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Editorial

Nonlinear Analysis of Dynamical Complex Networks

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Complex networks are composed of a large number of highly interconnected dynamical units and therefore exhibit very complicated dynamics. Examples of such complex networks include the Internet, that is, a network of routers or domains, the World Wide Web (WWW), that is, a network of websites, the brain, that is, a network of neurons, and an organization, that is, a network of people. Since the introduction of the small-world network principle, a great deal of research has been focused on the dependence of the asymptotic behavior of interconnected oscillatory agents on the structural properties of complex networks. It has been found out that the general structure of the interaction network may play a crucial role in the emergence of synchronization phenomena in various fields such as physics, technology, and the life sciences.

Complex networks have already become an ideal research area for control engineers, mathematicians, computer scientists, and biologists to manage, analyze, and interpret functional information from real-world networks. Sophisticated computer system theories and computing algorithms have been exploited or emerged in the general area of computer mathematics, such as analysis of algorithms, artificial intelligence, automata, computational complexity, computer security, concurrency and parallelism, data structures, knowledge discovery, DNA and quantum computing, randomization, semantics, symbol manipulation, numerical analysis and mathematical software. This special issue aims to bring together the latest approaches to understanding complex networks from a dynamic system perspective. Topics include, but are not limited to the following aspects of dynamics analysis for complex networks: (a) synchronization and control, (b) topology structure and dynamics, (c) stability analysis, (d) robustness and fragility, and (e) Applications in real-world complex networks.

We have solicited submissions to this special issue from electrical engineers, control engineers, mathematicians, and computer scientists. After a rigorous peer review process, 17 papers have been selected that provide overviews, solutions, or early promises to manage, analyze, and interpret dynamical behaviors of complex systems. These papers have covered both the theoretical and practical aspects of complex systems in the broad areas of dynamical systems, mathematics, statistics, operational research, and engineering.

This special issue starts with a survey paper on the recent advances of multiobjective control and filtering problems for nonlinear stochastic systems with variance constraints. Specifically, in the paper entitled "*Variance-constrained multiobjective control and filtering for nonlinear stochastic systems: a survey*" by L. Ma et al., the focus is to provide a timely review on the recent advances of the multiobjective control and filtering issues for nonlinear stochastic systems with variance constraints. Firstly, the concepts of nonlinear stochastic systems are recalled along with the introduction of some recent advances. Then, the covariance control theory, which serves as a practical method for multiobjective control design as well as a foundation for linear system theory, is reviewed comprehensively. The multiple design requirements frequently applied in engineering practice for the use of evaluating