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A family of absolutely stable difference scheme with two parameters for a class of evolution equations. (Chinese. English summary) [Zbl 1020.65045]

This paper presents a three-level implicit difference scheme with two parameters \((\alpha, \beta)\) for the linear one-dimensional evolution equation \(u_t = a\partial_x^{2m+1}u\) with periodic boundary condition, where \(a\) is a constant. The scheme is shown to have a truncation error of \(O((\Delta t)^2 + (\Delta x)^4)\). Moreover, when \(\alpha = 1/2\) and \(\beta = 0\), the scheme results in a two-level difference scheme. Using the Fourier analysis and Miller’s theorem, the author proves the absolute stability of the scheme.

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MSC:

65M06 Finite difference methods for initial value and initial-boundary value problems involving PDEs
65M12 Stability and convergence of numerical methods for initial value and initial-boundary value problems involving PDEs
65M15 Error bounds for initial value and initial-boundary value problems involving PDEs
35K30 Initial value problems for higher-order parabolic equations

Keywords:
evolution equation; difference scheme; error bound; absolute stability