

Difference functional inequalities and applications

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We investigate difference functional inequalities generated by initial boundary value problems for hyperbolic nonlinear differential functional systems. We use these results to prove the theorem on the error estimates of approximate solutions for functional difference weighted schemes. The proof of the convergence is based on the stability of difference equation with initial condition. It is well known that with the adopted proof technique the convergence is equivalent to the stability of difference schemes.

In theorems on the convergence of explicit functional difference methods for (1), (2) we need assumptions on the mesh which are known as the (CFL) conditions. In our investigations we need the (CFL) condition which depends on the weight values. The conclusion of the theoretical analysis carried out in the paper is that only the strong implicit method is unconditionally stable. The same conclusions can be found in the papers [1]-[4] for the nonlinear parabolic partial differential equations of the second order. Nevertheless the numerical experiments show that the (CFL) condition, required in the adopted method of proof, is only sufficient but not necessary.

References

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