STIRRED TANK (con disturbo)

le concentrazioni $c_1(t)$ $c_2(t)$ sono soggette a fluttuazioni rispetto al valor medio

$$c_1(t) = c_1 + \nu_1(t) \qquad w(t) \triangleq \begin{bmatrix} \nu_1(t) \\ \nu_2(t) \end{bmatrix} \in \mathbb{R}^d \quad d=2$$

$$c_2(t) = c_2 + \nu_2(t)$$

$$\dot{x}(t) = \begin{bmatrix} -0.01 & 0 \\ 0 & -0.02 \end{bmatrix} x(t) + \begin{bmatrix} 1 & 1 \\ -0.25 & 0.75 \end{bmatrix} u(t) + \begin{bmatrix} 0 & 0 \\ 0.015 & 0.005 \end{bmatrix} w(t)$$

$$y(t) = \begin{bmatrix} 0.01 & 0 \\ 0 & 1 \end{bmatrix} x(t) + \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} w(t) \qquad w(t) = \begin{bmatrix} 0.01 \cos t \\ 0.01 \operatorname{sen} t \end{bmatrix}$$

$$y_{des} = \begin{bmatrix} 0.05 \\ 1.5 \end{bmatrix}$$

- Costruzione Esosistema

$$S = \left[\begin{array}{c|c|c} S_1 & & \\ \hline & S_2 & \\ \hline & & S_3 \end{array}\right] \qquad S_1 = S_2 = 0 \qquad S_3 = \begin{bmatrix} 0 & -\omega \\ \omega & 0 \end{bmatrix} \quad \omega = 1$$

$$\tilde{w}(0) = \left[\begin{array}{c} 0.05 \\ \hline 1.5 \\ \hline 0.01 \\ 0 \end{array}\right] \qquad \tilde{w}(t) = \left[\begin{array}{c} 0.05 \\ \hline 1.5 \\ \hline 0.01 \cos t \\ 0.01 \operatorname{sen} t \end{array}\right] \begin{array}{l} \} \, y_d \\ \\ \} \, w \end{array}$$

$(\tilde{P}, \tilde{Q}, \tilde{C})$ del processo soggetto al disturbo generalizzato $\tilde{w}(t) = \begin{bmatrix} 0.05 \\ 1.5 \\ \hline 0.01 \cos t \\ 0.01 \sin t \end{bmatrix}$

$$\tilde{C} \triangleq -C$$

$$\tilde{P} \cdot \tilde{w} = P \cdot w \Rightarrow \tilde{P} = [0_{m \times p} \; P]$$

$$\tilde{Q} \tilde{w} = y_{des} - Q w \Rightarrow \tilde{Q} = [I_{p \times p} \; -Q]$$

Verifica H_1 H_2 (A, B) stabilizzabile

K : place $(A, B, [\lambda_1, \dots, \lambda_n])$ $K = -K$

L $\exists \, \Pi, \Gamma$:

$$\begin{pmatrix} I & \underset{m \times m}{0} \\ \underset{p \times m}{0} & \underset{p \times m}{0} \end{pmatrix} \begin{pmatrix} \Pi \\ \Gamma \end{pmatrix} S = \begin{pmatrix} A & B \\ \tilde{C} & \underset{p \times m}{0} \end{pmatrix} \begin{pmatrix} \Pi \\ \Gamma \end{pmatrix} + \begin{pmatrix} \tilde{P} \\ \tilde{Q} \end{pmatrix}$$

$$\underset{(n+m) \times r}{X} \triangleq \begin{bmatrix} \Pi \\ \Gamma \end{bmatrix}$$

$$L = \Gamma - K \Pi$$