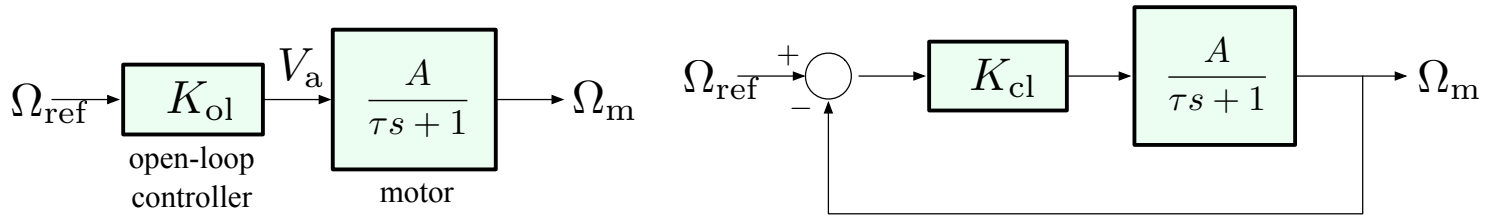
Sensitivity to Parameter Variations

Consider again our DC motor model, with no disturbance:



Bode's sensitivity concept: In the "nominal" situation, we have the motor with DC gain $= A$, and the overall transfer function, either open- or closed-loop, has some other DC gain (call it T).

Now suppose that, due to modeling error, changes in operating conditions, etc., the motor gain changes:

$$A \longrightarrow A + \underbrace{\delta A}_{\substack{\text{small} \\ \text{perturbation}}}$$

This will cause a perturbation in the overall DC gain:

$$T \longrightarrow T + \delta T \qquad \text{(from calculus, to 1st order, } \delta T \approx \frac{\mathrm{d}T}{\mathrm{d}A}\delta A\text{)}$$