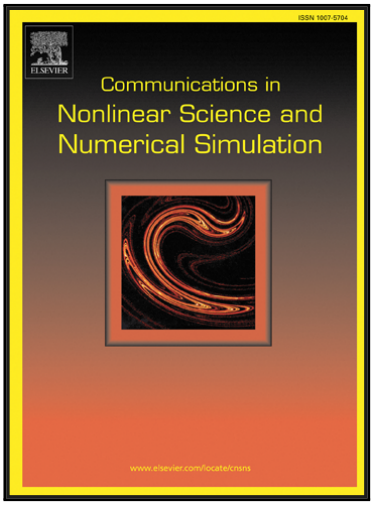

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Asymptotic stability of distributed order nonlinear dynamical systems

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Abstract

In this article we present a generalization of the Lyapunov direct method for distributed order nonlinear time-varying systems. By extending recently introduced properties of the Caputo fractional derivative to the distributed order case, we provide various ways to determine the stability or asymptotic stability of certain systems. The fractional results that inspired this work are recovered if an appropriate distribution function is chosen. Some examples are given to validate the obtained results.

Keywords: Distributed order fractional nonlinear dynamical system; Fractional-order Lyapunov direct method; Asymptotic stability.

1. Introduction

In recent years, distributed order fractional calculus has gained the attention of researchers because it allows to build more adequate models for certain dynamical systems. This branch of mathematics was first proposed by Caputo [1] and widely studied by him and others [2, 3]. Since then, various applications of the distributed order calculus have appeared, including [4, 5, 6, 7, 8, 9, 10].

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