A FORMULA FOR ESTIMATION OF TRUNCATION ERRORS OF CONVECTION TERMS IN A CURVILINEAR COORDINATE SYSTEM. D. Lee and Y. M. Tsuei, *Institute of Aeronautics and Astronautics, National Cheng Kung University, Tainan, Taiwan, R.O.C.*

A formula for truncation errors of convection terms arising from the Navier–Stokes equation in a curvilinear coordinate system is derived. These truncation error terms are interpreted in terms of grid size, grid uniformity, grid line angle, flow angle, and derivatives of flow properties to gain physical insights from the formula. The role of these factors in determining truncation errors is discussed. It is shown that an optimal grid arrangement cannot be obtained without considering the interactions between the grid and the flow field. The effect of the grid orthogonality on truncation errors is also analyzed for simple cases. The derived formula provides a useful indicator for truncation error distribution which yields guidelines for grid adaption.

EIGENVALUE CALCULATION PROCEDURE FOR AN EULER/NAVIER–STOKES SOLVER WITH APPLICATION TO FLOWS OVER AIRFOILS. Aparajit J. Mahajan, Earl H. Dowell, and Donald B. Bliss, *Department of Mechanical Engineering and Materials Science, School of Engineering, Duke University, Durham, North Carolina 27706, U.S.A.*

A Lanczos procedure is applied to a Navier–Stokes solver for computing eigenvalues and eigenvectors. These eigenvalues and eigenvectors are associated with small perturbation analysis of a finite difference representation of the Navier–Stokes equations for flows over airfoils. A combination of block tridiagonal matrices is converted into a two-dimensional matrix for this eigensystem calculation. This matrix is very large, sparse, real, and nonsymmetric. A separate procedure, based on lopsided iteration, is also used to determine the eigensystem. The results from these two procedures are compared. The Lanczos procedure provides complete spectral information about the eigenvalues, whereas the lopsided iteration provides only a few of the eigenvalues which are largest in magnitude and the corresponding eigenvectors. Such eigensystem information is central to transient stability analysis of Navier–Stokes solvers, for determining the modal behavior of fluid in a fluid–structure interaction problem and for development of reduced order models based on variational principles for Navier–Stokes solvers.

NOTE TO APPEAR

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