Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **13 (2006)** 269-282

AN LMI APPROACH TO PERSISTENT BOUNDED DISTURBANCE REJECTION FOR IMPULSIVE SYSTEMS WITH POLYTOPIC UNCERTAINTIES

Fei Hao[1], Long Wang[2], Tianguang Chu[2], and Lin Huang[2]

[1]Seventh Research Division,
Beijing University of Aeronautics and Astronautics, Beijing, 100083, P R China,
Email: fhao@buaa.edu.cn.
[2]Center for Systems and Control,
Peking University, Beijing 100871, P R China.

Abstract. The problem of persistent bounded disturbance rejection for uncertain linear impulsive systems is considered in this paper. The systems under consideration is subject to polytopic uncertainties appearing in all matrices of the state-space model. By using positive invariant set and Lyapunov function methods, a sufficient condition for robust internal stability and L_1-performance of the impulsive systems is established in terms of linear matrix inequalities. A simple algebraic approach to the design of a linear state-feedback controller that robustly stabilizes the system and achieves a desired level of disturbance attenuation is proposed. Furthermore, since Lyapunov function matrix is decoupled from coefficient matrices in the newly obtained sufficient criterion, it is convenient to study the robustness problem for impulsive systems with respect to polytopic uncertainties. A numerical example is worked out to illustrate the efficiency of the proposed approach and less conservatism of the newly obtained results.
Keywords. Impulsive systems; Robust stability; Guaranteed performance of persistent bounded disturbance rejection; Polytopic uncertainty; linear matrix inequality (LMI).
AMS (MOS) subject classification: 34A37, 93C55, 93D05.

1 Introduction

Impulsive systems arise in many areas such as neural networks, communication, rhythm in medicine and biology, optimal control in economics and so on (see, e.g., [10], [12]–[14], [16], [19] and the references therein). Impulsive differential equations, that is, differential equations involving impulsive effects, appear as a natural description of these phenomena of several real world problems. The theory of impulsive differential systems is still developing up to now. There have been many works devoted to the qualitative analysis of impulsive systems and applications of impulsive control theory (see, e.g., [10], [14], [15], [18] and the references therein). Recently, problems concerning control of impulsive systems have also attracted increasing attentions [5], [12], [13], [15]. Particularly, the controllability and its applications, and the design problem of impulsive control systems have been addressed in [6], [11], [12] and [16]. Very recently, the problem of disturbance rejection