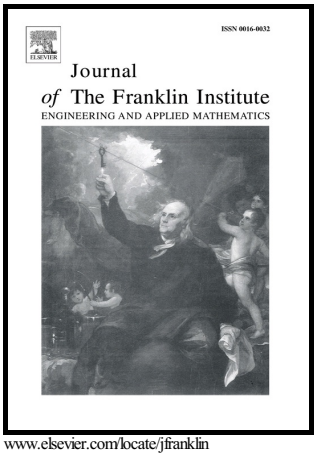

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Guaranteed performance design for distributed bounded containment control of networked uncertain underactuated surface vessels

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Abstract

This paper presents a predefined performance design approach for distributed containment control of networked heterogeneous underactuated surface vessels (USVs) under a directed graph topology. It is assumed that the position information of multiple dynamic leaders is informed to only a subset of the followers consisting of USVs and all nonlinearities and external forces in each USV follower are unknown. The local control law for each USV follower is recursively designed using the predefined performance design technique where auxiliary variables are presented to deal with underactuated constraints in the predefined performance design framework and the approach angles capable of the tracking of both straight and curved line are employed. Compared with existing literature on the control of multiple ocean vehicles with uncertainties, the proposed distributed control methodology is simply designed without using any function approximators and adaptive techniques to estimate uncertainties or their bounds. It is shown that the distributed containment errors are preserved within the predefined bounds of transient and steady-state performance in the Lyapunov sense.

Keywords: Distributed containment control, nonparametric uncertainty, preassigned performance, networked underactuated surface vessels

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