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MODEL REFERENCE ADAPTIVE INTEGRAL SLIDING MODE CONTROL FOR SWITCHED DELAY SYSTEMS

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Abstract. *This paper proposes a strategy of model reference adaptive integral sliding mode variable structure control to solve the tracking problem for a class of uncertain switched systems with time-varying delay. A stable integral sliding surface is first constructed. An adaptive control technique is used to adapt the unknown upper bounds of perturbations. Furthermore, adaptive variable structure controllers are employed such that the switched delay system containing perturbations with unknown upper bounds tracks the reference model under arbitrary switching signals. Finally, a numerical example is given to illustrate the effectiveness of the proposed design method.*
Keywords: Switched delay systems, Model reference adaptive control, Integral sliding control

1. **Introduction.** Over the last two decades, much attention has been paid to establishing variable structure control design algorithms. In theories of variable structure control, sliding mode control as the dominant method is an excellent robust control approach to resolve the stability problems of systems [1-5]. Actually, the complete response of the sliding mode control comprises two phases: reaching phase and sliding phase. We know that in the reaching phase systems are sensitive to uncertainties and perturbations. In order to solve the problem, [6] proposed a new sliding mode, called integral sliding mode which does not have reaching phase. Integral sliding mode control has been widely applied to various systems [7-9]. However, so far there have been no results for the integral sliding mode control of switched systems.

Switched systems play an important role in many real-world systems. Switched systems deserve investigation for theoretical development as well as for practical applications. There have been many studies for switched systems without delays [10-13]. On the other hand time-delay is often encountered in various industrial systems. Switched systems with delays are one of the most useful models and have strong engineering background such as power systems [14] and networked control systems [15]. However, due to the complicated