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# NONLINEAR OBSERVER DESIGN WITH GENERAL CRITERIA

Chung Seop Jeong, Edwin E. Yaz
Department of Electrical and Computer Engineering
Marquette University
Milwaukee, WI 53201, USA
{chung.jeong; edwin.yaz}@marquette.edu

Adil Bahakeem
Department of Electrical Engineering
University of Arkansas
Fayetteville, AR 72703, USA
abahake@uark.edu

Yvonne I. Yaz
Mathematics Department
Milwaukee School of Engineering
Milwaukee, WI 53202, USA
yaz@msoe.edu

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Abstract. *A large class of nonlinear system and measurement equations involving incrementally conic nonlinearities and finite energy disturbances is considered. A linear matrix inequality based observer design approach is presented to guarantee the satisfaction of a variety of performance criteria ranging from simple estimation error boundedness to dissipativity. Simulation examples are included to explore the freedom in the design process, to show the feasibility limits for the solution and to illustrate the resulting time responses of various observers in a comparative manner.*
**Keywords:** Observers, Nonlinear systems, Continuous-time, Linear matrix inequality

1. **Introduction.** Because of its practical importance, such as in the case of insufficient number of sensors, design of observers for nonlinear systems has been an active area of research. Many new nonlinear state observation techniques have emerged recently: feedback linearization, variable structure techniques, extended linearization, high gain observers, Lyapunov-based observer design, etc. In references [1,3], several feedback linearization techniques for a class of nonlinear systems are proposed. A variable structure technique is proposed in reference [4]. Performance of several nonlinear state observation techniques are compared in [5]. A design methodology for state estimation of nonlinear stochastic systems and measurement models with colored noise process is presented in reference [6]. In [7], an extension is given of the variable structure observers to unbounded noise and measurement uncertainties. In [8], an adaptive extension of the sliding-mode observer to state reconstruction of nonlinear systems with uncertainty having unknown bounds is presented. An extended linearization technique, a design method based on the family of linearizations of the system, parameterized by constant operating points for a single input