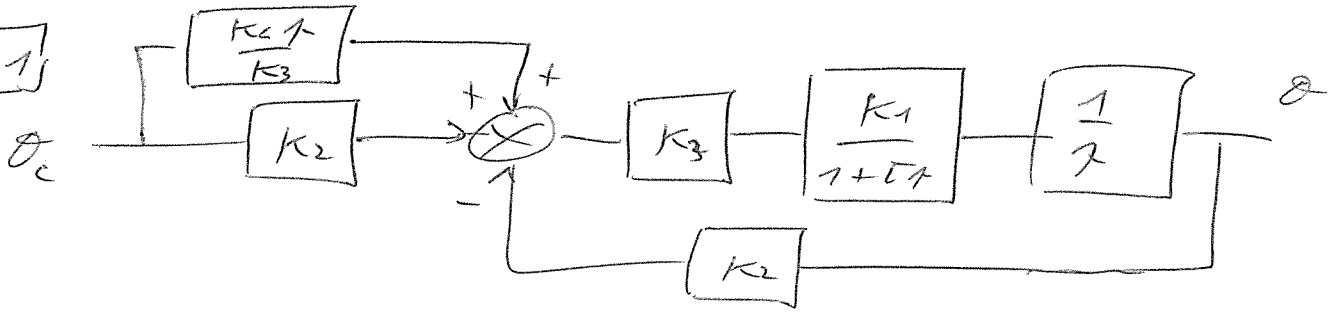
Correction DS de SI, MPSI, nov 25

Exo 1



$$\frac{\theta_c}{\theta} = \left(K_2 + \frac{K_4 \tau}{K_3}\right) \frac{K_1 K_3}{\tau(1+\tau\tau) + K_1 K_3 K_2}$$

Pb 1

(Q1) CF du robot Spline

(Q2) $K_m = 0{,}83 \text{ rad s}^{-1} \text{V}^{-1}$ et $\tau_m = 0{,}13 \text{ s}$

(Q3) Schéma bloc

(Q4) $H_1(\tau) = \frac{R_{G1}}{U} = \frac{360 K_m \lambda}{\pi(1+\tau_m \tau)} \Rightarrow K_1 = \frac{360 K_m \lambda}{\pi} = 7 \text{ tr s}^{-1} \text{V}$

(Q5) $H_2(\tau) = \frac{R_{G1}}{U_c} = \frac{K_1}{1+\tau_m \tau + K_1 K_3} = \frac{\frac{K_1}{1+K_1 K_3}}{1 + \frac{\tau_m}{1+K_1 K_3}\tau} = \frac{K_2}{1+\tau_2 \tau}$

$K_2 = 6{,}4 \text{ rad s}^{-1} \text{V}^{-1}$ et $\tau_2 = 0{,}12 \text{ s}$

Influence : diminution du gain et de la cte de temps

(Q6) $H_3(\tau) = \frac{C K_2}{\tau(1+\tau_2 \tau)} = \frac{\beta}{\varepsilon}$; $H_4(\tau) = \frac{C K_2}{\tau(1+\tau_2 \tau) + C K_2} = \frac{\beta}{\beta}$

$$H_4(\tau) = \frac{1}{\frac{\tau_2}{C K_2}\tau^2 + \frac{1}{C K_2}\tau + 1} \qquad K_4 = 1 \qquad \omega_0 = \sqrt{\frac{C K_2}{\tau_2}}$$

$$\frac{2\xi}{\omega_0} = \frac{1}{C K_2} \Rightarrow \xi = \frac{1}{2\sqrt{C K_2 \tau_2}}$$

(Q7) $\xi = 1 \Rightarrow C = \frac{1}{4 K_2 \tau_2} = 0{,}3$

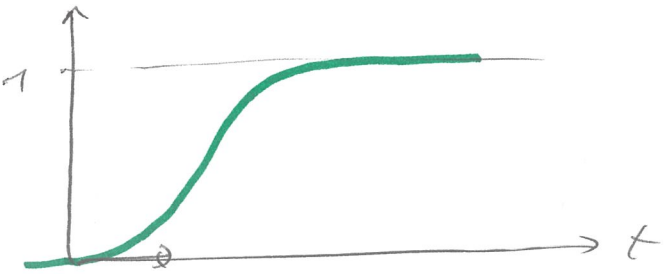
② (Q7) Sinte : $\omega_0 = 3,85$ $\quad t_{5\%} = \frac{5}{\omega_0} = 1,3\ s$

