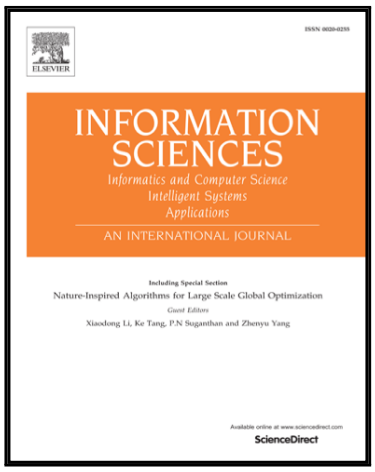

Constrained Distributed Cooperative Synchronization and Reconfigurable Control of Heterogeneous Networked Euler-Lagrange Multi-Agent Systems

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Constrained Distributed Cooperative Synchronization and Reconfigurable Control of Heterogeneous Networked Euler-Lagrange Multi-Agent Systems☆

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Abstract

The main objective of this paper is to design distributed cooperative synchronization and reconfigurable control strategies for a network of heterogeneous multi-agent Euler-Lagrange (EL) systems by taking into account constraints on the control inputs and actuator saturation faults. First, bounded distributed cooperative synchronization (or consensus seeking) controllers are developed by using full state feedback. It is shown that boundedness of the control effort is guaranteed independent of the initial conditions. Second distributed output feedback (i.e. without using full state feedback) controllers are developed for cooperative synchronization. The third objective is to design reconfigurable distributed controllers in presence of actuator saturation faults. Finally, our last objective is to develop a switching-based distributed control reconfiguration strategy that is utilized in case of an actuator fault or an actuator saturation constraint to accomplish cooperative control of networked El multi-agent systems. Towards the above end, we introduce two classes of distributed controllers that can be used to maintain the overall control objectives of the networked El multi-agent systems in both the absence and in the presence of actuator faults and actuator constraints. We introduce a procedure that can be employed to switch between the two distributed constrained controllers. In presence of actuator faults and actuator saturations, a switching mechanism is proposed to yield a reconfigurable controller for the networked El multi-agent system for ensuring and maintaining the overall mission objectives and requirements.

Keywords: Distributed cooperative control, Networked Euler-Lagrange systems, heterogeneous multi-agent systems, recovery control, switching network topologies.

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