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EDITORIAL

Special issue on Complexity in Engineering

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The idea of this special issue on the theme of Complexity in Engineering originated during the conference (Complexity in Engineering) that has been held at the University of Catania from July 4 to 6, 2016. CompEng 2016 was intended to provide a forum for experts and professionals working on the latest developments in the field of complexity theory and its applications in an engineering perspective. Special emphasis has been given to electrical, communication, information and industrial engineering fields and large-scale network engineering taking also into account topics like financial engineering. During the conference several participants manifested the wish to collaborate to a special issue collecting the recent results discussed at the meeting and open to further contributions from researchers in the field. The special issue now includes extended versions of selected papers presented at the conference and other works submitted in response to the open call for contribution to Nonlinear Dynamics.

Nowadays, the technological advancements have led to systems governed by an intricate relationship of interactions often occurring at different layers and involving components of different nature and to man-made systems that cannot be separated by the social network that interacts with them and determines how they are working. These systems cannot be fully understood if such elements of complexity are not taken into account; at the same time, they cannot be properly engineered if the right methodologies for control are not used. Complexity in Engineering, hence, involves both analysis and design, from the perspective of realizing the systems and circuits with added values and outstanding properties. In this field, the emergent methods proper of nonlinear dynamics are strategic. The efforts in the selection of the papers for the special issue have been directed to collect contributions covering different fields representative of what complex system engineering must take into account: "Think globally act locally," according to the well-known paradigm of R. Buckminster Fuller.

The special issue consists of eleven papers. The first paper, "Conflicts among N armed groups: Scenarios from a new descriptive model" by Della Rossa et al., makes use of methods from nonlinear dynamics and complex network science to introduce and analyze a novel descriptive model of conflicts among N groups, showing a rich repertoire of dynamical behaviors that are interpreted in the context of the model proposed. Pinning control, a fundamental control technique for complex engineered system, is dealt with in the second and third papers of the special issue. In particular, in the paper "A new pinning control scheme of complex net-

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works based on data flow" by Liu et al., a new approach to the selection of the nodes to pin is introduced and its suitability is theoretically proved and compared with other existing approaches. In the paper "Herding as a consensus problem" by Napoletano et al., the theoretical tools of pinning control and consensus are used to interpret herding phenomena appearing in financial markets. This paper introduces the theme of financial networks which is also dealt with in other two works included in the special issue. In the first paper, "Overconfident agents and evolving financial networks" by Di Meglio et al., a model based on evolving networks is considered to study the impact of agent personality on the dynamics of financial markets. In the other work, "Topological entropy and geometric entropy and their application to the horizontal visibility graph for financial time series" by Lei Rong et al., measures based on the notion of topological and geometric entropy are described and applied to the study of financial time series. The next two papers of the issue focus on nonlinear modeling application to microfluidics and optics. In the paper "Modeling and closed-loop control of a polymer composite based hard-magnetic micromirror for optical switching applications" by Yeow et al., a mathematical model of a MEMS hard-magnetic micromirror based on an electromagnetic actuated polymer composite is introduced and experimentally validated; the control of the setup is also illustrated. The paper "Nonlinear Systems Synchronization for Modelling Two-Phase Microfluidics Flows" by Bucolo et al. discusses an identification technique based on the concept of synchronization of nonlinear systems and applied to modeling experimental time series obtained from microfluidic laboratory experiments. Synchronization is also dealt with in the paper "Generalized synchronization of fractional-order hyperchaotic systems and its DSP implementation" by He et al., which, in particular, considers the problem of fractional-order hyperchaotic systems; the implementation issues are also considered by experimentally investigating a DSP-based setup. The last group of papers deals with different aspects of analysis and control of vehicles. The first one, "Analysis of the lateral dynamics of a vehicle and driver model running straight ahead" by Della Rossa et al., discusses the multi-stability and sensible dependence on initial conditions of a nonlinear vehicle and driver model. The second one, "Hopf bifurcation analysis of railway bogie" by Zeng et al., presents the bifurcation analysis of a model of a railway bogie, in order to identify the discriminants of the system qualitative behavior. Finally, the hunting behavior of locomotives is studied in the paper "A Further Investigation about a Simple Model of the Hunting Behavior of Some Old Locomotives" by Costamagna, focusing on a new model able to simulate kinetic trajectories, elastic or viscous links and dampers.