Proportional Feedback Control System

EEET-427-01:Control Systems

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Feedback systems are better than magic numbers.

Jargon time:

- Plant: the transfer function of the system
- Controller: the inputs, and the error of the output
- $R(s)$: Reference signal
- $E(s)$: Difference between reference and output
- $U(s)$: input to the plant
- $C(s)$: output
- K_p: Some gain (all gains are K)

Breaking down into lab1:

$$
\begin{aligned}
E(s) &= \omega_{ref} - \omega \\
E(s) &= \omega_{ref} - (\frac{a}{s+b})(K_p)(E(s)) \\
\omega_{ref} &= E(s)(1 + \frac{a}{s+b}K_p) \\
\frac{E(s)}{\omega_{ref}} &= \frac{1}{1 + \frac{a}{s+b}K_p} \\
\frac{E(s)}{\omega_{ref}} &= \frac{s+b}{s+b+K_p a}
\end{aligned}
\tag{1}
$$

Time constant doesn't care about the numerator, whatsoever. In the first-order system $\frac{a}{s+b}$, $\frac{1}{b}$ is the time constant. So, in the above system, $\tau = \frac{1}{b+K_p a}$

Ideally, $E(s) = 0$. We can't do that though, because b exists. As such, we want to have K_p as big as possible.

Now, lets add some noise to the system. [insert image]

$$
\begin{aligned}
\frac{\omega}{V_{dist}} &= ? \\
\omega &= v_{arm}(\frac{a}{s+b}) \\
& v_{arm}
\end{aligned}
\tag{2}
$$