# The Luenberger Observer

$$\text{System:} \qquad \dot{x} = Ax$$
$$y = Cx$$
$$\text{Observer:} \qquad \dot{\hat{x}} = (A - LC)\hat{x} + Ly.$$

What happens to state estimation error $e = x - \hat{x}$ as $t \to \infty$?

$$\dot{e} = \dot{x} - \dot{\hat{x}}$$
$$= Ax - [(A - LC)\hat{x} + LCx]$$
$$= (A - LC)x - (A - LC)\hat{x}$$
$$= (A - LC)e$$

Does $e(t)$ converge to zero in some sense?