Perf : $K_4 = 1$ Précis

Pas de Dépassement

$t_{5\%} = 1,3\ s$

Pas assez rapide



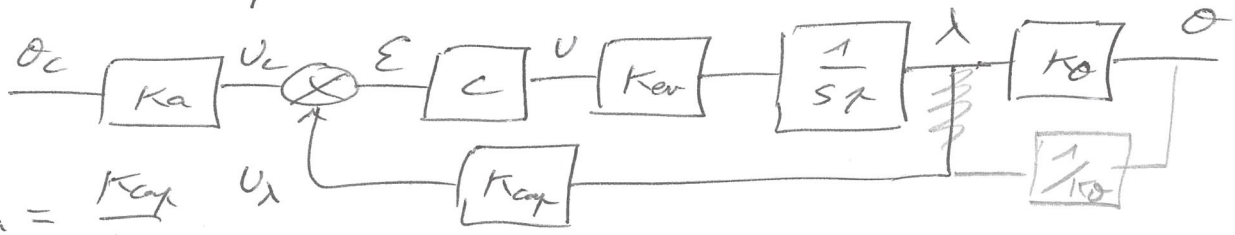
(Q8) stable, pas de dépassement, précis, $t_{5\%} = 0,22\ s < 0,3\ s$

Pb 2 (Q1) $K_\theta = \frac{60}{950 - 820} = \frac{6}{13}\ d°\,mm^{-1} = \frac{6}{13} \times \frac{\pi}{180} \times 1000\ rad\,m^{-1}$

$K_\theta = 8\ rad\,m^{-1}$

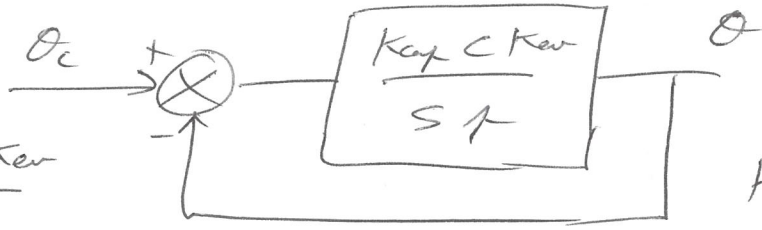
(Q2) $H_v(p) = \frac{1}{5p}$ (Q3) $K_{ap} = \frac{2,4}{0,2} = 120\ V\,m^{-1}$

(Q4)



(Q5) $K_a = \frac{K_{ap}}{K_\theta}$

(Q6)



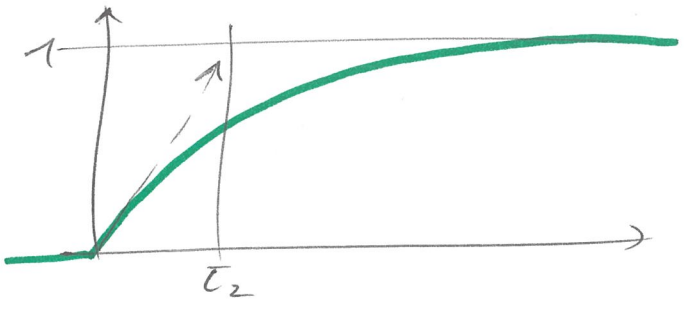
$H_1(p) = \frac{C K_{ap} K_{ev}}{5p}$ $\quad K_1 = \frac{K_{ap} K_{ev}}{5}$

$K_1 = 120$

(Q7) $H_2(p) = \frac{120C}{p + 120C} = \frac{1}{1 + \frac{1}{120C}p} = \frac{K_2}{1 + \tau_2 p}$

$K_2 = 1$ $\quad \tau_2 = \frac{1}{120C}$ on veut $t_{5\%} = 3\tau_2 < 2$

$K_2 = 1 \Rightarrow$ Précis $\quad \Rightarrow \frac{3}{120C} < 2 \Rightarrow C > \frac{1}{80}$



(3)

