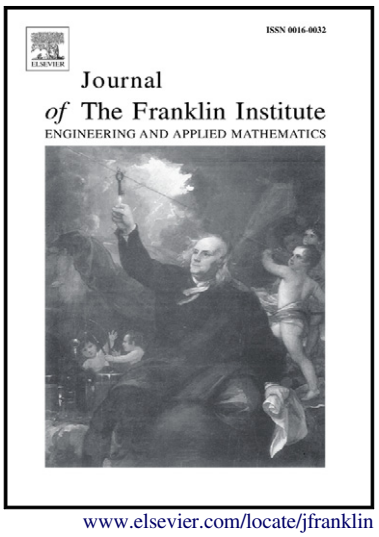

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Distributed formation control of networked Euler-Lagrange systems with fault diagnosis

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Abstract

A distributed leader-follower formation tracking controller is presented in this paper. The dynamics of each agent are modeled by Euler-Lagrange equations, and all agents are guaranteed to track a desired time-varying trajectory in the workspace. The system uncertainties and external disturbances, which are equivalently described by a bounded additive noise, are considered in the controller design, and the proposed controller is robust to noise. Fault diagnosis of the nonlinear multi-agent system is also discussed with the help of differential geometry tools and an active fault recovery strategy is incorporated into the proposed control scheme. The effectiveness of the proposed controller is verified through simulations.

Keywords: Distributed consensus; Formation tracking; Euler-Lagrange system; Sliding mode control; Fault diagnosis

1 Introduction

Distributed coordination of multiple networked dynamic agents has spurred a broad interest in the last decade. Compared to a single complicated agent, greater efficiency, operational capability and lower cost can be achieved by networking multiple simpler and cheaper agents. To execute a common mission using networked multi-agent systems, the consistent agreement about the group movement is required. This agreement is called "consensus" in multi-agent systems. The agreement variables are rendered with specific physical quantities in different applications, such as the work load in a network of parallel computers and the clock speed for wireless sensor networks. A "consensus algorithm" is a common iteration rule that specifies the information exchange relationship and the

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