A New Representation of Exact Solutions for Nonlinear Time-Fractional Wave-Like Equations with Variable Coefficients

A. Khalouta* and A. Kadem

Laboratory of Fundamental and Numerical Mathematics,
Departement of Mathematics, Faculty of Sciences,
Ferhat Abbas Sétif University 1, 19000 Sétif, Algeria.

Abstract: In this paper, we give a new representation of exact solutions for nonlinear time-fractional wave-like equations with variable coefficients using a recent and reliable method, namely the fractional reduced differential transform method (FRDTM). Using the FRDTM, it is possible to find solution for this type of equations in the form of infinite series, this series in closed form gives the exact solution. It has been proven that the FRDTM is a convenient and effective method in its application. The accuracy and efficiency of the method is tested by means of three numerical examples.

Keywords: *nonlinear time-fractional wave-like equations; Caputo fractional derivative; fractional reduced differential transform method.*

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1 Introduction

The nonlinear fractional partial differential equations (NFPDEs) are increasingly used to model many problems in mathematical physics, including electromagnetics, fluid flow, diffusion, quantum mechanics, damping laws, viscoelasticity and other applications. Exact solutions of NFPDEs are sometimes too complicated to be attained by conventional techniques due to the computational complexities of nonlinear parts involving them. Therefore, for the study of solution of NFPDEs there are variety of analytical and approximate methods found in literature. Among them most useful and common methods are: the Adomian decomposition method (ADM) [8], variational iteration method

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* Corresponding author: `mailto:nadjibkh@yahoo.fr`