

An Operator-difference Scheme for Hyperbolic PDEs with Significant First-order Derivative Term

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An abstract Cauchy problem for hyperbolic equations containing the operator $A(t)$ with significant first-order derivative term is considered. This operator is unbounded self-adjoint positive linear operator with domain in an arbitrary Hilbert space. A second-order absolutely stable difference scheme is developed for solving the problem. The stability estimates for the solution of this difference scheme is presented. To support the theoretical statements for the solution of this difference scheme, various numerical examples are tested and the results are compared with other published numerical solutions obtained via a variety of methods. The modified difference scheme is applied for finding the transient response of a single phase lossy transmission line.