Discontinuous Galerkin and multiscale variational schemes for a coupled damped nonlinear system of Schrödinger equations

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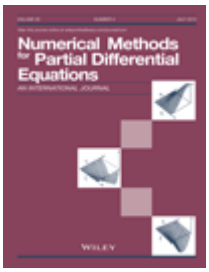

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Abstract

In this article, we study a streamline diffusion-based discontinuous Galerkin approximation for the numerical solution of a coupled nonlinear system of Schrödinger equations and extend the resulting method to a multiscale variational scheme. We prove stability estimates and derive optimal convergence rates due to the maximal available regularity of the exact solution. In the weak formulation, to make the underlying bilinear form coercive, it was necessary to supply the equation system with an artificial viscosity term with a small coefficient of order proportional to a power of mesh size. We justify the theory by implementing an example of an application of the time-dependent Schrödinger equation in the coupled ultrafast laser. © 2013 Wiley Periodicals, Inc. Numer Methods Partial Differential Eq, 2013

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