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Summary: The Klein-Gordon equation on an infinite two dimensional strip is considered. Numerical computation is reduced to a finite domain by using the Hagstrom-Warburton (H-W) absorbing boundary conditions (ABCs) with free parameters in the formulation of the auxiliary variables. The spatial discretization is achieved by using fourth order finite differences and the time integration is made by means of an efficient and easy to implement fourth order exponential splitting scheme which was used by Alonso-Mallo and Portillo (2016) considering the fixed Padé parameters in the formulation of the ABCs. Here, we generalize the splitting time technique to other choices of the parameters. To check the time integrator we consider, on one hand, four types of fixed parameters, the Newmann’s parameters, the Chebyshev’s parameters, the Padé’s parameters and optimal parameters proposed in Hagstrom et al. (2007) and, on the other hand, an adaptive scheme for the dynamic control of the order of absorption and the parameters. We study the efficiency of the splitting scheme by comparing with the fourth-order four-stage Runge-Kutta method.

MSC:
65M20 Method of lines for initial value and initial-boundary value problems involving PDEs
35Q40 PDEs in connection with quantum mechanics
65M06 Finite difference methods for initial value and initial-boundary value problems involving PDEs
65L06 Multistep, Runge-Kutta and extrapolation methods for ordinary differential equations

Keywords:
splitting methods; absorbing boundary conditions; dispersive waves; auxiliary variables; artificial boundary; finite differences; semidiscretization; Klein-Gordon equation; Runge-Kutta method

Full Text: DOI

References:


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