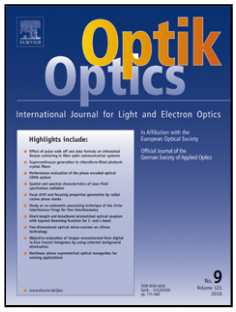

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Controlling unstable periodic orbits in complex dynamical networks with chaotic nodes

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Abstract

This paper is concerned with the problem of high order stabilization in a class of complex dynamical networks (CDNs). This class of CDNs is represented by scale-free networks with chaotic nodes. The main idea is to apply a nonlinear control method that offers the possibility of stabilizing the desired unstable periodic orbits of continuous-time chaotic systems for each node in the network. Numerical examples are presented to demonstrate the effectiveness of the proposed control strategy.

Keywords: Complex dynamical networks, high-order control, unstable periodic orbits, Poincaré section, scale-free network.

1. Introduction

In the past two decades, and with the growing demand for modeling real-world complex systems, complex dynamical networks (CDNs) have been a subject for an important research work in different disciplines such as Internet, social networks, ecological networks, scientific collaboration networks, acquaintance networks, etc. [1, 2]. Typically, CDNs are characterized by two topological structures, known as the coupled map lattice (CML) [3] and the cellular neural network (CNN) [4]. In order to better describe a variety of real life complex systems, Watts and Strogatz [5] proposed the concept of the so-called small-world network. The connectivity distribution in this network representation is homogeneous, which peaks at an average value and decays

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