< Current - controlled Brushed DC Motors >

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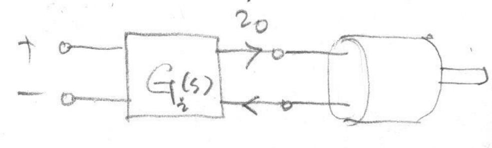
Objectives

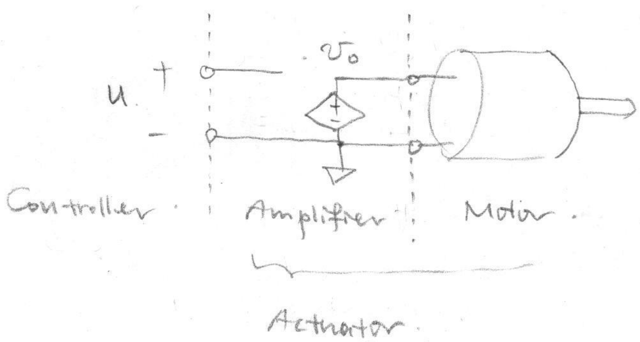
- Understand the dynamics of current - controlled dc motors.
- Torque response & output impedance
- Transconductance amplifier design

$G_i(s) = \frac{I_o}{U}$ [A/V]



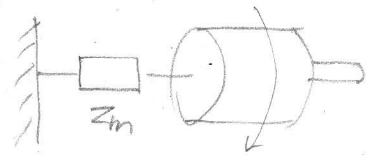
Review

$G_v(s) = \frac{V_o}{U}$ [V/V]



Assuming High-bandwidth $G_v(s)$. $\Rightarrow$

$\tau_{th} = \frac{K}{Ls+R} V_o$



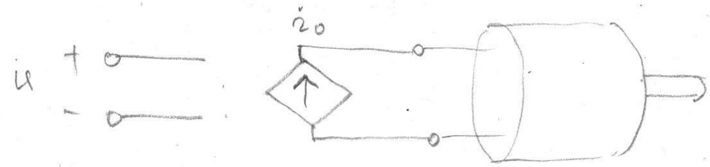
$Z_m = \frac{K^2}{Z_e}$.

① slow torque resp. : $\omega_e = \frac{R}{L}$

② Actuator output impedance : $Z_m = \frac{K^2}{Z_e}$

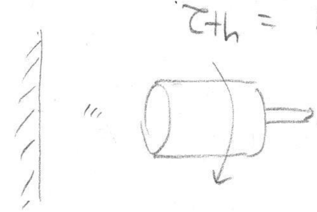
- What if we drive the motor with a current source?

$G_i(s) = \frac{I_o}{U}$ [A/V]



Assuming High-bandwidth $G_i(s)$. $\Rightarrow$

$\tau_{th} = K i_o$



$Z_m = \frac{K^2}{\underset{\infty}{Z_e}} \rightarrow 0$.

① Fast torque response : $\tau = K i$

② Low output impedance

$\Rightarrow$ Closer to an ideal torque (or force) source

e.g. $Z_m \rightarrow 0$ is important for vibration isolation