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CHAOS SYNCHRONIZATION OF THE 4D HYPERCHAOTIC LORENZ STENFLO SYSTEM

Rezzag Samia

Department of Mathematics and Informatics,
University Larbi Ben M'hidi, 04000, Oum-El-Bouaghi, Algeria
E-mail: rezzag.samia@gmail.com

Abstract. In this paper, we study the completely chaos synchronization of the hyperchaotic Lorenz Stenflo system. By employing a linear feedback controller with two variables, an exact threshold is given with the system parameters based on its boundedness. Finally, some numerical simulations are presented to show the effectiveness of the proposed chaos synchronization scheme.

Keywords. Hyperchaotic Lorenz Stenflo system, Boundedness of solutions, Synchronization, Chaos and Hyperchaos.

AMS (MOS) subject classification: Primary 65P20, 65P30, 65P40.

1 Introduction

Since Lorenz found the well-known Lorenz chaotic system [5], chaotic dynamics has attracted tremendous research interests, and many chaotic and hyperchaotic systems have been presented. Hyperchaotic system is usually defined as a chaotic system with more than one positive Lyapunov exponent. It is even more complicated than chaotic systems and has more unstable manifolds. At the same time, due to its theoretical and practical applications in technological fields, such as secure communications [18], lasers [19], nonlinear circuits [15], control [16], synchronization [17], hyperchaos has recently become a central topic in the research of nonlinear sciences.

In particular, ultimate boundedness of a chaotic system is very important for the researchers to study the qualitative behavior of a chaotic system. If one can show that a chaotic or a hyperchaotic system has a global attractor, then one knows that the system cannot have equilibrium points, periodic or quasi-periodic solutions, or other chaotic attractors outside the global attractor.

Such an estimation is quite difficult to achieve technically, however, several works on this topic were realized for some 3D and 4D dynamical systems [1], [7], [8], [2], [3], [4], [6], [9], [10], [13], [14].

The complete synchronization of chaotic systems (A) and (B) is described as follows. If the chaotic system (A) is called the master or driver system and