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Reset strategy for consensus in networks of clusters. (English) [Zbl 1328.93017]

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Summary: This paper addresses the problem of consensus in networks structured in several clusters. The clusters are represented by fixed, directed and strongly connected graphs. They are composed by a number of agents which are able to interact only with other agents belonging to the same cluster. To every agent we associate a scalar real value representing its state. The states continuously evolve following a linear consensus protocol and approach local agreements specific to each cluster. In order to enforce a global agreement over the whole network, we consider that each cluster contains an agent that can be exogenously controlled. The state of this agent, called leader, will be quasi-periodically reseted by a local master controller that receives information from some neighboring leaders. In order to control the consensus value we have to firstly characterize it. Precisely we show that it depends only on the initial condition and the interaction topologies. Secondly, we provide sufficient Linear Matrix Inequality (LMI) conditions for the global uniform exponential stability of the consensus in presence of a quasi-periodic reset rule. The study of the network behavior is completed by a decay rate analysis. Finally, we design the interaction network of the leaders which allows to reach a prescribed consensus value. Numerical implementation strategy is provided before illustrating the results by some simulations.

MSC:
93A14 Decentralized systems
68T42 Agent technology and artificial intelligence
93A15 Large-scale systems
93D20 Asymptotic stability in control theory

Keywords:
multiagent systems; consensus; reset systems; LMI; opinion dynamics

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References:


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