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A Parallel Time-Propagation Solver for the Non-Linear Schroedinger Equation. NICOLAI NYGAARD, TAPIO SIMULA, University of Aarhus, BARRY I. SCHNEIDER, National Science Foundation — We describe a powerful numerical method for solving the time-dependent non-linear Schrödinger equation. Our method is based on the finite-element discrete variable representation. The time-propagation is facilitated either by the Lanczos-Arnoldi method or by split-operator formulas of different orders. The ground-state solution is found by propagation in imaginary time using an adaptive time stepping algorithm, and the absolute convergence of the propagation is faithfully characterized by a positive-definite error norm. Parallelization of this method is transparent, and we have utilized an MPI implementation demonstrating linear scaling of wall-clock computation time with the number of processors used.

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