Abstract

A decentralized control law using a backstepping scheme is proposed to deal with a leader follower multiple robots structure. Based on graph theory and Laplacian, the coordination strategy combines the leader follower control with the decentralized control. In fact, in the proposed approach, each follower robot only needs the information exchange with its connected neighbors and does not assume the existence of direct communication channel with the leader, which mitigate the implementation cost, mainly when the cooperative robots number increases. The objective of the designed control law is to synchronize positions and velocities of multiple followers interconnected via the neighbor-based rule with respect to the leader’s state. The proposed strategy is further extended to adaptive neural network coordination. The performance of synchronization control system and the nonlinear stability are derived by Lyapunov method. Simulations were performed to demonstrate the effectiveness of the proposed synchronization control approach.
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