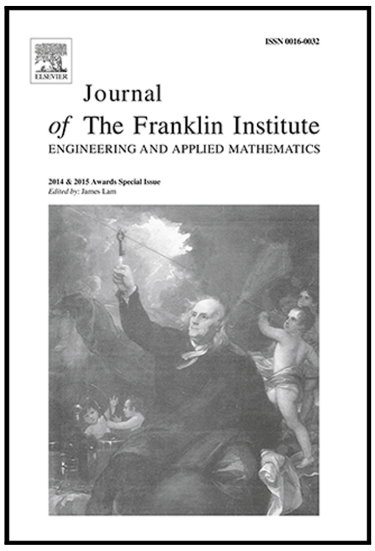

Sampled-data based consensus for multiple harmonic oscillators with directed switching topology

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Sampled-data based consensus for multiple harmonic oscillators with directed switching topology

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Abstract

This paper investigates the distributed consensus problem for a group of harmonic oscillators under directed switching topology. First, under the assumption that the union of the directed interaction graphs has a spanning tree, a class of sampled-data based consensus protocols are designed by using motion planning approaches and Pontryagin's principle. The proposed protocols only require that the union of communication topologies switched at the sampled instants has a spanning tree, without requiring information exchanges over the sampled interval and the connectivity of communication topology at each sampling instant. Then, the distributed consensus problem can be solved under directed switching topology by using stability principle and the properties of stochastic matrixes. Compared with the existing sampled-data based consensus algorithms, in this article, a remarkable advantage is that, for the proposed sampled-data based protocols, the sampled periods, communication topologies and control gains are decoupling and can be separately designed, which relaxes many restrictions in controller designs. Finally, as an extension of the leaderless consensus protocols, a leader-following consensus algorithm is further proposed in this paper. Some numerical examples are also given to illustrate the effectiveness of the analytical results.

Key words: Distributed Consensus; Sampled Data; Directed Switching Topology; Motion Planning; Harmonic Oscillator

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