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SPECIAL ISSUE ON NEW TRENDS ON COMPLEX SYSTEMS: ADAPTATION AND CONTROL

As is well known, Kybernetika is dedicated to bringing together disciplines such as Control and Information Sciences, Statistical Decision Making, Applied Probability Theory, Random Processes, Operations Research, Fuzziness and Uncertainty Theories, and other related topics. From different perspectives and applications, these disciplines aim to tackle nonlinear systems of several components which may interact with each other resulting in complex overall behavior, known as complexity. Due to a large number of elements, higher-order interactions, feedback loops, and nonlinearities, complex systems are difficult to model and control in general, thereby becoming a challenging subject for research.

In the last decade, in particular, complex adaptive systems have merged as a research area with many applications in different scientific fields, ranging from mathematics, biology, engineering, economics to social sciences, which demonstrate the multidisciplinary nature of complexity. A central aspect of complex systems is adaptivity, that is, the capacity to self-change based on learning from experience.The study of complex adaptive systems cannot be easily tackled from reduction approaches as the behavior of the ensemble is not predicted by the behavior of their components. On the other hand, complex systems are dynamical systems that can change over time; therefore, prior states may have influence on present states and their control is fundamental for many applications. Because of the relevance acquired by complex adaptive systems in recent years, we organize here a special issue dedicated to exploring "New Trends on Complex Systems: Adaptation and Control".

This special issue aimed at creating a multidisciplinary forum for discussions on complex systems exploring new research trends in adaptation and control, which could involve modeling, analysis as well as new applications to some of the areas listed below. The eleven selected papers show a diversity of new developments including theoretical aspects considered by S. Senthilraj, R. Raja, R. Samidurai and J. Cao in *Passivity analysis of uncertain stochastic neural network with leakage and distributed delays under impulsive perturbations*, on *Adaptive tracking via pinning in networks of nonidentical nodes* developed by J. G. Barajas-Ramírez, followed by an article entitled *On the static output feedback stabilization of deterministic finite automata based upon the approach of semi-tensor product of matrix* by Z. Zhang, Z. Chen, X. Han and Z. Liu. This section of theoretical studies is closed by Z. Wang, Y. Feng, C. Zheng, Y. Lu, and L. Pans paper *Asynchronous sampling-based leader-following consensus in second-order multi-agent systems.*

To that end, novel approaches to deal with complex systems are presented in the following order; First, J. Rubio, E. Lughofer, A. Plamen, J. F. Novia and J. A. Meda-Campaña present *A novel algorithm for the modeling of complex processes.* Then, I. Bashkirtseva discusses *Controlling the stochastic sensitivity in thermochemical systems under incomplete information.* Next, E. Ruiz-Velázquez, O. D. Sánchez, G. Quiroz and G. Obregon-Pulido study *Parametric identification of Sorensen model for glucose-insulin-carbohydrates dynamics using evolutive algorithms*, followed by some bioinspired algorithms in the paper of A. Rodriguez-Angeles and L. F. Vazquez-Chavez, *Bio-inspired decentralized autonomous robot mobile navigation control for multi agent systems.* Another application along this line is developed by S. Čelikovský, J. A. Torres-Muñoz and A. R. Dominguez-Bocanegra in *Adaptive high gain observer extension and its application to bioprocess monitoring*, followed by the paper *Comparative Analysis of Noise Robustness of Type 2 Fuzzy Logic Controllers* authored by E. Ontiveros, P. Melin and O. Castillo. Finally, this special issue is closed with the work of M. Brunot, A. Janot, P. C. Young and F. Carrillo on *An instrumental variable method for robot identification based on time variable parameter estimation.*

Composing of high-quality articles, this special issue covers both theoretical and practical aspects of complex adaptive systems, serving as a platform to

i) introduce the basics of complexity to students and new scientists entering into this field,

ii) know the most recent advances in the studies of complexity,

iii) bring together experienced researchers in this area for further cooperation.

In summary, this special issue serves as a promoter of future development as well as a reference to existing problems, altogether paving the way towards a better understanding of complex adaptive systems.

We the guest editors would like to thank Kybernetika for giving the opportunity to contribute to the Complex Systems field through this special issue. In addition, we sincerely thank the contributors for their valuable work and thank all the anonymous reviewers for their help to bring together high-quality papers in this special issue.

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