Paper Review: Distributed Event-Triggered Control for Multi-Agent Systems

Wang He

Traditionally, feedback control laws are mainly implemented in digital hardware since the periodicity simplifies the analysis of the disparity between the control design and its implementation. However, such time-driven control laws overlook the state of the system and may be not desired when the computing resources are limited.

In this paper, the authors focus on the event-triggered fashion in a distributed way where agents only require knowledge of their neighbors' states. To derive the distributed approach, first they consider the centralized event-triggered control scheme and combine it with the piecewise constant control law which seems more applicable to networked multi-agent systems than continuously varying control laws in practice and implies that the control law updates only when the event-triggered conditions are satisfied. Moreover, they show that all agents asymptotically converge to their initial average and the inter-event time intervals are away from zero. Nevertheless, in the centralized case, each agents has to access the global knowledge of measurement errors for determining whether the events are triggered. Thus, in order to relax such limitation, the distributed approach modifies the centralized control laws updated both at each agents' own event-triggered time as well as its neighbors event-triggered time. However, this paper only guarantees that the lower bound on the inter-execution time intervals of at least one agent is strictly positive. Then, to fix this drawback, they also propose a novel distributed self-triggered approach as an extension, where each agent computes its next update time at the previous one, without tracking the state error between two consecutive control updates. In the analysis of the convergence of self-triggered ruling, zero inter-execution time for each agent i can only occur when the relative state information is equal to zero, which implying the control objective has been achieved by agent i.