Adaptive output feedback sliding mode control for time-delay systems with extended disturbance

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ABSTRACT

This study proposes a new adaptive output feedback sliding mode control (SMC) for mismatched uncertain time-delay systems. First, sufficient conditions in terms of linear matrix inequalities are derived such that the equivalent reduced-order system in the sliding mode is asymptotically stable. Second, based on a new lemma and a novel adaptive law, an adaptive sliding mode controller is designed to guarantee the finite-time reachability of the system states using output feedback only. The proposed method is not limited by the following conditions: (1) the exogenous disturbances must be bounded by a known function of the outputs or by a known function of the state and delayed state variables, and (2) the norm of unmeasured states must be bounded by a constant value. As these conditions are required for the application of most existing SMC approaches for time-delay systems, the proposed approach can be applied to a more generalized system, making it a valuable contribution to the field.

Keywords: Time-delay systems, linear matrix inequalities, adaptive output feedback controller, sliding mode...