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Reduced Order Multiswitching Synchronization between Two Hyperchaotic Systems of Different Order

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Abstract: In this paper, we have investigated the problem of reduced order multiswitching synchronization using the active control method. Reduced order multiswitching synchronization can be considered as a combination of multi-switching with reduced order synchronization. Apt controllers have been constructed to establish the asymptotically stable synchronized state by using different laws of switching and Lyapunov stability theory. To analyze the proposed methodology, a six-dimensional Lorenz model and four-dimensional hyper-chaotic coupled dynamos system have been considered as a drive and response system, respectively. Theoretical results are validated by numerical simulations performed in MATLAB.

Keywords: *multiswitching synchronization; reduced order synchronization; Lyapunov stability theory; Lorenz model; dynamos system.*

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1 Introduction

Nonlinear dynamical systems manifest extreme sensitive dependence on initial conditions [1]. Different aspects of nonlinear dynamical systems such as chaos, stability, bifurcation, Poincare surface and synchronization have many useful applications in the modelling of brain activity [8], secure communication [11], information processing [10], medicine[8, 9], signal processing [10] and chemical networks. This has led to the discovery of various kinds of synchronization such as projective synchronization [6], reduced order synchronization [3], generalized synchronization, lag synchronization [5], phase synchronization [4], complete synchronization [7], anticipated synchronization and increased order synchronization [2].

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