Observer Design

- What if the system dynamics are:

$$\dot{x}(t) = Ax(t) + Bu(t), \quad y(t) = Cx(t) + Du(t)$$

- The observer dynamics will then be:

$$\dot{\hat{x}}(t) = A\hat{x}(t) + Bu(t) + L(y(t) - \hat{y}(t))$$

- Hence, the control input shouldn't impact the estimation error
- Why? Because the input $u(t)$ is know!
- Estimation error:

$$e(t) = x(t) - \hat{x}(t) \Longrightarrow \dot{e}(t) = \dot{x}(t) = \dot{\hat{x}}(t) = (A - LC)(x(t) - \hat{x}(t))$$

$$\Longrightarrow \dot{e}(t) = (A - LC)e(t)$$