SPECIAL ISSUE ON CONTROL AND OPTIMIZATION IN COOPERATIVE NETWORKS

This special issue of the *SIAM Journal on Control and Optimization* is motivated by the emerging disciplines of multi-agent networks, distributed motion coordination, and cooperative control. It is foreseen that, in the near future, large numbers of coordinated devices communicating through ad hoc networks will perform a variety of challenging sensing tasks. The potential advantages of employing arrays of sensors are numerous: certain tasks are difficult, if not impossible, when performed by a single agent; and a group of agents inherently provides robustness to failures of single agents or communication links. Although the individual components of these networked systems are increasingly sophisticated, we lack a fundamental understanding of how to assemble and coordinate the individual physical devices into a coherent whole. As a consequence of this limitation, there exists a strong need for the integration of the sensing, computing and networking aspects of coordinated control of networks.

This special issue gathers recent developments aimed at providing new sets of control and distributed optimization tools to address the research challenges posed by multi-agent networks. This volume presents 16 papers that deal with a wide range of coordination tasks such as consensus, connectivity maintenance, spatial process estimation, formation stabilization, localization, coverage, and target detection. The topics considered include the characterization of convergence speeds, the design of algorithms that tolerate delays, noisy measurements, and packet drops, and the study of the controllability of graph structures and the influence of the interconnection topology in the control design. Collectively, the papers detail deep connections between a wide variety of scientific disciplines, including cooperative, distributed and decentralized control theory, distributed algorithms and systems, communication networks, graph theory, geometric optimization, differential and computational geometry, game and learning theory, and process estimation.

We believe this special issue contains an excellent sample of current research on multi-agent networks and we envision that it will be of great interest to the broad readership of the *SIAM Journal on Control and Optimization*.

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Francesco Bullo
University of California, Santa Barbara

Jorge Cortés
University of California, San Diego

Benedetto Piccoli
Istituto per le Applicazioni del Calcolo "Mauro Picone"
Guest editors