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Editorial

Switched Dynamics with Its Applications

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In recent years, switched dynamics has attracted a rapidly growing attention in the fields of networked control systems, sliding mode control systems, switched systems, and T-S fuzzy systems. This special issue has a strong impact on many real-world systems, like automated highway systems, automotive engine control system, chemical process, constrained robotics, network systems, power systems and power electronics, robot manufacture, stepper motors, and even water quality control. Systems with switching may produce many complicated nonlinear system behaviors, such as multiple limit cycles and chaos. Nowadays, the analysis of switched dynamics of nonlinear systems still possesses many new challenges to researchers. When studying switched dynamics of practical systems, it is very crucial to be able to completely characterize the dynamical properties of the nonlinear systems with switching. This special issue aims at gathering research works focusing on the developments and discoveries of switched dynamics with its applications.

This special issue contains twenty papers, the contents of which are summarized as follows.

"*Sliding mode control with state derivative output feedback in reciprocal state space form*" by Y.-W. Tseng and Y.-N. Wang considers the design of novel sliding mode control by state derivative output feedback in nontraditional reciprocal state space (RSS) form. Novel switching function and approaching condition based on the derivative of sliding surface are introduced. A sufficient condition is developed to find the upper bound of system uncertainty and guarantee the stability for sliding surface in robustness analysis.

"*A prediction-correction dynamic method for large-scale generalized eigenvalue problems*" by X.-L. Luo et al. presents a new prediction-correction method of differential-algebraic equations for the smallest generalized eigenvalue problem. The smallest generalized eigenvalue problem is converted into an equivalent constrained optimization problem. According to the Karush-Kuhn-Tucker conditions of this special equality-constrained problem, a special continuous dynamical system of differential-algebraic equations is obtained. A prediction-correction method is constructed to follow the differential-algebraic equations.

"*Extension sliding mode controller for maximum power point tracking of hydrogen fuel cells*" by M.-H. Wang et al. proposes a maximum power point tracking (MPPT) control scheme based on extension theory to stabilize the output of a fuel cell at the point of maximum power. The simulation results confirm the ability of the controller to stabilize the output power at the maximum power point despite sudden changes in the temperature, hydrogen pressure, and membrane water content. The transient response time of the proposed controller is shown to be faster than that of existing sliding mode and extremum seeking controllers.

"*Controller design of multi-input multioutput time-delay large-scale system*" by C.-W. Lin et al. provides a novel feedback linearization controller of nonlinear multi-input