Heydari, M. H.; Avazzadeh, Z.
Fibonacci polynomials for the numerical solution of variable-order space-time fractional Burgers-Huxley equation. (English) Zbl 07382912

Summary: In this article, the variable-order (VO) space-time fractional version of the Burgers-Huxley equation is introduced with fractional differential operator of the Caputo type. The collocation technique based on the Fibonacci polynomials (FPs) is developed for finding the approximate solution of this equation. In order to implement the presented method, some novel operational matrices of derivative (including ordinary and fractional derivatives) are extracted for the FPs. Moreover, the roots of the Chebyshev polynomials of the first kind are chosen as the collocation points which reduce the equation to a system of algebraic equations more efficiently. Ultimately, we obtain the solution of the VO space-time fractional Burgers-Huxley equation in terms of the FPs. The devised method is validated by finding an error bound for the truncated series of the Fibonacci expansion in two dimensions. The accuracy of approximation is verified through various illustrative examples.

MSC:
65-XX Numerical analysis
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Burgers-Huxley equation; Fibonacci polynomials (FPs); operational matrices; variable-order (VO) fractional derivative

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