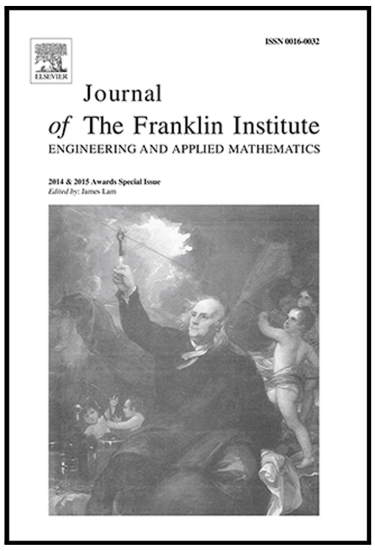

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Distributed estimation and control for two-target tracking mobile sensor networks

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Abstract

In this paper, we investigate a new estimation and control strategy for two-target tracking mobile sensor networks. Different from the single-target tracking problem, the two-target tracking one has to consider the interaction between followers in different groups. Based on a new flocking control algorithm and distributed filter, all mobile sensors can split into two groups to track their own target and form a cohesive flock with their neighbors. Stability analysis is conducted based on cascading Lyapunov method and matrix theory. Furthermore, a sufficient condition for the convergence is given in the form of the boundary conditions of feedback gains. Finally, a numerical example is presented to illustrate the validity of the proposed theoretical results.

Keywords: Distributed filter, flocking, two-target tracking, mobile sensor network

1. Introduction

Recently, due to the flexibility of deployment and low cost, sensor networks have appealed to researchers and practitioners in many areas, which is widely applied in surveillance systems, target tracking, information processing and so on [1], [2], [3]. Each sensor in mobile sensor networks can process information, communicate with its neighbors and move with the target. Generally speaking, every sensor uses a distributed estimation algorithm to estimate the uncertainty target and utilizes a control algorithm to move close to the target.

As an important part of sensor networks, filtering algorithms have been widely studied [4], [5], [6]. In particular, consensus algorithms have been proved to be effective tools for performing distributed computation tasks [7]. Inspired by consensus algorithms in multi-agent systems [8], [9], distributed Kalman filters have been proposed, which can help the estimation value of every sensor

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