

The Luenberger Observer

Consider a state-space model

$$\dot{x} = Ax \quad (\text{for now, assume } u = 0)$$

$$y = Cx$$

We wish to estimate the state x based on the output y .

Consider feeding the output y as input to the following system with state \hat{x} :

$$\dot{\hat{x}} = (A - LC)\hat{x} + Ly.$$

Assumption: The **output injection matrix** L is chosen in such a way that the matrix $A - LC$ is **Hurwitz** (i.e., all of its eigenvalues lie in LHP).

At this point, we do not assume anything about observability.