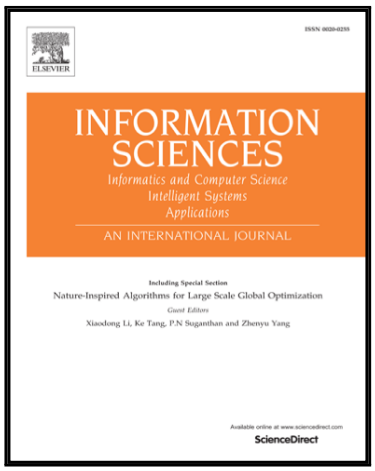

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Sampled-data synchronization of chaotic Lur'e systems via an adaptive event-triggered approach

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Abstract

In this paper, based on nonuniform sampling, the master-slave synchronization in a class of Lur'e systems is studied via using the sampled outputs of error system. Different from existing results, the transmission of control signals is determined by a novel adaptive event-triggered scheme, where the triggering thresholds depend on the dynamic behaviors of controlled systems rather than the predetermined constants as some traditional ones. Through choosing two augmented Lyapunov-Krasovskii functionals (LKFs), some delay-dependent synchronization criteria are formulated and the conservatism can be effectively reduced owing to the utilization of Wirtinger-based inequalities and delay-product-type LKF terms. Especially, the existence of the controller can be easily checked since the derived conditions are presented via LMI forms. Finally, two numerical examples with comparisons and simulations are given to illustrate the proposed results.

Key words: Chaotic Lur'e systems; master-slave synchronization; adaptive event-triggered scheme; sampled-data control; time-varying delay

1 Introduction

In past decades, the research on synchronization control of various chaotic systems has received considerable attention since the pioneering works of Pecora and Carroll were reported [1,20]. The works show that as some conditions are satisfied, a chaotic system (the slave system) may become synchronized to another identical one (the master system) if the master system sends some driving signals to the slave one. Presently, it is widely known that there exist many benefits of chaos synchronization in various engineering applications, such as teleoperation control, secure communication, and image processing. It is worth noting that the dynamical behaviors of chaotic systems are highly sensitive to small changes of initial values and the trajectories in phase space are bounded due to the presence of nonlinearity. Therefore, the problem on chaos synchronization has been widely investigated and a large number of elegant results have been reported [2,3,6,8,10,11,13,14,23–26,28,32,36–40].

Meanwhile, Lur'e system is an important theoretic model describing how nonlinear uncertainties reflect the dynamic behaviors in a system, which can include linear models and nonlinear ones as its special case and exhibit some chaotic behaviors [18,31]. Therefore, the synchronization in Lur'e systems has received considerable attention and many interesting results have been proposed [2,3,6,8,13,14,23–26,32,36–39]. The Ref. [6] studied two nonlinear Lur'e ones subject to control saturation and assumed that their outputs were measurable. In [36], two Lur'e networks of homogeneous dimensions were analyzed to tackle the master-slave synchronization only when the relative measurements were available. It is worth noting that time-delay is an inherent feature in physical processes and may lead to instability or significantly deteriorate system performance. Thus some works have tackled the time-delay Lur'e

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