Wang, Haitao; Wang, Jing; Chen, Xiangyong; Shi, Kaibo; Shen, Hao
Adaptive sliding mode control for persistent dwell-time switched nonlinear systems with matched/mismatched uncertainties and its application. (English) Zbl 07463957
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Summary: In this paper, the adaptive sliding mode control issue for switched nonlinear systems with matched and mismatched uncertainties is addressed, where the persistent dwell-time switching rule is introduced to describe the switching of parameters. Besides, considering the case that the upper bound of the matched uncertainty is unknown, the purpose of this paper is to utilize an adaptive control method to estimate its upper bound parameters. To begin with, a linear sliding surface is constructed, and then the reduced-order sliding mode dynamics can be obtained through a reduced-order method. Next, sufficient conditions can be derived based on the Lyapunov stability and the persistent dwell-time switching analysis techniques ensuring that the reduced-order sliding mode dynamics is globally uniformly exponentially stable. Moreover, a switched adaptive sliding mode control law is designed, which can not only ensure the reachability of the sliding surface but also estimate the upper bound parameters of the matched uncertainty. Finally, a numerical example and a circuit model are introduced to verify the effectiveness of the proposed method.

MSC:
93C40 Adaptive control/observation systems
93B12 Variable structure systems
93B11 System structure simplification
93C30 Control/observation systems governed by functional relations other than differential equations (such as hybrid and switching systems)
93C10 Nonlinear systems in control theory

Keywords:
adaptive sliding mode control; switched nonlinear systems; reduced-order sliding mode dynamics

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References:


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