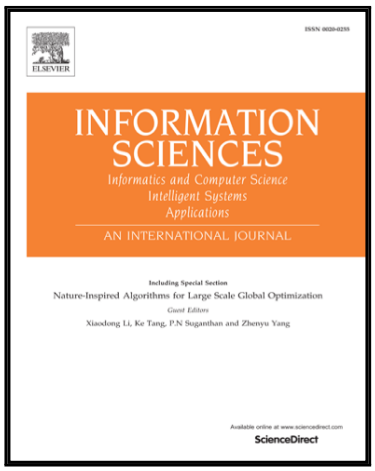

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Sliding Mode Fuzzy Control for Nonlinear Stochastic Systems Subject to Pole Assignment and Variance Constraint

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Keywords: Sliding Mode Fuzzy Control, Takagi-Sugeno Fuzzy Model, Output Performance Requirement, State Performance Requirement, Pole Assignment

ABSTRACT

A novel sliding mode fuzzy control problem of nonlinear stochastic systems is discussed subject to pole assignment and multiple performance requirements via Takagi–Sugeno fuzzy model approach in this paper. The requirements considered in this paper include output variance constraint, individual state variance constraint, while all poles are assigned into a specified disk. First, a reaching controller is designed to achieve a proposed integral sliding surface. Moreover, a fuzzy controller based on parallel distributed compensation is designed via full state feedback scheme to guarantee pole assignment and multiple performance requirements. Based on Lyapunov theory, some sufficient conditions are derived into linear matrix inequality form that can be directly solved by the convex optimization algorithm. Through using the proposed design method, a sliding mode fuzzy controller can be established to guarantee multiple performance constraints for nonlinear stochastic systems. Finally, a numerical example for the control of nonlinear synchronous generator is employed to demonstrate the effectiveness and application of the proposed design method.

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