Observer Design for Polynomial Systems
Using Convex Optimization

Hiroyuki Ichihara

Department of Systems Innovation and Informatics
Kyushu Institute of Technology

680-4 Kawazu
Iizuka, 820-8502, Japan
ichihara@ces.kyutech.ac.jp

Abstract

This paper presents a computational technique of observer design for input-affine polynomial systems based on Lyapunov’s stability theorem and invariance principal by using convex optimization. After some elementary results, an observer design method is discussed guaranteeing a regional stability of the closed-loop system for a given state estimate feedback law. Two performance improvements are also discussed with respect to decay rate and $L_2$ gain filter. To compute these observer gains, scalar and matrix-valued sum of squares optimization are effectively used.