm{sca}(t) \\ & d(t) = \pm\,\mathrm{sca}(t) \\ \omega_c \geq 1 \text{ rad/s} & \\ \varphi_m \geq 60^\circ & \end{aligned}$$

2 Processo a fase non minima



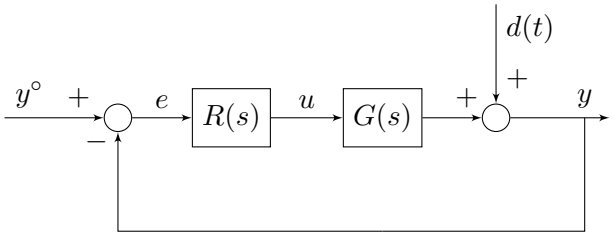
Sia

$$G(s) = \frac{10(1-s)}{1+10s}$$

Specifiche:

$$\begin{aligned} & |e_{y^\circ,\infty}| = 0, \quad y^\circ(t) = \mathrm{sca}(t) \\ & |e_{n,\infty}| \leq \frac{1}{10}, \quad n(t) = \sin(\omega_d t), \omega_d \geq 10\mathrm{rad/s} \\ & \omega_c \geq 0.1 \text{ rad/s} \\ & \varphi_m \geq 40^\circ \end{aligned}$$

3 Sistema con ritardo



con

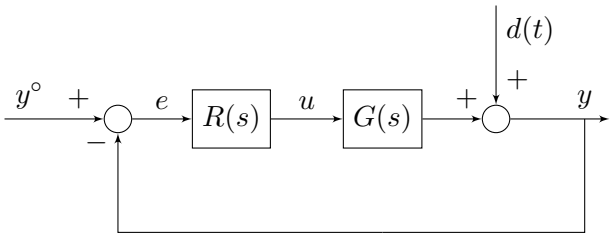
$$G(s) = \frac{e^{-s}}{(1+s)(1+10s)}$$

Specifiche:

$$|e_\infty| < 0.15, \quad d(t) = \pm \text{sca}(t)$$
$$\omega_c \geq 0.3 \text{ rad/s}$$
$$\varphi_m \geq 40^\circ$$

4 Disturbi Fourier trasformabili

Per il seguente sistema di controllo:



in cui:

$$G(s) = \frac{k}{(1+s)(1+0.2s)} \qquad k = 2 \pm 0.2$$

Si progetti il regolatore $R(s)$ in modo tale che:

$$|e_\infty| < 0.2, \quad y^\circ(t) = \text{ram}(t)$$
$$d(t) = \sin(\omega_d t), \omega_d \leq 0.2\text{rad/s}$$
$$\omega_c \geq 1 \text{ rad/s}$$
$$\varphi_m \geq 40^\circ$$