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EDITORIAL

IEEE ACCESS SPECIAL SECTION EDITORIAL: RECENT DEVELOPMENTS IN CONSENSUS PROBLEMS FOR COMPLEX NETWORKED SYSTEMS

Consensus problems for complex networked systems composed of interconnected interacting agents have received considerable attention in recent years partly due to the ever-increasing number of applications in various areas, such as swarm dynamics, smart grids, sensor networks, intelligent transportation systems, unmanned aerial vehicles, telerobotics, and the military. The design of consensus protocols takes advantage of nearest neighbor interaction rules, which renders a framework of distributed multi-agent systems so that the group of dynamic agents can reach an agreement or consensus on certain desired cooperative tasks. The growing complexity of the communication topology and agents' dynamics along with the great demands on system performance brings numerous challenges including consensus under switching topologies, interdependent networks, time-varying transmission delays, parameter variations, uncertainties, nonlinearities, etc. Moreover, deep links between network science and control theory have been gradually revealed within the last couple of years, which shed light into the consensus problem and make it a rather promising direction.

This Special Section in IEEE ACCESS brings together researchers and practitioners in the broad field of complex networks and systems, and provides a timely discussion on the recent advances and challenges of consensus problems in complex networked systems. After a rigorous review process according to the IEEE ACCESS policy and standard, we accepted four articles in this Special Section.

In the article ''Robust Synchronous Control of Multi-Motor Integrated with Artificial Potential Field and Sliding Mode Variable Structure,'' Chang-Fan Zhang *et al.* study the issue of robust synchronous control of multi-motor. A scheme of synchronous motion based on the artificial potential field is proposed. In this scheme, a model of artificial potential field is constructed and by employing the methods for the flocking control and the sliding mode variable structure, the synchronous control is designed for the multi-motor system. Moreover, by using the Lyapunov method and the graph theory, the stability conditions of the controlled system and further the necessary conditions of multi-motor synchronous control are obtained. It shows that, under such designed control scheme, the robustness with respect to the variations of parameters and the synchronous performance of a multi-motor system can be improved. Finally, the simulation and experimental results illustrate the effectiveness of the proposed method.

In the article ''Flocking of Mobile Agents using a New Interaction Model: a Cyber-Physical Perspective,'' Heng Li *et al.* address the main drawback of the attraction repulsion model, where environment effects are typically not taken into account. The authors have made an attempt to design flocking systems that are adaptive to the change of communication environments. The flocking system is modeled as a cyber-physical system, where the cyber layer and control layer are designed systematically. In the cyber layer, a new interaction model is proposed by considering communication parameters of the environment. In the control layer, distributed controllers are designed for mobile agents with switching topology using the proposed interaction model. It is shown that the proposed flocking law can react to change of communication environments and guarantee the optimal communication link between agents. The stability and convergence of the flocking system are analyzed with non-smooth techniques. Numerical simulations are provided to illustrate the effectiveness of the design.

The article ''Total-Amount Synchronous Control Based on Terminal Sliding-Mode Control'' authored by Chang-fan Zhang *et al.* presents a total-amount synchronous control (TASC) strategy for nonlinear systems with uncertainty based on finite-time control theory. In combination with a new type of terminal sliding-mode control strategy, finite-time convergence of TASC is realized. First, the specific mathematical expression of the system terminal sliding-mode surface is given. Based on this, according to the sliding-mode surface expression, the sliding-mode variable structure control laws of regular nonlinear systems are derived, avoiding the singularity problem that can easily appear in ordinary terminal sliding-mode controllers. Meanwhile, the initial system is

located on the sliding-mode surface. The approach process in sliding-mode control is eliminated, and the existence of the sliding phase is proved according to the Lyapunov stability theory. Finally, the effectiveness of the algorithm is verified by a numerical example.

Finally, the article "An Improved Archaeology Algorithm Based on Integrated Multi-Source Biological Information for Yeast Protein Interaction Network" authored by Jin Zhang *et al.* proposes two ways to improve the accuracy of age predicting and skillfully embedding multisource biological information in each iteration of an archaeology algorithm for yeast protein interaction network (PIN). On the one hand, they reduce the probability of reversing errors by decreasing the non-duplication protein pairs, which are obtained from 460 gene trees constructed by means of a multiple sequence alignment and the neighbor-joining algorithm. On the other hand, the reliable crossover standard from different biological information sources can decrease local random errors of alternative treatment. The application of the novel algorithm to simulation data and real yeast PINs shows a marked improvement in accuracy. This research strongly suggests that putting non-biological methods into the biological context will bear more favorable results.

In conclusion, we would like to sincerely thank all the authors for submitting their articles to our Special Section and the reviewers who kindly reviewed submissions for us. We believe both the researchers with control theory background and engineers from applied fields could find useful insights in this Special Section in IEEE ACCESS.

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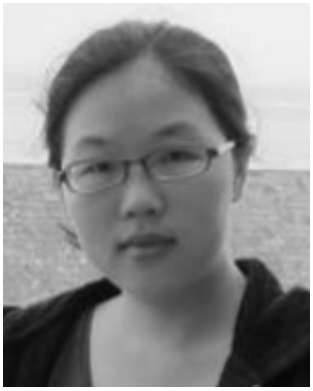

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