

On the numerical solution of a telegraph equation by difference schemes

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Abstract: In this study, the following initial-value problem for a telegraph equation

$$\frac{d^2u(t)}{dt^2} + \alpha \frac{du(t)}{dt} + Au(t) + \beta u(t) = f(t), \quad 0 \leq t \leq T$$
$$u(0) = \phi, \quad \frac{\partial}{\partial t} u(0) = \psi.$$

In a Hilbert space H with the self-adjoint positive operator A is investigated. The first and second order of accuracy difference schemes are presented. The stability estimates for the solutions of these difference schemes are established. Some results of numerical experiments are presented in order to support theoretical statements. The obtained results are discussed by comparing with other existing numerical solutions.

Keywords: Initial value problem, telegraph equation, numerical solution.

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