Approximate PI via Dynamic Compensation

PI control achieves the objective of stabilization and perfect steady-state tracking of constant references; however, just as with PD earlier, we want a *stable controller*.

Here's an idea:

$$\text{replace } K\frac{s+1}{s} \quad \text{by} \quad K\frac{s+1}{s+p}, \text{ where } p \text{ is small}$$

More generally, if $z = K_\mathrm{I}/K_\mathrm{P}$, then

$$\text{replace } K\frac{s+z}{s} \quad \text{by} \quad K\frac{s+z}{s+p}, \text{ where } p < z$$

This is lag compensation (or lag control)!

We use lag controllers as dynamic compensators for approximate PI control.