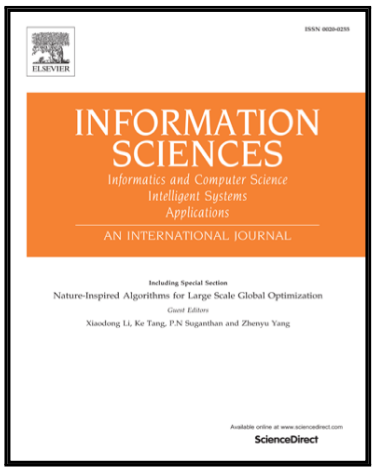

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Distributed Consensus Control for Multi-Agent Systems under Denial-of-Service

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Abstract

This paper investigates the problem of distributed consensus control for multi-agent systems under denial-of-service (DoS) attacks. Different from the existing results where DoS attacks on all the channels are same, in this paper, the adversaries compromise each channel independently. The objective is to design distributed controllers such that the consensus is still achieved in the presence of DoS attacks. Both state-feedback and observer-based controllers are considered. First, the decay rates under different attack modes are obtained by solving a class of linear matrix inequalities. Second, sufficient conditions on the duration of the DoS attacks, under which the consensus is still achieved, are proposed. The difficulty that there is no one-to-one match between the obtained decay rates and DoS duration limitations, is overcome by introducing the equivalent decay rates corresponding to channels. Moreover, the computational complexity is reduced greatly by introducing a novel scaling method. Finally, two examples are presented to illustrate the effectiveness of the proposed approaches.

Keywords: Multi-agent systems, Distributed consensus control, Observer-based controller, Linear matrix inequality, Denial-of-service attacks

1. Introduction

Cyber-physical systems (CPSs) has been intensively studied over the past few years, such as stability analysis [7, 18], sliding-mode observer [33], fault/attack detection [22], and control problems [21, 31], for its immense field of application, such as power grid systems, deep sea exploiting systems, and multi-agent systems (MASs).

Compared with the general computing systems where attacks limit their impact to the cyber realm, CPSs where attacks even can impact the physical world for the tight integra-

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