

Multi-symplecticity of the centred box scheme for PDEs and quasi-periodically solitary waves.

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ABSTRACT:

In this talk the multi-symplectic integrator for a class of Hamiltonian PDEs depending explicitly on time and spatial variables (nonautonomous Hamiltonian PDEs) is defined, and the multi-symplecticity of the centred box scheme for this kind of Hamiltonian PDEs is proven. We give an application of the result to (periodic) quasi-periodic variable coefficient Korteweg-de Vries (qpKdV) equation, which is known to have a physical application in the propagation of surface waves in straits or channels with quasi-periodic varying depth and width in the time direction. We derive a multi-symplectic scheme for qpKdV equation in terms of the multi-symplecticity of the centred box scheme, then make use of it to simulate numerically the (periodically) quasi-periodically solitary wave of the equation. Numerical experiments are presented in illustration of the multi-symplectic scheme of qpKdV equation stemming the centred box discretization.