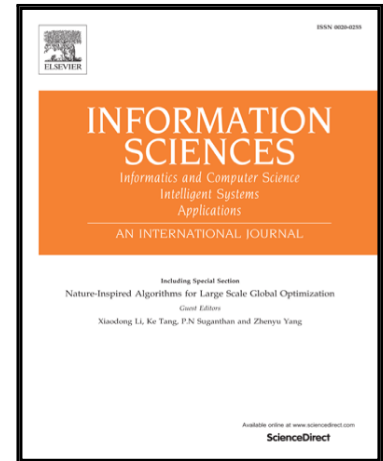


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Adaptive Sliding Mode Fault-Tolerant Control for Type-2 Fuzzy Systems with Distributed Delays

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Abstract

In this paper, the problem of sliding-mode fault-tolerant control is addressed for a class of uncertain nonlinear systems with distributed delays and parameter perturbations. By using interval type-2 Takagi-Sugeno (T-S) fuzzy models, the nonlinear systems are formulated, of which uncertain parameters and distributed state delays are represented in a unified type-2 fuzzy framework. In order to tackle with the uncertain parameters in pre-designed membership functions, an adaptive mechanism is utilized to manage the time-varying weightings corresponding to the upper membership functions. A simple linear sliding surface subject to several solvable matrix inequalities is designed by using a reduced-order system. To guarantee the stability of the overall dynamic system, an adaptive sliding mode controller is designed, which can compensate for both uncertainties and distributed delays. Finally, a truck-trailer model system is used in simulations to verify the applicability and effectiveness of the control and estimation schemes.

Keywords: Fuzzy sets, sliding mode control, adaptive control, fault tolerance, time-delay systems.

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