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A meshfree interpolation method for the numerical solution of the coupled nonlinear partial differential equations. (English) Zbl 1244.65193

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Summary: This paper formulates a simple classical radial basis functions (RBFs) collocation (Kansa) method for the numerical solution of the coupled Korteweg-de Vries (KdV) equations, coupled Burgers' equations, and quasi-nonlinear hyperbolic equations. Contrary to the mesh oriented methods such as the finite-difference and finite element methods, the new technique does not require mesh to discretize the problem domain, and a set of scattered nodes provided by initial data is required for realization of solution of the problem. Accuracy of the method is assessed in terms of the error norms L_2, L_∞ , number of nodes in the domain of influence, time step length, parameter free and parameter dependent RBFs. Numerical experiments are performed to demonstrate the accuracy and robustness of the method for the three classes of partial differential equations (PDEs).

MSC:

- 65N35 Spectral, collocation and related methods for boundary value problems involving PDEs Cited in 23 Documents
- 76M25 Other numerical methods (fluid mechanics) (MSC2010)

Keywords:

RBFs; coupled KdV equations; coupled Burgers equations; nonlinear hyperbolic system; multiquadric (MQ); quintics

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