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SOFT-CONTROL ON MULTI-AGENT SYSTEMS

This talk addresses the problem of how to coordinate Multi-Agent Systems (MASs) without destructing the original system. In many real world systems, such as birds and crowds, the interaction rules among agents are part of the natural mechanism. They cannot be re-designed for the desired collective behavior. Therefore, the coordination should not change the interaction rules of the already-existing agents (normal agents). But adding some agents is allowed in many MASs. So, one way for coordination is to add one or a few special agents. The special agent plays the role of a 'skill': it acts using strategies designed for the purpose of coordination, but it is treated as a normal agent by the normal ones. So it does not require any changes in interaction rules of normal agents. This framework is called 'Soft Control', which keeps the local rule of the existing agents in the system. In this talk, I will show the feasibility of soft-control by two case studies: (1) adding a skill to help a group of locally interacting mobile agents (the Vicsek's model) to reach synchronization; (2) adding some skills to introduce cooperation in an evolving group of agents that plays the 2-stage repeated Prisoner's Dilemma. Both the mathematical analysis and the computer simulations show the effectiveness of soft-control. So one, or a few 'clever' skills, can change the collective behavior of a group. This is a potential method for coordination of other MASs. It may bring out many interesting issues and challenges on the control of complex systems.

BIOGRAPHY

Jing Han was born in China in 1974. She received both the B.S. degree (1998) and Ph.D. degree (2002) in Computer Science from University of Science and Technology of China. She was a Joint-postdoc of the Santa Fe Institute and the Academy of Mathematics and Systems Science (AMSS) of the Chinese Academy of Sciences. She was an international fellow of the Santa Fe Institute from 2000-2002. She is currently an associate professor of the Academy of AMSS, Beijing, China. She is also the associate director of the complex systems research center of AMSS. Her current research interests are multi-agent systems, intervention to collective behavior, complex adaptive systems, combinatorial optimization and combinatorial games.