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Fully distributed observer-based adaptive fault-tolerant consensus control for multi-agent systems. (Chinese. English summary) [Zbl 1488.93109]


Summary: This paper investigates the fault-tolerant control for leader-following multi-agent systems with mismatched disturbances and unknown nonlinear dynamics. To begin with, a fully distributed observer is designed to estimate the state of the leader under directed switching topology, which translates the consensus problem into a local tracking problem. Next, by state transformation the error system is decoupled into two cascade systems, which separates the mismatched disturbances and the matched faulty factors. Thirdly, the radial basis function neural network is utilized to approximate the unknown nonlinear dynamics, based on which, three fault compensators are designed by combining with the backstepping method. It is proven that the consensus tracking problem can be solved, and the effects of mismatched disturbances, actuator faults and unknown nonlinear dynamics can be eliminated adaptively online. Finally, a numerical simulation is given to validate the effectiveness of the proposed protocols.

MSC:

93C40 Adaptive control/observation systems
93D50 Consensus
93A16 Multi-agent systems
93B53 Observers

Keywords:

multi-agent systems; fault-tolerant control; consensus; adaptive fault compensator; neural network; backstepping control

Full Text: DOI