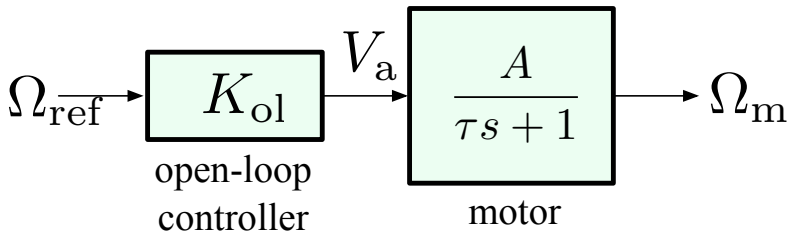
Disturbance Rejection: Open-Loop Control

First assume zero disturbance:



Transfer function:

$$\frac{A}{\tau s+1} \text{ (stable pole at } s=-1/\tau)$$

We want DC gain $= 1$

$$\Omega_{\text{m}} = \frac{A}{\tau s+1} V_{\text{a}} = \frac{K_{\text{ol}} A}{\tau s+1} \Omega_{\text{ref}}$$

Let's just use constant gain: $K_{\text{ol}} = 1/A$

$$\omega_{\text{m}}(\infty) = \frac{1}{A} \cdot A \cdot \omega_{\text{ref}} = \omega_{\text{ref}} \qquad (\text{for } T_{\text{e}} = 0)$$

What happens in the presence of nonzero T_{e}?

$$\Omega_{\text{m}} = \underbrace{\frac{A}{\tau s+1}\frac{1}{A}}_{\text{DC gain}=1} \Omega_{\text{ref}} + \underbrace{\frac{B}{\tau s+1}}_{\text{DC gain}=B} T_{\text{e}}$$

$$\Longrightarrow \omega_{\text{m}}(\infty) = \underbrace{\omega_{\text{ref}}}_{\text{step input}} + B \underbrace{\tau_{\text{e}}}_{\text{step input}}$$