



Accuracy of Gradient Reconstruction on Grids with High Aspect Ratio

By James Thomas

BiblioGov. Paperback. Book Condition: New. This item is printed on demand. Paperback. 30 pages. Dimensions: 9.7in. x 7.4in. x 0.1in. Gradient approximation methods commonly used in unstructured-grid finite-volume schemes intended for solutions of high Reynolds number flow equations are studied comprehensively. The accuracy of gradients within cells and within faces is evaluated systematically for both node-centered and cell-centered formulations. Computational and analytical evaluations are made on a series of high-aspect-ratio grids with different primal elements, including quadrilateral, triangular, and mixed element grids, with and without random perturbations to the mesh. Both rectangular and cylindrical geometries are considered; the latter serves to study the effects of geometric curvature. The study shows that the accuracy of gradient reconstruction on high-aspect-ratio grids is determined by a combination of the grid and the solution. The contributors to the error are identified and approaches to reduce errors are given, including the addition of higher-order terms in the direction of larger mesh spacing. A parameter GAMMA characterizing accuracy on curved high-aspect-ratio grids is discussed and an approximate-mapped-least-square method using a commonly-available distance function is presented; the method provides accurate gradient reconstruction on general grids. The study is intended to be a reference guide accompanying the construction of...



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