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Discrete Chebyshev polynomials for nonsingular variable-order fractional KdV Burgers’ equation. (English) Zbl 07376663

Summary: In this article, nonlinear variable-order (VO) fractional Korteweg-de Vries (KdV) Burgers’ equation with nonsingular VO time fractional derivative is introduced and discussed. The approximate solution of the expressed problem is obtained in the form of a series expansion in terms of the shifted discrete Chebyshev polynomials (CPs) with great accuracy. The method is a computational procedure based on the collocation technique and the shifted discrete CPs together with their operational matrices (ordinary and VO fractional derivatives). The main advantage of the designed approach is that it provides a global solution for the problem. In order to examine the efficiency of the designed algorithm, some numerical problems have been provided. The obtained solutions confirm that the present method is computationally effective and sufficiently accurate in solving this equation.

MSC:
35R11 Fractional partial differential equations
35C10 Series solutions to PDEs
35Q53 KdV equations (Korteweg-de Vries equations)

Keywords:
discrete Chebyshev polynomials; operational matrices; variable-order (VO) fractional KdV Burgers’ equation

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