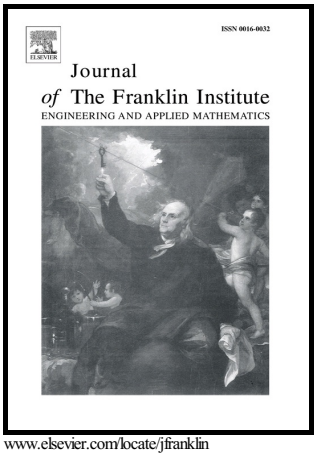

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Periodic Event-Triggered State-Feedback Control for Discrete-Time Linear Systems ☆

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Abstract

This paper investigates the periodic event-triggered control for discrete-time linear systems. The discrete-time plant denotes a combination of the continuous-time controlled plant, the sensors and the actuator. A general packaged component, event machine, is introduced to conduct the detection and judgement of the events. Then the periodic event-triggered control for the discrete-time system including a discrete-time plant, an event machine, a transmitter and a continuous static controller, exhibits some different behaviors from that for the continuous-time system. Especially, in this system, the sampling sequences and the event-verifying sequences may be independent from each other. Furthermore, according to the difference between the two sequences, the periodic event-triggered control system is classified into three cases, and the corresponding models are established for the three cases: a discrete-time perturbed linear system, a discrete time-delay system and a switched system, respectively. Moreover, the stability conditions for the three cases are proposed. Finally, a numerical example is given to illustrate the efficiency and feasibility of the obtained results.

Keywords: State feedback, event-triggered control, discrete-time plant, time-delay system.

1. Introduction

Recently, event-triggered control attracts more and more attention due to the advantages of reducing the number of control task executions and the cost of communication resources. In this control strategy, the control task is executed after the occurrence of a so-called event instead of a certain fixed period of time. The event is generated by the designed event-triggering condition, which is a state-related criterion. A number of results has shown that event-triggered control is more suitable for the resources limited controlled systems [1]-[3]. In general event-triggered control systems, the event-triggering conditions have to be monitored and verified continuously (see [4]-[17] and the references therein), and this type of event-triggered control was named by continuous event-triggered control in [19]. In [4]-[7], the authors studied the state-feedback event-triggered control from an input-to-state stable point of view, and proposed several types of event-triggering conditions to guarantee the asymptotic stability of the closed-loop systems. In [9]-[12], the authors investigated the event-triggered control with partial state or output feedback. In [16], the event-triggered state estimation problem was investigated for a class of complex networks with mixed time delays and a new event-triggered transmission scheme was proposed to reduce unnecessary network traffic between the sensors and the estimator. Recently, [14] and [15] formulated the event-triggered control system as a hybrid system,

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