*** Wiener (continu)**

$$* \; H(p) = \frac{1}{S^+_{yy}(p)} \left[\frac{S_{xy}(p)}{S^+_{yy}(-p)} \right]_+ \qquad \begin{cases} \phi_{xy}(\tau) = E\left[x(t+\tau)\, y(t)\right] \\ S_{xy}(p) = \mathcal{L}_b\left(\phi_{xy}(\tau)\right) \end{cases}$$

. x et v sont indépendantes

$$E\left[x(t+\tau)\, v(t)\right] = 0$$

$$S_{yy}(p) = \underbrace{S^+_{yy}(p)}_{\text{stable}} \times \underbrace{S^-_{yy}(p)}_{\text{instable}}$$

stable : $Re(p) < 0$

$$\frac{S_{xy}(p)}{S^-_{yy}(p)} = \frac{S_{xy}(p)}{S^+_{yy}(-p)} = \left[\frac{S_{xy}(p)}{S^+_{yy}(-p)} \right]_+ + \left[\frac{S_{xy}(p)}{S^+_{yy}(-p)} \right]_-$$

*** Wiener (discret)**

$$* \; H(z) = \frac{1}{S^+_{yy}(z)} \left[\frac{S_{xy}(z)}{S^+_{yy}(z^{-1})} \right] \qquad \begin{cases} \phi_{xy}(j) = E\left[x(i+j)\, y(i)\right] \\ S_{xy}(z) = \mathcal{Z}_b\left(\phi_{xy}(j)\right) \end{cases}$$

x et v sont indépendantes

$$E\left[x(i+j)\, v(i)\right] = 0$$

stable : $|p| < 1$

$$S_{yy}(z) = S^+_{yy}(z) \times S^-_{yy}(z)$$

$$\frac{S_{xy}(z)}{S^-_{yy}(z)} = \frac{S_{xy}(z)}{S^+_{yy}(z^{-1})} = \left[\frac{S_{xy}(z)}{S^+_{yy}(z^{-1})} \right]_+ + \left[\frac{S_{xy}(z)}{S^+_{yy}(z^{-1})} \right]_-$$

*** Kalman (discret)**

$$\begin{cases} * \; x_{k+1} = A_k x_k + G_k w_k + B_k u_k \\ * \; y_k = C_k x_k + v_k \end{cases}$$

$$\begin{cases} \hat{x}_{k+1/k} = A_k (I - K_k C_k)\, \hat{x}_{k/k-1} + B_k u_k + A_k K_k y_k \\ P_{k+1/k} = A_k (I - K_k C_k)\, P_{k/k-1} A^T_k + G_k Q_k G^T_k \quad (*) \\ K_k = P_{k/k-1} C^T_k \left(R_k + C_k P_{k/k-1} C^T_k\right)^{-1} \quad (**) \end{cases}$$

$P_{k+1/k} = P_{k/k-1} = P$: matrice définie symétrique positive.

$\dot{P} = 0$

Eq 2^{nd} degré de l'équation (*) نعوضو ال (1)

نعوضو P في (**) (2)

$H(z) = \dfrac{\hat{x}(k)}{y(k)}$ نلقو (3)

*** Kalman (continu)**

$$\begin{cases} * \; \dot{x}(t) = A(t)\, x(t) + B(t)\, u(t) + G(t)\, w(t) \\ * \; y(t) = C(t)\, x(t) + v(t) \end{cases}$$

$$\begin{cases} \dot{\hat{x}}(t) = A(t)\, \hat{x}(t) + B(t)\, u(t) + K(t)\left[y(t) - C(t)\hat{x}(t)\right] \\ K(t) = P(t)\, C^T(t)\, R^{-1}(t) \\ \dot{P}(t) = A(t) P(t) + P(t) A^T(t) + G(t) Q(t) G^T(t) - P(t) C^T(t) R^{-1}(t) C(t) P(t) \end{cases}$$

$$\begin{cases} * \; \dot{P}(t) = 0 \\ * \; P(t) = p : \text{matrice définie positive} \end{cases}$$

(1) نلوجو على P و نعوضوها في K(t)

$H(p) = \dfrac{\hat{x}(p)}{y(p)}$ نلقو (2)