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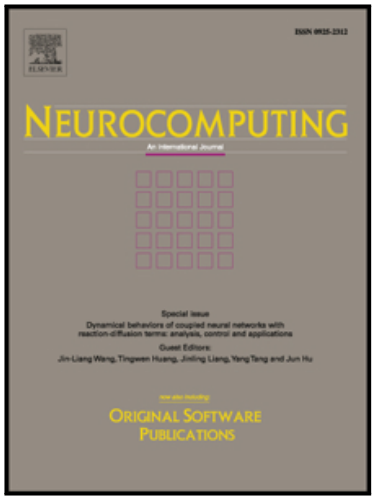

Sampled-data based containment control of continuous-time multi-agent systems with switching topology and time-delays

Huiyang Liu, Guangming Xie

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Sampled-data based containment control of continuous-time multi-agent systems with switching topology and time-delays☆

Huiyang Liu[a,*], Guangming Xie[b]

[a]*School of Mathematics and Physics, University of Science and Technology Beijing, Beijing, 100083, China.*
[b]*Intelligent Control Laboratory, College of Engineering, Peking University, Beijing, 100871, China*

Abstract

This paper addresses containment control of multi-agent systems with multiple interactive leaders. The containment control objective is two-fold: the leaders converge to a desired formation, and the followers move into the convex hull spanned by the leaders' final positions. Some sampled-data based protocols are proposed, which are effective when the communication environment suffers from intermit information, switching topology and time-delays. For the leaders, the convergence analysis can be easily obtained by using the properties of the SIA matrices. The geometric configuration of the desired formation is not affected by the switching topology or time-delays. For the followers, the convergence analysis is much complicated since the properties of the SIA matrices cannot be used. Based on the relationship between the topology and matrices, it is proved that the followers will move into the convex hull of the desired formation, and then change their positions in the convex hull as the time evolves under the switching topology; however, the final states of the followers are not affected by the time-delays. Finally, the theoretical results are illustrated by some simulations.

Keywords: Containment control; multi-agent systems; directed graphs; switching topology; time-delays.

*Corresponding author
Email address: huiyangliu@ustb.edu.cn (Huiyang Liu)

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