



# A New Approach To Synchronize Different Dimensional Chaotic Maps Using Two Scaling Matrices

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**Abstract:** In this paper, a new type of synchronization, called  $\Theta$ – $\Phi$  synchronization, is introduced for different chaotic discrete-time systems using two scaling matrices. The proposed synchronization approach allows us to study synchronization between two different dimensional discrete-time chaotic systems in different dimensions. By using Lyapunov stability theory and stability property of linear discrete-time systems, some control schemes are proposed and new synchronization results are derived. To verify the effectiveness of our approach, numerical example and simulations are given.

**Keywords:** *synchronization; chaotic maps; hyperchaotic maps; different dimensions; scaling matrices.*

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## 1 Introduction

Over the last two decades, many scholars have proposed various control schemes in chaos synchronization [1–6], but the most of works have concentrated on continuous-time rather than discrete-time chaotic systems. Recently, synchronization of chaotic and hyperchaotic maps has attracted a great deal of interest of applied scientists and engineers due to its potential applications in cryptology and secure communication [7–10]. Different methods have been developed to study the synchronization in discrete-time chaotic dynamical systems [11–13].

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