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ROBUST SLIDING MODE CONTROL FOR A CLASS OF UNCERTAIN SWITCHED NEUTRAL SYSTEMS

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Abstract. In this paper, the method of robust sliding mode control for a class of switched neutral control systems with mismatched fractional form parametric uncertainties is investigated. A delay-dependent sufficient condition for the existence of linear sliding surfaces is given in term of linear matrix inequality(LMI), and sliding mode controllers based on reaching law are developed, which are to ensure system trajectories from any initial conditions be convergent to sliding surface. A numerical example illustrates the proposed results.

Keywords. Sliding mode control; Neutral systems; Switched systems; LMI; Stability
AMS (MOS) subject classification: 34C10, 35Q35

1 Introduction

Switched systems, as an important embranchment of hybrid control systems, have garnered great attention of researchers in recent years[1-12]. The motivation for studying switched systems comes from the fact that many practical systems are inherently multimodal,and the fact that some of intelligent control methods are based on the idea of switching between different controllers. Many surveys are focused on stability analysis by using multiple Lyapunov functions or a Lyapunov-like function[6-12]. Recently, some stability criteria of switched system with time delay have been obtained[16],[17], due to time delay being familiar for control systems where actuators, sensors and transmission lines may introduce time lags[13-15]. In fact, in real world, many systems involve not only time delay but also the derivation of the past state. However, the study of this kind of switched systems rarely is reported in previous publications.

In practical systems, the analysis of a mathematical model is usually an important work for a control engineer as to control a system. However, the mathematical model always contains some uncertain elements. Hence the stability problem for uncertain neutral systems is a practical issue.

We are here concerned with the problem of robust sliding mode control for