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Editorial
Recent Advances in Hybrid Dynamical Systems

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There has been extensive research in hybrid dynamical systems in recent years due to their important applications in various industrial and technological areas such as communication, complex networks, biotechnology, artificial intelligence, switching circuits in power electronics, spacecrafts control, and ecosystems management. This special issue consists of eight excellent papers that represent new and important developments in the field of hybrid dynamical systems. Hopefully, this special issue will stimulate further research on this topic and collaboration to the world of scientific community.

The paper "*A new series of three-dimensional chaotic systems with cross-product nonlinearities and their switching*" by X. Zhao, F. Jiang, Z. Zhang, and J. Hu introduces a new series of three-dimensional chaotic systems. Based on some conditions, it analyzes the globally (conditional) exponentially attractive set and positive invariant set of these chaotic systems. Moreover, it gives some examples to show that the results and the exponential estimate are explicitly derived. It also constructs some three-dimensional chaotic systems with cross product nonlinearities and studies the switching system between them.

In the paper "*Exponential stabilizability of switched systems with polytopic uncertainties*" by X. Zhang, Z.-Q. Xia, and Y. Gao, the exponential stabilizability of switched nonlinear systems with polytopic uncertainties are explored by employing the methods of nonsmooth analysis and the minimum quadratic Lyapunov function. The switchings among subsystems are dependent on the directional derivative along the vertex directions of subsystems. Especially, a sufficient condition for exponential stabilizability of the switched linear systems is established considering the sliding modes and the directional derivatives along sliding modes. Furthermore, the matrix conditions of exponential stabilizability are derived for the case of switched linear system and some numerical examples are given to show the validity of the synthesis results.

The paper "*Stability in terms of two measures for nonlinear impulsive systems on time scales*" by K. Zhang and X. Liu investigates the stability problems of nonlinear impulsive systems with fixed moments of impulses in terms of two measures on time scales. Sufficient conditions for (uniform) stability, (uniform) asymptotic stability, and instability in terms of two measures are derived by using the method of Lyapunov functions. The obtained results include the existing results as the time scale reduces to the set of real numbers. Particularly, the results provide stability criteria for impulsive discrete systems in terms of two measures, which have not been investigated extensively. Two examples are presented to illustrate the efficiency of the proposed results.

In the paper "*p-Stability and p-stabilizability of stochastic nonlinear and bilinear hybrid systems under stabilizing switching rules*" by E. Seroka and L. Socha, the problem of pth mean exponential stability and stabilizability of a class of stochastic nonlinear and bilinear hybrid systems with unstable and stable subsystems is considered. Sufficient conditions for the pth mean exponential stability and stabilizability under a feedback control and stabilizing switching rules are derived. A method for the construction of stabilizing switching rules based on the Lyapunov technique and the knowledge of the regions of decreasing of Lyapunov functions for subsystems is given. Two cases, including a single Lyapunov function and