Hongmei Zhao: Consensus problems for multi-agent systems

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In this paper, we study consensus problems in networks of dynamic agents with first-order, second-order and high-order dynamics, respectively. Several conditions are obtained to make all agents reach consensus. The detailed contents are as follows:

(1) We study guaranteed cost coordination in directed networks of agents with uncertainty. For convergence analysis of the networks, a class of Lyapunov functions are introduced as a measure of the disagreement dynamics. Using these Lyapunov functions, sufficient conditions are derived for state consensus of system with desired cost performance.

(2) We consider consensus control in directed networks of agents with double integrator dynamics. A sufficient and necessary condition is proved by using the eigenvector-eigenvalue method of finding solutions.

(3) We investigate consensus of high-order multi-agent systems. A new dynamic neighbor-based control law is proposed which contains two parts, one is the local feedback and the other is the distributed feedback of the first states of each agent.

A sufficient condition is derived for state consensus of the system.