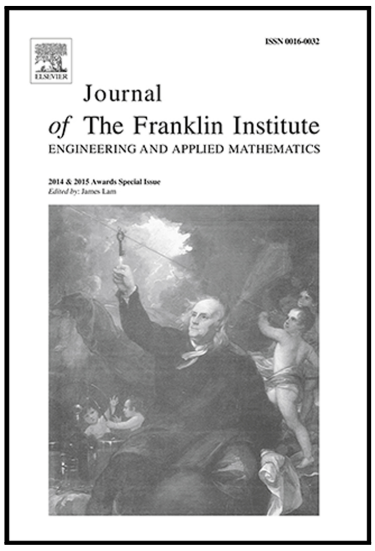

Non-fragile finite-time extended dissipative control for a class of uncertain discrete time switched linear systems

Jianwei Xia, Hui Gao, Mingxin Liu, Guangming Zhuang, Baoyong Zhang

PII: S0016-0032(18)30126-1
DOI: 10.1016/j.jfranklin.2018.02.017
Reference: FI 3342

To appear in: *Journal of the Franklin Institute*

Received date: 22 August 2017
Revised date: 8 February 2018
Accepted date: 19 February 2018

Please cite this article as: Jianwei Xia, Hui Gao, Mingxin Liu, Guangming Zhuang, Baoyong Zhang, Non-fragile finite-time extended dissipative control for a class of uncertain discrete time switched linear systems, *Journal of the Franklin Institute* (2018), doi: 10.1016/j.jfranklin.2018.02.017

Non-fragile finite-time extended dissipative control for a class of uncertain discrete time switched linear systems ¶

Jianwei Xia* **Hui Gao†** **Mingxin Liu‡** **Guangming Zhuang§** **Baoyong Zhang¶**

Abstract

In this paper, the issues of finite-time extended dissipative analysis and non-fragile control are investigated for a class of uncertain discrete time switched linear systems. Based on average dwell-time approach, sufficient conditions for the finite-time boundedness and finite-time extended dissipative performance of the considered systems are proposed by solving some linear matrix inequalities, where using the concept of extended dissipative, we can solve the H_∞, L_2-L_∞, Passivity and (Q, S, R)-dissipativity performance in a unified framework. Furthermore, two form of non-fragile state feedback controllers are designed to guarantee that the closed-loop systems satisfy the finite-time extended dissipative performance. Finally, simulation example is given to show the efficiency of the proposed methods.

Keywords: Extended dissipative, finite-time, switch system, average dwell-time

1 Introduction

Switched system is a hybrid system which consists of several subsystems and a switching signal that orchestrates the switching among them. It has attracted considerable attention and has been widely studied in past decades [1, 2]. Stability is a basic topic for switched systems, and lots of researchers have shown great interest toward Lyapunov asymptotic stability, which is defined over an infinite time interval [3–9]. Meanwhile, in practice, the system behavior over a fixed finite time interval is also important in many practical applications, such as neural networks, chemical engineering processing, robot control and missile systems. Recently, a great deal of finite-time analysis and control for different switched systems were presented in the literatures [10–18] with different effective methods. For example, finite-time H_∞ control of switched systems with mode-dependent average dwell time method was discussed in [10], the problem of adaptive finite-time control for a class of uncertain switched nonlinear systems using neural networks method was investigated in [11], a common Lyapunov function and backstepping method were proposed to investigate the finite-time control for stochastic switched systems under arbitrary switching in [12], etc.

As is well known, in general, the designed controller are assumed to be exactly implemented. However, in many industrial applications, the imprecision occurring in controller implementation is always inevitable,

*School of Mathematics Science, Liaocheng University, Liaocheng 252000, P. R. China. Corresponding Author. Email:njustxjw@126.com

†School of Mathematics Science, Liaocheng University, Liaocheng 252000, P. R. China. Email:gaohui194011@sina.com

‡College of information science and engineering, Yanshan University, Qinhuangdao 066004, China. Email: liumx@ysu.edu.cn

§School of Mathematics Science, Liaocheng University, Shandong 252000, China. Email: zgmtsg@126.com

¶School of Automation, Nanjing University of Science and Technology, Nanjing 210094, P.R. China Email: baoyongzhang@gmail.com