Hindawi Publishing Corporation
Discrete Dynamics in Nature and Society
Volume 2011, Article ID 437156, 19 pages
doi:10.1155/2011/437156

Research Article

Generalized Projective Synchronization for Different Hyperchaotic Dynamical Systems

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Received 14 July 2011; Accepted 24 August 2011

Academic Editor: Recai Kilic

Projective synchronization and generalized projective synchronization have recently been observed in the coupled hyperchaotic systems. In this paper a generalized projective synchronization technique is applied in the hyperchaotic Lorenz system and the hyperchaotic Lü. The sufficient conditions for achieving projective synchronization of two different hyperchaotic systems are derived. Numerical simulations are used to verify the effectiveness of the proposed synchronization techniques.

1. Introduction

Chaos is an interesting phenomenon in nonlinear dynamical systems research area. In the last three decades, chaos has been extensively studied within the scientific, engineering, and mathematical communities [1–6].

A chaotic system is a nonlinear deterministic system that displays complex, noisy-like and unpredictable behavior. These motions are trajectories in which infinite unstable periodic orbits (UPOs) are embedded. Chaos is generally undesirable in many fields. This irregular and complex phenomenon can lead systems to harmful or even catastrophic situations. In these troublesome cases chaos should be suppressed as much as possible or totally eliminated. Therefore controlling chaos has become one of the most considerable research area in the nonlinear problems ranging from biology, physics and chemistry to economics.

Since Pecora and Carroll [7, 8] showed that it is possible to synchronize two identical chaotic systems, chaos synchronization has been intensively and extensively studied due to its potential applications in secure communication, ecological systems, system identification, and so forth.

Among all kinds of chaos synchronizations, projective synchronization is one of the most noticeable ones. This kind of synchronization was first observed in continuous systems