Abstract Submitted
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A Nonlinear Finite Difference Scheme for the Time-Dependent Schrodinger Equation[1] RONALD MICKENS — In general, the time-dependent Schrodinger equation (TDSE) cannot be explicitly solved for an arbitrary boundary and/or initial value problem. One resolution of this difficulty is to construct discrete models of this equation and use them to calculate numerical solutions. We consider the case of the TDSE, in one space dimension, and demonstrate that a nonlinear finite difference scheme can be formulated. We study its various limiting forms and compare their mathematical properties with those of the corresponding ordinary and partial differential equations. A formal solution is presented for the fully discrete TDSE. We discuss the basis of this nonlinear discretization within the framework of the nonstandard finite difference methodology created by Mickens [1] and the work of Bhattacharya [2].

[1] R. E. Mickens, Nonstandard Finite Difference Models of Differential Equations (World Scientific, Singapore, 1994).
[2] M. C. Bhattacharya, Applied Mathematical Modeling 10 (1986), 68-70.

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