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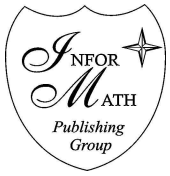

Global Stability of Phase Synchronization in Coupled Chaotic Systems

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Abstract: In analytical or numerical synchronizations studies of coupled chaotic systems, the phase synchronizations are less considered in the leading literatures. This paper is an attempt to find a sufficient analytical condition for the stability of phase synchronization in coupled chaotic systems. The method of nonlinear feedback function and the scheme of matrix measure have been used to justify this analytical stability, and tested numerically for the existence of the phase synchronization in some coupled chaotic systems.

Keywords: *chaos; phase synchronization; stability.*

Mathematics Subject Classification (2010): 37N35, 65P20, 65P99.

1 Introduction

Sensitivity to initial conditions is a generic feature of chaotic dynamical systems. Two chaotic systems starting from slightly different initial points in the state space separate away from each other with time. Therefore, how to control two chaotic systems to be synchronized has aroused a great deal of interest.

Recently, synchronization phenomena in coupled chaotic systems have received much attention [1–17]. Pecora and Carroll have shown [1–4] that in coupled chaotic systems a complete synchronization occurs if the difference between the various states of synchronized systems converges to zero. They have also shown that synchronization stability depends upon the signs of the conditional Lyapunov exponents: i.e., if all of the Lyapunov exponents of the response system under the action of the driver are negative, then there is a complete and stable synchronization between the drive and response systems.

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