



# Anti Difference Multiswitching Compound–Compound Combination Synchronization of Seven Chaotic Systems

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Accepted: 10 September 2021

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## Abstract

In this paper, a new scheme of anti difference multiswitching compound compound combination synchronization for achieving synchronization between seven chaotic systems has been proposed. This novel scheme of synchronization involves five drive systems and two response systems and its first of a kind. Due to multiswitching of signals, the security of signals transmitted through the systems enhances. Nonlinear controllers have been designed and synchronization has been achieved between the drive and response systems using Lyapunov stability criteria. Theoretical results have been given and numerical simulations have been performed using MATLAB to show the effectiveness of the proposed method.

**Keywords** Chaos synchronization · Compound synchronization · Combination–combination synchronization · Lyapunov stability

**Mathematics Subject Classification** 34A08 · 34D06 · 34H10

## Introduction

Synchronization of chaos has become an important area of research due to its applications in various fields such as physics, chemistry, engineering, economics, ecology, medicine, geology, secure communication and many more [1–10]. The first attempt of synchronizing the chaotic systems was made by Pecora and Carroll in 1990 [11]. Lot of work has been done after this for synchronizing both identical and non identical chaotic and hyper-chaotic systems. Various synchronization methods such as complete synchronization, anti synchronization, hybrid synchronization, hybrid projective synchronization, function projective synchronization, lag synchronization, phase and antiphase synchronization have been adopted [12–18] and several schemes of synchronization such as adaptive control,

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