State Estimation Using an Observer

The idea is to design the observer in such a way that the state estimate $\widehat{x}$ is *asymptotically accurate*:

$$\|\widehat{x}(t) - x(t)\| = \sqrt{\sum_{i=1}^{n} (\widehat{x}_i(t) - x_i(t))^2} \xrightarrow{t \to \infty} 0$$

If we are successful, then we can try estimated state feedback: