Partial Measurements

$$\text{state } x = \begin{pmatrix} x_1 \\ \vdots \\ x_n \end{pmatrix} \in \mathbb{R}^n \qquad \text{input } u = \begin{pmatrix} u_1 \\ \vdots \\ u_m \end{pmatrix} \in \mathbb{R}^m$$

$$\text{output } y = \begin{pmatrix} y_1 \\ \vdots \\ y_p \end{pmatrix} \in \mathbb{R}^p \qquad y = Cx \qquad C- p \times n \text{ matrix}$$

$$\dot{x} = Ax + Bu$$
$$y = Cx$$

Example: if we only care about (or can only measure) x_1, then

$$y = x_1 = \begin{pmatrix} 1 & 0 & \dots & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix}$$