(Q8) $K_{cv} = 0{,}0105\ m^3 A^{-1}$ et $\tau_{cv} = 0{,}15\ s$

(Q9) $H_3(p) = \dfrac{C K_3}{p(1+\tau_{cv} p)}$ $\qquad K_3 = \dfrac{K_{cv} K_{cp}}{5} = 126$

(Q10) $H_3(p) = \dfrac{126\,C}{p(1+0{,}02p)}$

$$H_f(p) = \frac{126\,C}{p(1+0{,}02p)+126\,C} = \frac{1}{\frac{p^2}{6300\,C} + \frac{p}{126\,C} + 1}$$

$\omega_0 = \sqrt{6300\,C} = \sqrt{50 \times 126\,C}$ $\qquad K_f = 1$ (Précis)

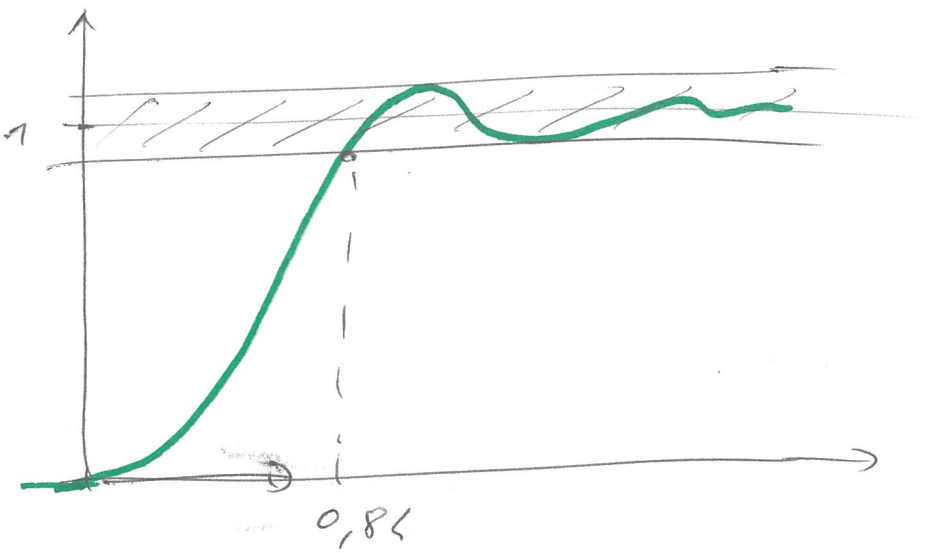
$$\frac{2z}{\omega_0} = \frac{1}{126\,C} \Rightarrow z = \frac{\sqrt{50 \times 126\,C}}{2 \times 126\,C} = \frac{5}{\sqrt{252\,C}}$$

$$z = 0{,}7 \Rightarrow C = \frac{25}{256 \times (0{,}7)^2} = 0{,}2$$

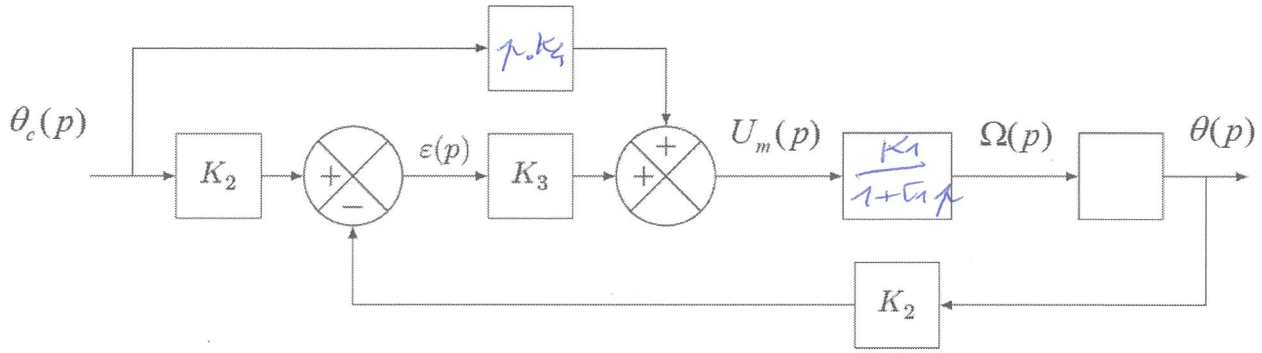
$\omega_0 = 35{,}5$ ~~$t_{5\%} = \frac{\omega_0}{3} = 1{,}18\ s$~~

