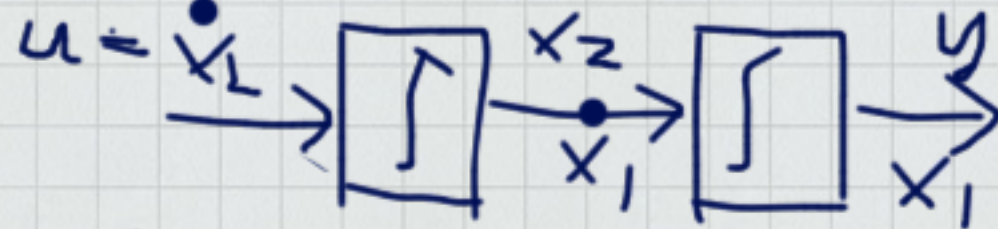


Contoh: Suatu "double integrator plant" (tidak stabil), dimodelkan dengan model

Ruang Keadaan:



$$\dot{x}_1 = x_2$$

$$\dot{x}_2 = u$$

$$y = x_1$$

$$\dot{\mathbf{x}} = \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \underbrace{\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}}_{\mathbf{A} [2 \times 2]} \underbrace{\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}}_{\mathbf{x}} + \underbrace{\begin{bmatrix} 0 \\ 1 \end{bmatrix}}_{\mathbf{B} [2 \times 1]} u$$

$$y = \underbrace{\begin{bmatrix} 1 & 0 \end{bmatrix}}_{\mathbf{C} [1 \times 2]} \underbrace{\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}}_{\mathbf{x}} + \underbrace{\begin{bmatrix} 0 \end{bmatrix}}_{\mathbf{D} [1 \times 1]} u$$

$$[\mathbf{P}] = [\mathbf{B} \ \mathbf{A}\mathbf{B}] = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \rightarrow \det[\mathbf{P}] = -1 \neq 0$$

$$[\mathbf{Q}] = [\mathbf{C}^T \ \mathbf{A}^T \ \mathbf{C}] = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix} \rightarrow \det[\mathbf{Q}] = 1 \neq 0$$

full rank
sepenuhnya terkecuali