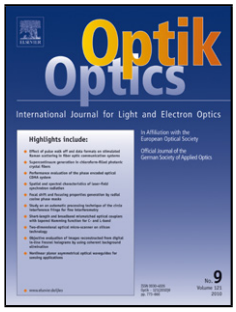

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Adaptive synchronization of two time-delayed fractional-order chaotic systems with different structure and different order

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Abstract: In this paper, the chaos synchronization of time-delayed fractional-order (FO) Lorenz chaotic systems and time-delayed FO Chen chaotic systems with different fractional derivative order is considered. First, by use of the fractional calculus techniques, we give the phase trajectories of the time-delayed FO Lorenz and time-delayed FO Chen chaotic systems. Then, combined the active control and adaptive control theory, a novel synchronization scheme, which includes the compensation controller and the optimal controller, is proposed for two time-delayed FO chaotic systems with different structure and different order in presence of parameter uncertainty. Based on the new version of FO Lyapunov stability theory, we design the compensation controllers and optimal controllers, respectively. Finally, numerical simulations have shown to illustrate the effectiveness and validation of the proposed method.

Key Words: Fractional-order chaotic systems, Time delay, Adaptive synchronization, Different structure and different order

1 Introduction

Recently, as one of the early classical chaotic synchronization technologies, the slave-master synchronization method has received considerable attention in view of its potential applications in many fields. Up to now, a wide variety of synchronization design methods has been proposed, such as synchronization using fuzzy control methods [1-2], fuzzy neural control for the synchronization of the chaotic systems [3], synchronization of chaotic systems in terms of sampled-data control [4] and so on. However all the above reference for the synchronization of integer order chaotic system. More recently, many synchronization control schemes for fractional-order chaotic systems have been proposed including active control [5], active sliding mode control [6], adaptive-impulsive control [7], fuzzy adaptive control [8], generalized projective synchronization [9] and the references therein.

Fractional-order dynamic systems have been largely investigated, including the stability analysis [10-12], controller design [13-15] and the discretization schemes [16]. Especially, fractional-order chaotic systems have attracted much attention, and many important results have