Distributed exponential finite-time coordination of multi-agent systems: containment control and consensus.


Summary: In this paper, exponential finite-time coordination problems of multi-agent systems are investigated, including containment control and consensus. The theoretical basis is that a class of nonlinear systems has favourable finite-time convergence characteristic. For the objective of containment control, the proposed protocol ensures that the boundary agents in the same strong component exponentially reach a consensus and the internal agents exponentially converge to the convex hull spanned by the boundary agents in a finite time. For the objective of consensus, a pinning control strategy is designed for a fraction of agents such that all the agents exponentially reach a consensus with the leader in a finite time. The distinguished features of this paper lie in the following two points: (1) a smaller settling time of the Lyapunov function is obtained, which manifests in a faster convergence rate than the traditional one and (2) the weakly connected topology considered in this paper is more general than the ones (a spanning tree, a spanning forest, and so on) in other coordination problems. All the results are illustrated by some simulations.

Keywords: multi-agent systems; exponential finite-time; containment control; consensus; pinning control
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