$t_{5\%} = \dfrac{3}{\omega_0} = 0{,}8\ s < 2\ s$

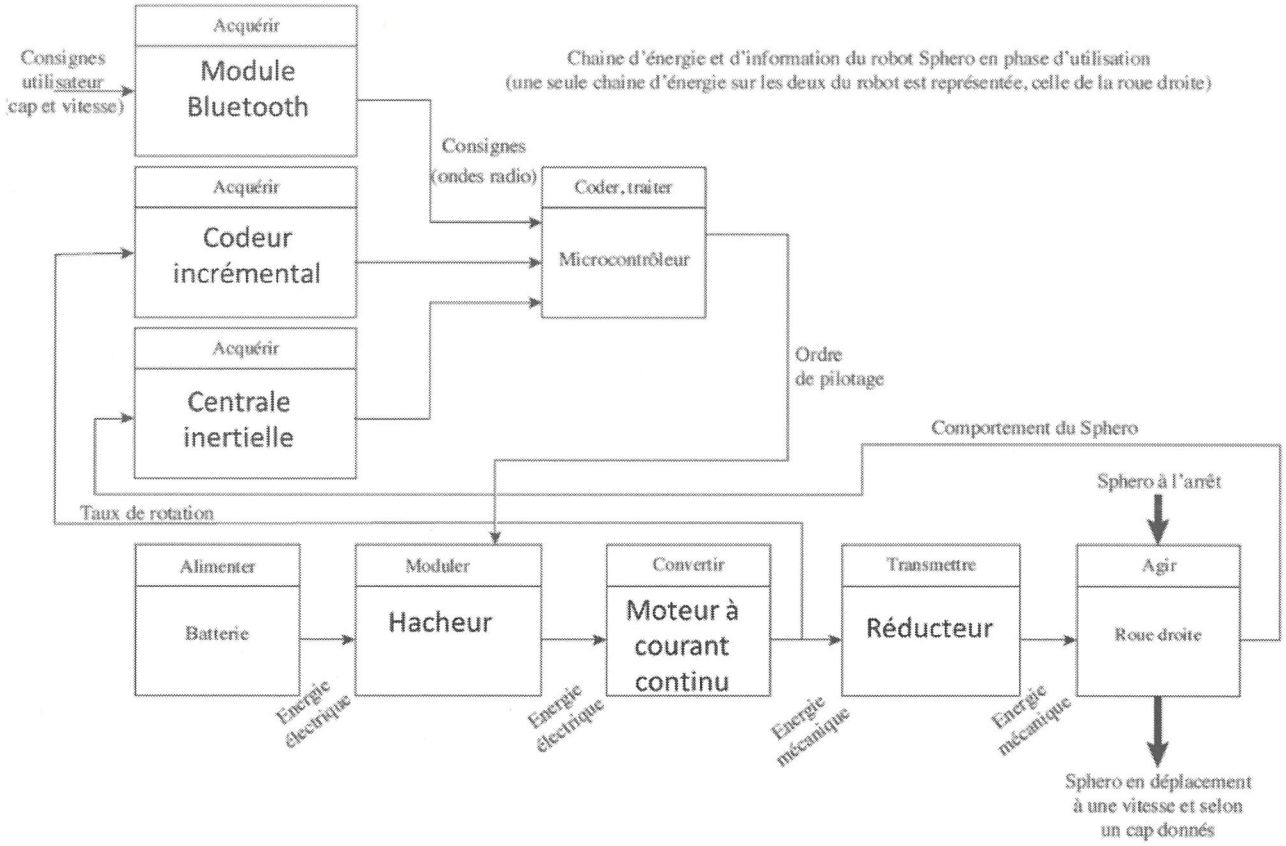
Perf : | Précis
| Assez rapide
| D% = 5%



Exercice Robot delta 2 axes



Problème 1 Robot Sphéro Question 1



Problème 1 Robot Sphéro Question 3