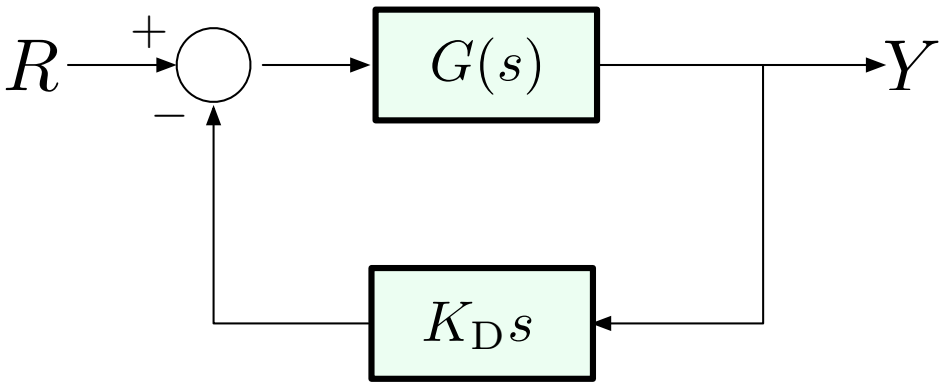
Disclaimer 2 about D-Feedback: Noise Amplification

Differentiators amplify noise (noise $\longrightarrow$ rapid changes in the reference).

In the lab, D-feedback is implemented differently, in the feedback path. This way, we avoid differentiating the reference, which may be rapidly changing:



$$\text{Before:} \quad \frac{Y}{R} = \frac{K_\mathrm{D} s G(s)}{1 + K_\mathrm{D} s G(s)}$$

$$\text{Now:} \quad \frac{Y}{R} = \frac{G(s)}{1 + K_\mathrm{D} s G(s)}$$

$$\text{Poles:} \quad 1 + K_\mathrm{D} s G(s) = 0$$

— same poles, but different zeros.

Now the reference signal is *smoothed out* by the plant $G(s)$ before entering the differentiator, which minimizes distortion due to noise.