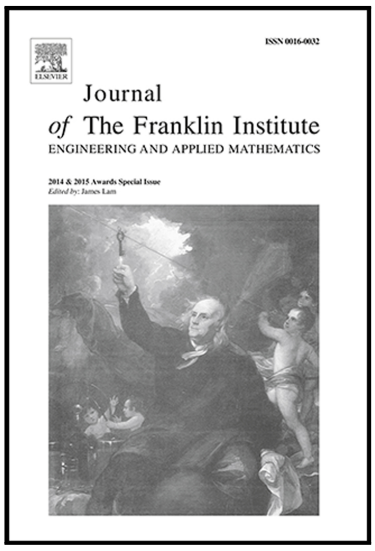

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Flocking of multiple three-dimensional nonholonomic agents with proximity graph

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Abstract

In this paper, we consider the flocking control problem of multiple three-dimensional nonholonomic agents with proximity graphs. We first analyze the nonlinear property of the three-dimensional nonholonomic model of the agent. Based on the model analysis and the neighboring information, a distributed linear control protocol is designed only using relative attitude information. Using the tools from proximity graph theory and Lyapunov stability theory, the proposed distributed linear control protocol guarantees that the attitudes of all agents exponentially converge to synchronization, and simultaneously ensures connectivity preservation and collision avoidance of the whole group, if the initial proximity graph is connected. Finally, numerical simulations are presented to illustrate the effectiveness of the theoretical results.

Keywords: Flocking, three-dimensional nonholonomic model, proximity graphs, connectivity preservation, collision avoidance.

1. Introduction

From fish schools to bird flocks to insect swarms, collective motion is a ubiquitous phenomenon throughout the biological systems [1]. One focus of the study of collective motion is how a large number of interacting agents achieve the common group objective, namely, flocking behavior, which has

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