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A fourth-order explicit schemes for the coupled nonlinear Schrödinger equation. (English)

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Summary: We derive numerical methods for solving the coupled nonlinear Schrödinger equation. We discretize the space derivative by central difference formulas of fourth-order. The resulting ordinary differential system is solved by the fourth-order explicit Runge-Kutta method. Neumann and periodic boundary conditions are used. The method is tested for accuracy and the conserved quantities. These methods conserve the three conserved quantities exactly for at least five decimal places. A comparison has been made with some existing methods.

MSC:

- 65M06 Finite difference methods for initial value and initial-boundary value problems involving PDEs
- 35Q55 NLS equations (nonlinear Schrödinger equations)
- 65M20 Method of lines for initial value and initial-boundary value problems involving PDEs
- 65L06 Multistep, Runge-Kutta and extrapolation methods for ordinary differential equations

Cited in 18 Documents

Keywords:

coupled nonlinear Schrödinger equation; Runge-Kutta method; interaction of two solitons; finite difference method; semidiscretization; numerical examples; comparison of methods

Full Text: DOI

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