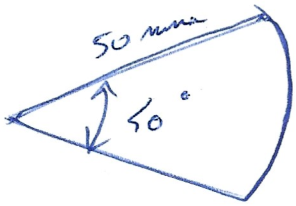
Correction DS MP, octobre 21, Vision augmentée

Q1 $t = 50 + 5 + 20 + 5 = 80\,ms < 120\,ms$ OK

Q2



$360° \longrightarrow 2\pi R$

$50° \longrightarrow 2\pi R \dfrac{50}{360} \longrightarrow 1024$ pixels.

$2\pi R \dfrac{50}{360} \dfrac{1}{1024}$ mm $\longrightarrow 1$ pixel

$\Longrightarrow$ 1 pixel $= 0{,}034$ mm

<u>Resolution</u> : 1m pour 1Km $\Longrightarrow$ 0,05 mm pour 50cm

$0{,}034 < 0{,}05$ OK.

Q3 1024 pixels $\longrightarrow 2\pi \dfrac{50}{360} = \dfrac{2\pi}{9}$ rad.

1 pixel $\longrightarrow \dfrac{2\pi}{9 \times 1024} = 6{,}8 \cdot 10^{-4}$ rad

Q4 Liaison equivalente (dans la base B_a) $\longrightarrow \begin{Bmatrix} 0 & 0 \\ \dot{\theta}_{ea} & 0 \\ \dot{\theta}_{ap} & 0 \end{Bmatrix}_P$

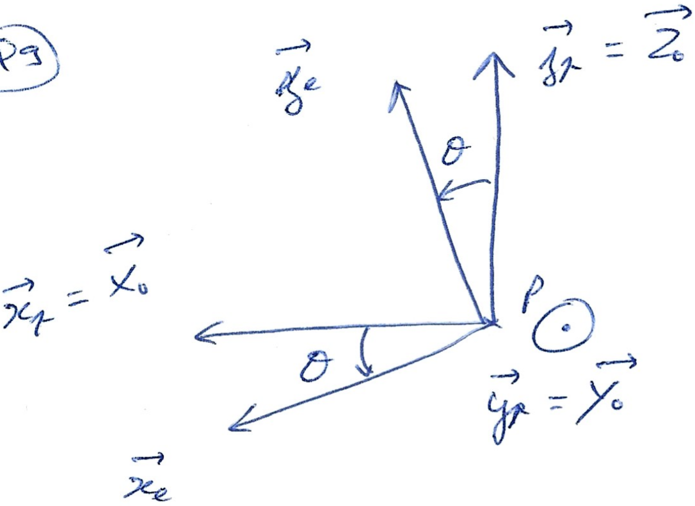
$\Longrightarrow$ rotule à doigt

Q5 Caméra (2 mobilités) $\longleftrightarrow$ Tête (3 mobilités)

L'algorithme doit calculer les consignes de mouvement de la caméra en fonction des mouvement de la tête.

Q6 L'inertie de la charge sur $(P, \vec{z}_p)$ est constante.

Q9



(2) Dans la base $(\vec{x_e}, \vec{y_e}, \vec{z_e})$ $\qquad \vec{PP_0} = d.\vec{x_e}$

$$\bar{\bar{I}}(P, opt) = \begin{pmatrix} A_0 & 0 & 0 \\ 0 & B_0 & 0 \\ 0 & 0 & B_0 \end{pmatrix} + m_0 \begin{pmatrix} 0 & 0 & 0 \\ 0 & d^2 & 0 \\ 0 & 0 & d^2 \end{pmatrix} \quad (\underline{\text{HUYGENS}})$$

$$\Rightarrow \bar{\bar{I}}(P, fe) = \begin{pmatrix} A_{cyl} + A_0 & 0 & 0 \\ 0 & B_{cyl} + B_0 + m_0 d^2 & 0 \\ 0 & 0 & A_{cyl} + B_0 + m_0 d^2 \end{pmatrix} = \begin{pmatrix} A & & \\ & B & \\ & & A \end{pmatrix}$$

$$\vec{PG_{fe}} = \frac{\vec{PP}.m_{cyl} + \vec{PP_0}.m_0}{m_{cyl} + m_0} = \frac{d\, m_0}{m_{fe}} \vec{x_e} = a.\vec{x_e}$$

(Q10) $\vec{v}(G_{fe}, fe/R_0) = \vec{v}(P, fe/R_0) + \vec{\Omega}^{fe/R_0} \wedge \vec{PG_{fe}}$

$\qquad = v.\vec{z_0} + \dot{\theta}\vec{y_0} \wedge a\vec{x_e} = v.\vec{z_0} - a\dot{\theta}\vec{z_e}$

(Q11) $\vec{\sigma}(P, fe/R_0) = \bar{\bar{I}}(P, fe)\underbrace{\vec{\Omega}^{fe/R_0}}_{\dot{\theta}\vec{y_e}} + m_{fe}.\underbrace{\vec{PG_{fe}}}_{a\vec{x_e}} \wedge \underbrace{\vec{v}(P, fe/R_0)}_{v\vec{z_0}}$

$\vec{\sigma}(P, fe/R_0) = B\dot{\theta}\vec{y_0} - m_{fe}\, a\, v \cos\theta\, \vec{y_0} = (B\dot{\theta} - m_{fe}\, a\, v\cos\theta)\vec{y_0}$

$\vec{\delta}(P, fe/R_0) = \cancel{B\ddot{\theta} + m_{fe}\, a\, v\, \gamma \cos\theta + m_{fe}}\ a$

