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Review text:

Nonlinear time-depenendent Schroedinger equation (general: with x-dependent "metric" or "mass" and with a virtually arbitrary interaction part) is considered on a d-dimensional unit cube which is discretized to a d-dimensional equidistant mesh. The standard replacement of derivatives by the (central) differences (leap-frog scheme) or its inessential modification (DuFort-Frankel scheme) are interpreted as special cases of a general second-order explicit "three-level" scheme, clearly preferrable in the parallel computing architecture.

Within this framework, two theorems are proved which transfer the continuous conservation laws to the discrete case. As a consequence this is shown to establish the conditional stability (related to a bound on the time step) for both the special schemes. The more usual (=spectral) analysis of stability re-confirms the same conclusion. The authors also propose a third scheme with a weaker sensitivity to the form of the interaction.

The key theorems 3 and 4 formulate the conditions of convergence and offer the error estimates up to d=3. The proof is organized in an unfortunate (circular?) arrangement but a numerical illustration is also given for solvable d=1 and d=2 examples. It indicates a slight preference of the leap-frog scheme. At this point the reader reveals a "hidden inspiration" of the whole study by the Wu's 1996 paper (quoted as ref. [12]) which arrived at an opposite recommendation. The source of the misunderstanding is found in the inapplicability of the Wu's spectral stability analysis to the DuFort-Frankel scheme in the "non-commutative" case with the variable mass.