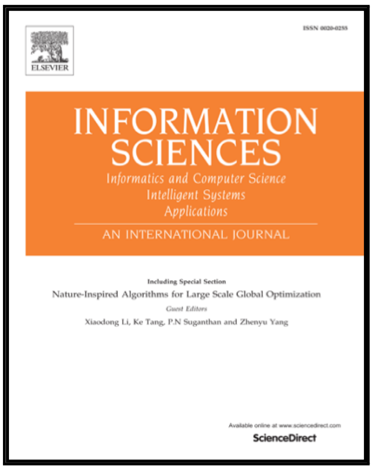
Accepted Manuscript



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PII: S0020-0255(18)30174-9
DOI: 10.1016/j.ins.2018.03.003
Reference: INS 13478

To appear in: *Information Sciences*

Received date: 6 September 2017
Revised date: 2 March 2018
Accepted date: 3 March 2018

Please cite this article as: Jia Wang, Xian-Ming Zhang, Yufeng Lin, Xiaohua Ge, Qing-Long Han, Event-triggered dissipative control for networked stochastic systems under non-uniform sampling, *Information Sciences* (2018), doi: 10.1016/j.ins.2018.03.003

Event-triggered dissipative control for networked stochastic systems under non-uniform sampling ☆

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Abstract

This paper is concerned with dissipative control for networked stochastic systems with an event-triggered transmission mechanism. Different from some existing results, signals from a physical plant are sampled *non-uniformly*. In order to save precious communication resources, a data-packet processor is introduced to choose necessary data-packets based on a flexible event-triggered condition. By establishing an integral inequality in stochastic setting, which is regarded as a counterpart of Wirtinger-based inequality, a criterion is derived such that the resultant closed-loop system is mean-square stable and dissipative. This criterion is then used to calculate suitable event-triggered controllers in terms of solutions to linear matrix inequalities. An air vehicle system is finally taken to substantiate the validity of the proposed method.

Keywords: Networked stochastic systems; dissipative control; event-triggered scheme; non-uniform sampling.

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1. Introduction

Networked control systems (NCSs) can be tracked back to 1950s when the first form of analog NCSs comes to the true, where an analog fly-by-wire flight control system is designed to 'eliminate the complexity, fragility, and weight of the mechanical circuit of hydromechanical flight control systems using an electrical circuit' [11]. With the rapid development of computer and networking technologies, analog NCSs expose more and more limitations in industrial applications, and the digital networked control systems come to the fore. Some significant advantages of an NCS are ascribed to low cost, ease of installation and maintenance, remote operations, high reliability and so on [17, 41, 43]. Up to date, NCSs have been widely applied in modern industrial control systems, and one can refer to [3, 19, 21, 32, 40].

Before an NCS is applied, the signals from physical plants should be sampled. For an ideal communication network, some better system performance is usually inherited from a small sampling period. However, due to limited network bandwidth, such a smaller sampling period definitely leads to more network-loads, which potentially make the network traffic congested. The congested network should be responsible for packet dropouts and long transmission delays, which are regarded as the main sources degrading the system performance including stability. Thus, it is significative to reduce network-loads as much as possible such that the network traffic is in a good condition while some desired system performance is ensured. There are two conspicuous ways to reduce the number of network-loads.

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