$\qquad \left[B\ddot{\theta} - m_{fe}\, a(\gamma\cos\theta - v\dot{\theta}\sin\theta)\right]\vec{y_0} + m_{fe} \underbrace{\underbrace{\vec{v}(P, fe/R_0)}_{v\vec{z_0}} \wedge \underbrace{\vec{v}(G_{fe}, fe/R_0)}_{v\vec{z_0} - a\dot{\theta}\vec{z_e}}}_{a\, v\, \dot{\theta}\sin\theta\, \vec{y_0}}$

$\vec{\delta}(P, fe/R_0) = (B\ddot{\theta} - m_{fe}\, a\, \gamma\cos\theta)\vec{y_0}$

$\underline{\text{TMD sur } (P, \vec{y_0})} \Rightarrow B\ddot{\theta} - m_{fe}\, a\, \gamma\cos\theta = C_m + m_0\, g\, d\cos\theta$

(Q12) $C_{pert} = m_0\, g\, d\cos\theta + m_{fe}\, a\, \gamma\cos\theta$.

avec $a = \dfrac{d\, m_0}{m_{fe}}$ on a $C_{pert} = m\, d\,(g + \gamma)\cos\theta$

C_{pert} max pour $\theta = 0$

③

Q13 "BABAR" : $\vec{v}(A, fe/R_0) = \vec{v}(\overset{P}{G_{fe}}, fe/R_0) + \underbrace{\vec{AP}}_{-r\vec{x}_e} \wedge \underbrace{\vec{\Omega}_{fe/R_0}}_{\dot{\theta}\vec{y}_0}$

$\vec{v}(A, fe/R_0) = v(t)\vec{z}_0 + r\dot{\theta}\cdot\vec{y}_e$

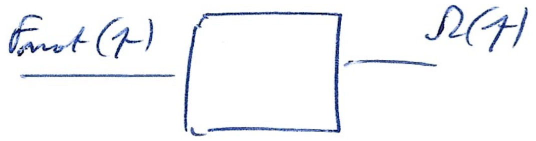
Composition de mvt : $\vec{v}(A, fe/R_0) = \vec{v}(A, fe/g_e) + \vec{v}(A, g_e/R_0)$

$\vec{v}(A, fe/R_0) = \vec{v}_{tige}(t) + v(t)\cdot\vec{z}_0$

$\Rightarrow v_{tige}(t) = r\cdot\dot{\theta}$

Q14 TMD appliqué à (fe) sur $(P, \vec{y}_e)$ $\Rightarrow B_f\cdot\dot{\omega}(t) = r\cdot F_{mot}(t)$

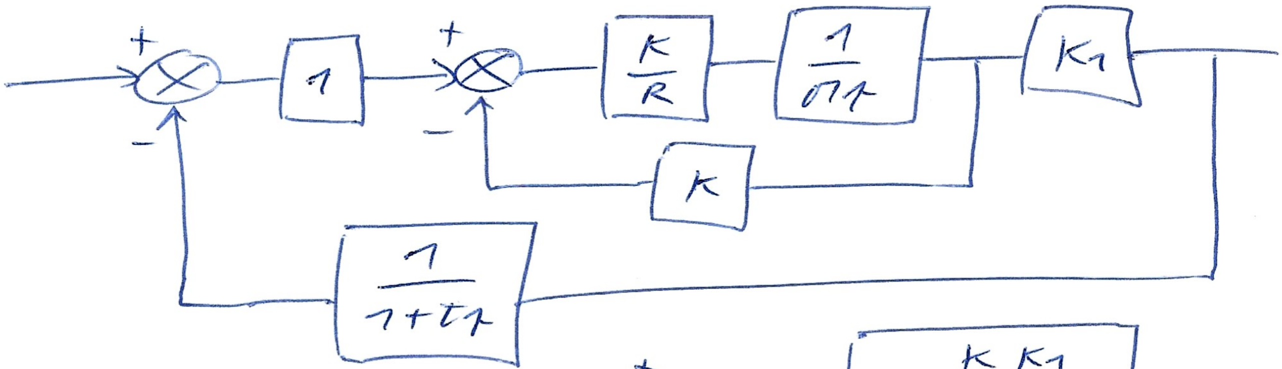
On applique la TL $\Rightarrow B_f\, p\, \Omega(p) = r\, F_{mot}(p)$



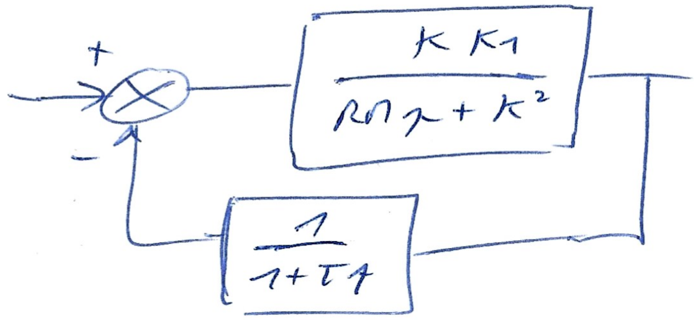
$$\frac{\Omega(p)}{F_{mot}(p)} = \frac{r}{B_f\cdot p}$$

Q15 ? $\frac{1}{1+\tau_{gyro}\,p} \Rightarrow \tau_{gyro} = \frac{1}{2\pi f} = \frac{1}{200\pi} = 1,6$ ms

Q16



$H_1(p) = \frac{K}{RMp + K^2}$



$FTBF(p) =$

$$FTBF(p) = \frac{KK_1(1+\tau p)}{(RMp+K^2)(1+\tau p) + KK_1}$$

$$FTBF(p) = \frac{K_1}{K+K_1}\,\frac{1+\tau p}{\frac{RM\tau}{K(K+K_1)}p^2 + \frac{K^2\tau + RM}{K(K+K_1)}p + 1}$$