

Problem Statement

The nonlinear dynamical system is given by

$$\begin{aligned}\dot{x}(t) &= Ax(t) + B_u u(t) + B_f f(x) \\ y(t) &= Cx(t)\end{aligned}$$

where $x(t) \in \mathcal{R}^{n_x}$ is the state vector, $u \in \mathcal{R}^{n_u}$ is the control input, $y(t) \in \mathcal{R}^{n_y}$ is output vector. $f(x)$ represents nonlinearity in the system.

Assumption 1

The nonlinear function $f(x)$ satisfies [1]

$$\|f(x) - f(z)\| \leq \beta \|x - z\|$$

$\forall x, z \in \mathcal{R}^n$ and $\beta > 0$

- Examples of this nonlinearity are omitted here and can be found in the below reference.
- Bad estimate of β might affect the results.

References

- [1] R. Rajamani, "Observers for lipschitz nonlinear systems," *IEEE transactions on Automatic Control*, vol. 43, no. 3, pp. 397–401, 1998.