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Computation of inviscid supersonic flows around cylinders and spheres with the SUPG formulation and $YZ\beta$ shock-capturing. (English) Zbl 1176.76077

Comput. Mech. 38, No. 4-5, 469-481 (2006).

Summary: Numerical experiments with inviscid supersonic flows around cylinders and spheres are carried out to evaluate the stabilization and shock-capturing parameters introduced recently for the Streamline-Upwind/Petrov-Galerkin (SUPG) formulation of compressible flows based on conservation variables. The tests with the cylinders are carried out for both structured and unstructured meshes. The new shock-capturing parameters, which we call "$YZ\beta$ Shock-Capturing", are compared to earlier SUPG parameters derived based on the entropy variables. In addition to being much simpler, the new shock-capturing parameters yield better shock quality in the test computations, with more substantial improvements seen for unstructured meshes with triangular and tetrahedral elements. Furthermore, the results obtained with $YZ\beta$ Shock-Capturing compare very favorably to those obtained with the well established OVERFLOW code.

MSC:

76M10	Finite element methods applied to problems in fluid mechanics
76J20	Supersonic flows

Keywords:

Supersonic flows; Cylinders and spheres; SUPG stabilization; Stabilization parameter; Shock-capturing parameter

Software:

OVERFLOW

Full Text: DOI

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