Nonlinear Dynamics and Systems Theory, **24** (5) (2024) 495–504

Conformable Fractional Khalouta Transform and Its Applications to Fractional Differential Equations

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Received: February 24, 2024; Revised: September 30, 2024

Abstract: In 2023, the author [6] introduced a new integral transform called the Khalouta transform which is a generalization of many well-known integral transforms. In this paper, our aim is to generalize the formula of the Khalouta transform to the conformable fractional order. Moreover, we present and prove some main properties and theorems related to the conformable fractional Khalouta transform. In order to illustrate the validity, efficiency, and applicability of the proposed technique, we apply the conformable fractional Khalouta transform to solve some fractional differential equations. Finally, the results show that our new technique is powerful, effective, and applicable for the both conformable fractional problems.

Keywords: *fractional differential equations; Khalouta transform; conformable fractional derivative; exact solutions.*

Mathematics Subject Classification (2010): 34A08, 26A33, 70K75, 93-06.

1 Introduction

Fractional differential equations are a very important mathematial tool for modeling many applications in real life sciences and engineering such as fluid dynamics, mathematical biology, electrical circuits, optics, quantum mechanics, biophysics, wave theory, polymers, continuum mechanics, etc. [1, 4, 5, 7, 11–13]. There are many definitions of fractional derivatives and integrals used in many applications and natural phenomena such as Riemann–Liouville [10], Liouville–Caputo [9], Caputo–Fabrizio [3], Atangana–Baleanu [2] derivatives and so on. In 2014, Khalil et al. [8] introduced a new definition of the fractional derivative which is called the conformable fractional derivative, and it

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