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Dual Phase Synchronization of Chaotic Systems Using Nonlinear Observer Based Technique

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Abstract: The present paper reports an investigation on dual phase synchronization results among chaotic systems with nonlinear observer controller. The dual phase synchronization is achieved using the nonlinear state observer technique and the stability theory. The Qi system and the Newton-Leipnik system are considered during the demonstration of dual phase synchronization. The nonlinear state observer technique is found to be very effective and convenient to achieve dual phase synchronization of various types of chaotic systems. Numerical simulation and graphical results demonstrate the effectiveness of the control technique during dual phase synchronization among chaotic systems.

Keywords: *dual synchronization, phase synchronization, chaotic systems, nonlinear state observer technique.*

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1 Introduction

Chaos theory is a developing field since 1970 and still the theory has not yet been understood very well. If a dynamical system is bounded and has infinite recurrences with dependency on initial conditions, then it is known as chaotic [1]. Several researchers have studied chaotic dynamical systems in various fields and effect of chaos in nonlinear dynamics is studied during the last few years. This effect is most common and has been detected in a number of dynamical systems of various types of physical nature. Chaos theory is also used to analyze the problems of dynamical and non-linear dynamical systems related with complex networks which are generally used in biological and social systems in ecology, medicine and in the field of business strategy. The most important achievement in the research of chaos is that chaotic systems can be made to synchronize with each other. The first idea of synchronization of two identical chaotic systems was

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