

Separation Principle

Separation principle. The closed-loop eigenvalues are:

$$\begin{aligned} & \{\text{controller poles (roots of } \det(Is - A + BK))\} \\ & \cup \{\text{observer poles (roots of } \det(Is - A + LC))\} \end{aligned}$$

— this holds only for linear systems!!

Moral of the story:

- ▶ If we choose observer poles to be several times faster than the controller poles (e.g., 2–5 times), then the controller poles will be dominant.
- ▶ Dynamic output feedback gives essentially the same performance as (nonimplementable) full-state feedback — provided observer poles are far enough into LHP.
- ▶ Remember: the system must be **controllable** and **observable**!!