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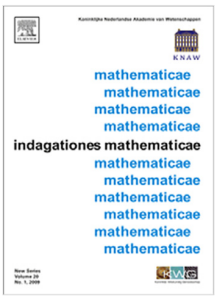

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Abdourazek Souahi, Abdellatif Ben Makhlouf, Mohamed Ali Hammami

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Stability analysis of conformable fractional-order nonlinear systems

Abdourazek Souahi [*], Abdellatif Ben Makhlouf [†], Mohamed Ali Hammami [‡]

Abstract

In this paper, we study the stability and asymptotic stability of conformable fractional-order nonlinear systems by using Lyapunov function.

Keywords: Conformable fractional derivative, fractional exponential stability, asymptotic stability.

1 Introduction

In recent years, the subject of fractional calculus has gained considerable popularity and importance due mainly to its demonstrated applications in numerous seemingly diverse and widespread fields of science and engineering. On the monographs [13, 21, 23] the reader can find excellent sources of the theory aspect alongside numerous examples of applications in physics, chemistry, aerodynamics and thermo-elasticity. In the last two decades, there has been a rapid development in the theoretical aspects such as periodicity, asymptotic behavior, controllability and many others.

As the qualitative aspect of the ordinary and fractional differential equations, the development of fixed point theory, Lyapunov theory and the introduction of Mittag-Leffler function permitted to establish various and significant results in the stability, the exponential stability, and Mittag-Leffler stability on many systems, the reader is kindly referred to [3, 4, 6, 7, 8, 9, 10, 12, 14, 15, 16, 19, 20, 22] and the references therein.

Recently, in [11], R. Khalil et al. defined a new simple derivative called "the conformable fractional derivative", later in [1] T. Abdeljawad developed it more, and is currently under great investigations, see [17, 24, 25, 26, 27, 28, 29, 30, 31], and others. Indeed, both Riemann Liouville (RL) and Caputo definitions share some weaknesses, for example: the property $D^{\alpha}_{RL}(1) = 0$ is not satisfied with the RL derivative. In

[*]University of 8 May 1945 Guelma, Algeria Laboratory of Applied Mathematics and Modeling, University of 8 May 1945 Guelma, P.O. Box 401, 24000 Guelma, Algeria

[†]Department of Mathematics, Faculty of Sciences of Sfax, Route Soukra, BP 1171, 3000 Sfax, Tunisia

[‡]Department of Mathematics, Faculty of Sciences of Sfax, Route Soukra, BP 1171, 3000 Sfax, Tunisia