Example: Computing $G(s)$

$$\begin{pmatrix} \dot{x}_1 \\ \dot{x}_2 \end{pmatrix} = \underbrace{\begin{pmatrix} 0 & 1 \\ -6 & -5 \end{pmatrix}}_{A} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + \underbrace{\begin{pmatrix} 0 \\ 1 \end{pmatrix}}_{B} u, \qquad y = \underbrace{\begin{pmatrix} 1 & 1 \end{pmatrix}}_{C} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

$$\begin{aligned} G(s) &= C(Is - A)^{-1}B \\ &= \begin{pmatrix} 1 & 1 \end{pmatrix} \frac{1}{s^2 + 5s + 6} \begin{pmatrix} s+5 & 1 \\ -6 & s \end{pmatrix} \begin{pmatrix} 0 \\ 1 \end{pmatrix} \\ &= \frac{1}{s^2 + 5s + 6} \begin{pmatrix} 1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ s \end{pmatrix} \\ &= \frac{s+1}{s^2 + 5s + 6} \end{aligned}$$

- the above state-space model is a *realization* of this t.f.
- note how coefficients 5 and 6 appear in both $G(s)$ and A!!