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Linear Chaos Control of Fractional Generalized Hénon Map

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Abstract: This paper is concerned with the topic of chaos control in fractional maps. It presents two linear control laws to stabilize the dynamics of a new three-dimensional fractional Hénon map. The chaos control has been achieved by proving a new theorem, based on a suitable Lyapunov function and a linear method. Finally, numerical simulations have been carried out to highlight the effectiveness of the proposed control method.

Keywords: *discrete fractional calculus; fractional generalized Hénon map; linear control; Lyapunov method.*

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1 Introduction

Recently, researchers have diverted their attention to the discrete-time case of fractional calculus and attempted to put together a complete theoretical framework for the subject [1]. Perhaps one of the earliest works is that of Diaz and Olser [2]. Successively, several types of discrete operators have been proposed, including some fractional *h-difference* operators, which represent further generalizations of the fractional difference operators [3–5]. Furthermore, numerical formulas and stability conditions corresponding to fractional difference systems can be found in [6,7]. Most recently, some advances have been made in the applications of discrete fractional calculus [8]. The introduction of different discrete fractional operators has led to the publication of several papers regarding the chaotic behaviors of fractional nonlinear maps [9–17].

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