Darbandi, M.; **Schneider, G. E.**

Momentum variable procedure for solving compressible and incompressible flows. (English)

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Summary: Navier-Stokes equations are solved for both compressible and incompressible flows using momentum component variables instead of the usual velocity variables as the dependent variables. The numerical procedure is developed in a control-volume-based, finite element context. The procedure is determined in a pressure-based algorithm rather than in the density-based algorithms, which compressible methods normally use. The proper selection of the connections between the variables on control volume surfaces and the main nodal values allow the use of a collocated grid arrangement. The compressible and incompressible results of this algorithm are investigated by testing a number of test cases including the driven cavity, an entrance region flow, and a converging-diverging nozzle flow. The results indicate that the momentum component procedure is quite successful for solving compressible and incompressible flows within a single algorithm.

Reviewer: Reviewer (Berlin)

MSC:

76M10 Finite element methods applied to problems in fluid mechanics
76N10 Existence, uniqueness, and regularity theory for compressible fluids and gas dynamics
76D05 Navier-Stokes equations for incompressible viscous fluids

Keywords:

Navier-Stokes equations; pressure-based algorithm; collocated grid arrangement; driven cavity; entrance region flow; converging-diverging nozzle flow

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