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Legendre wavelets based numerical algorithm for simulation of multidimensional Benjamin-Bona-Mahony-Burgers and Sobolev equations. (English) Zbl 1446.65129

Summary: In this work, a numerical algorithm is developed with the help of Legendre wavelets and the quasilinearization method for the simulation of Multidimensional Benjamin-Bona-Mahony-Burgers (BBMB) and Sobolev equations. Initially, the nonlinear equation is linearized by a quasilinearization method and then Legendre wavelets are used for both space and temporal discretization. The algorithm is developed without the aid of finite difference method to preserve the accuracy of the Legendre wavelets. In numerical experiments, time dependent 1D, 2D and 3D problems are considered to check the accuracy and efficiency of the algorithm. A comparison is made with the analytical and numerical solutions available in the literature. It is concluded that the present algorithm without finite difference based Legendre method gives better results than finite difference based Haar wavelet methods for time dependent 2D-BBMB and 2D-Sobolev equations also. Numerical experiments reveal that the proposed algorithm produces more accurate results even with comparatively coarser grids.

MSC:
65M70 Spectral, collocation and related methods for initial value and initial-boundary value problems involving PDEs
65T60 Numerical methods for wavelets
35Q53 KdV equations (Korteweg-de Vries equations)

Keywords:
3D Benjamin-Bona-Mahony-Burgers equation; 3D-Sobolev equation; Chebyshev wavelet; collocation method; Legendre wavelet; quasilinearization

Software:
Algorithm 862

Full Text: DOI

References:
[10] Arora, G.; Mittal, R. C.; Singh, B. K., Numerical solution of BBM-Burger equation with quartic B-spline collocation method,


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