

## ROBUST SLIDING MODE CONTROL FOR UNCERTAIN LINEAR DISCRETE SYSTEMS INDEPENDENT OF TIME-DELAY

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**ABSTRACT.** *In this paper, robust sliding mode control is investigated for a class of uncertain systems with time-delay in discrete-time. The uncertainties include both mismatched parametric uncertainties in the state model and the matched external disturbance. After deriving sufficient conditions for the existence of linear sliding surfaces based on linear matrix inequality (LMI), robust reaching motion control is presented. A simulation study shows the effectiveness of the control scheme.*

**Keywords:** Sliding mode control, Time-delay, Linear matrix inequality, Uncertain systems, Discrete-time systems

**1. Introduction.** Time-delay is often encountered in various industrial systems, such as the turbojet engine, electrical networks, nuclear reactor, rolling mill and chemical process, etc. It is often one of the main sources of instability and poor performance of a control system, which is frequently encountered. Therefore, the study of time-delay systems has attracted much attention from many researchers in the past years; a great number of results on delay systems have been reported and various approaches have been proposed in the literature, see for example [1, 2, 3, 4, 5].

It is well known that the sliding-mode control has attractive features to keep the systems insensitive to the uncertainties on the sliding surface, its applications have been extensively studied in [6, 7, 8, 9, 10, 11, 12]. On the other hand, due to the widespread use of digital controllers, many researches have been done on discrete-time sliding mode control based on state-space models [13, 14]. In [15], the problem of discrete Variable Structure Control (VSC) was first considered. The concept of the quasi-sliding mode was suggested in [16], and phenomena of switching, reaching and quasi-sliding mode were investigated in [17]. In [18], a discrete adaptive sliding mode control is investigated for delta operator systems. In [19], a robust quasi-sliding mode controller is designed for the discrete-time systems

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