Strategies for the Development of Efficient, High-Order Accurate Residual Distribution Schemes for the Solution of Compressible Flow Problems

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We present graph and mesh partitioning technique for the distribution of unstructured meshes used in the massively parallel, robust, parameter free and high-order accurate schemes for the numerical solution of hyperbolic systems for steady compressible flow problems. The flow problems described by the hyperbolic partial differential equations are solved using the residual distribution (RD) schemes. A robust and high-order accurate RD method which can be viewed as a stabilized finite element method without using tuning parameter for the stabilization is obtained by solving the system of equations with an iterative method. This creates a large sparse linear system which must be solved at each time step. Investigation for the iterative convergence which must be good in order to get spatially accurate solutions and the choice of right preconditioner to accelerate the converge of the iterative linear solvers used in the numerical solution of compressible flows are presented.

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