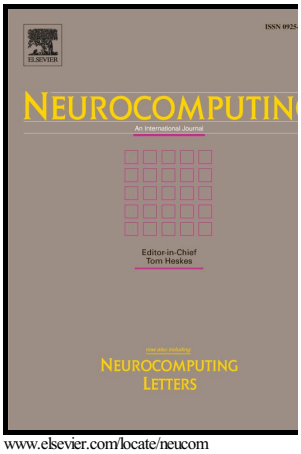

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Hybrid synchronization behavior in an array of coupled chaotic systems with ring connection ⋕

Xiangyong Chen[1,2], Jianlong Qiu[1,3],Jinde Cao[2,4],Haibo He[3]

[1] School of Science, Linyi University, Linyi, Shandong, 276005, China

[2] Department of Mathematics, Southeast University, Nanjing, Jiangsu, 210096, China

[3] Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, USA

[4] Department of Mathematics, Faculty of Science, King Abdulaziz University, Jeddah, Saudi Arabia

Abstract: In this paper, we investigate the hybrid synchronization behavior in an array of coupled chaotic systems with ring connection, of which means complete synchronization (CS) and anti-synchronization (AS) could coexist. First, the anti-synchronization controllers are designed, which can transform the synchronization error dynamic system into a nonlinear system with an antisymmetric structure. Second, we investigate the complete synchronization behavior in such a chaotic systems under the anti-synchronization control. After that, the stability conditions are given for reaching hybrid synchronization. Finally, numerical examples and simulation results are presented to verify and validate the hybrid synchronization behavior in coupled chaotic system.

Keywords: Chaotic system, state coupling, ring connection, hybrid synchronization behavior, anti-synchronization, complete synchronization

1. Introduction

Since the synchronization behavior in chaotic systems was investigated in the literature [1], this problem has become an interesting and important topic because of its useful applications on communications, automatic control and so on [2-4]. Nowadays, some synchronization models [5-10] have been studied in chaotic dynamical systems. In last several years, a new chaos synchronization behavior, which is considered as hybrid synchronization [11−25,37−38], is found in chaotic systems. In the new synchronization mode, one part of chaotic systems is completely synchronized and the others belongs to the anti-synchronization. The existence of hybrid synchronization can effectively enhance security in communication. Due to these reasons, To design the proper controller to reach the hybrid synchronization has become an important problems. Shi et al. [11, 12] analyzed the hybrid synchronization problem in two Lorenz systems with unknown parameters and time delay. Zhang et al. [13] investigated the coexistence of the anti-phase synchronization and complete synchronization in chaotic systems. Sundarapandian et al. [14] used sliding control technology to propose the hybrid

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†Corresponding author: Jianlong Qiu, E-mail:qiujianlong@lyu.edu.cn.