

From Consensus and Agreement in Multi-Agent Systems to Coverage Verification in Sensor Networks

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Abstract:

In this talk we provide a unified view of distributed coordination and consensus algorithms which have appeared in various disciplines such as distributed computing, statistical physics, computer graphics, robotics, and control theory over the past decade. These algorithms have been proposed as a mechanism for demonstrating emergence of a global collective behavior (such as social aggregation in different species, including schooling, flocking and synchronization) using purely local interactions. Next, we extend our results from graphs to simplicial complexes (objects of study in algebraic topology) to verify coverage in mobile sensor networks in a purely decentralized fashion and without location information. These simplicial complexes are combinatorial objects that generalize the proximity graphs formed from binary relations between agents to, higher order relations, and their study will allow us to infer the coverage properties of mobile sensor networks with time-varying interconnections without any localization. The enabling mathematical technique for our result is the theory of higher order Laplacian operators, which will be presented as a generalization of the graph Laplacian used in the first part of the talk for analysis of synchronization, agreement and consensus problems.

About the Speaker:

Ali Jadbabaie got his BS from Sharif University of Technology in 1995. He received a Masters degree in Electrical and Computer Engineering from the University of New Mexico, Albuquerque in 1997 and a Ph.D. degree in Control and Dynamical Systems from California Institute of Technology (Caltech) in June 2001. From July 2001-July 2002 he was a postdoctoral associate at the department of Electrical Engineering at Yale University. Since July 2002 he has been an assistant professor in the department of Electrical and Systems Engineering and GRASP Laboratory at the University of Pennsylvania, Philadelphia. He is a recipient of an NSF Career Award, an ONR Young Investigator award, Best student paper award (as advisor) in the American Control Conference, and the George S. Axelby Outstanding Paper Award of the IEEE Control Systems Society.
