STUDY OF THE BDF-DGFE METHOD FOR THE SOLUTION OF THE COMPRESSIBLE NAVIER-STOKES EQUATIONS

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Abstract

Our aim is to developed a sufficiently robust, accurate and efficient numerical scheme for the simulation of a viscous compressible flow, which is described by the system of the *Navier-Stokes equations*. Among several types of numerical schemes the *discontinuous Galerkin finite element* (DGFE) method seems to be a promising technique for the discretization of this system. DGFE method is based on a discontinuous piecewise-polynomial approximation. The main advantages of this approach are the discontinuous approximation (important for transonic flow regimes), high order of approximation, local character of the method and easy parallelization.

Within this contribution we present a semi-implicit numerical scheme which is based on DGFE method for the space semi-discretization and the *backward difference formula* (BDF) for the time discretization presented in [1]. A suitable *linearization* of inviscid as well as viscous fluxes leads to a linear algebraic problem at each time step which should be solved by a suitable solver.

We study the implementation and algoritmization aspects of this approach, namely the choice of basis functions, matrix solver and preconditioning of the linear algebraic problem. We present several numerical examples.

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References

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