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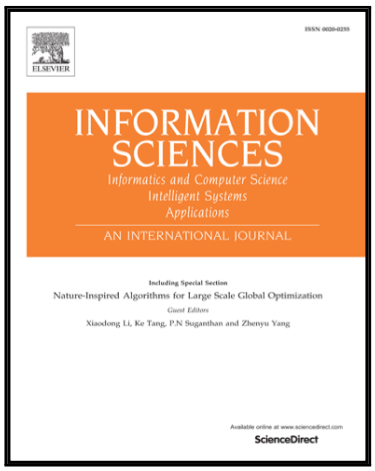

Quasi-time-dependent Control for 2-D Switched Systems with Actuator Saturation

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Abstract

This paper is concerned with controller design for a class of two-dimensional (2-D) switched systems with actuator saturation, which are formulated by the well-known Fornasini-Marchesini local state-space (FMLSS) model. By constructing a quasi-time-dependent Lyapunov functional, the stability and ℓ_2-gain analysis for 2-D switched systems are addressed firstly. Then, a set of state feedback controllers is designed, which is both quasi-time-dependent and mode-dependent. Compared with the time-independent criteria, the new results lead to less conservatism. The effectiveness and potential of our proposed methods are illustrated by a numerical example.

Keywords: Quasi-time-dependent control; 2-D switched systems; Mode-dependent average dwell time; Actuator saturation.

I. Introduction

Over the last few decades, two-dimensional (2-D) systems have received considerable attention due to their wide applications in many areas. A large number of practical systems and processes can be modeled as 2-D systems, such as signal processing, water stream heating, linear image processing and iterative learning control [7], [16], [17], [28]. In general, 2-D systems can be represented by different models such as the Rosser model, Fornasini–Marchesini (FM) model and

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