Algorithms of Solution Reconstruction on Unstructured Grids in Computational Aerodynamics : Impact on Aircraft Design at The Boeing Company

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Abstract

We describe work that demonstrated the benefits achieved when the mathematical and computational aspects of a fluid dynamics problem were brought together to work on real-world aerodynamic applications. The research into solution reconstruction on adaptive grids was required by The Boeing Company in order to help them to design an efficient and accurate discretization of the governing equations that have to be solved numerically for the generation of aerodynamic data for various flow regimes. While earlier insight into the solution reconstruction problem was purely based on empirical intuition, research conducted by the author under a contract with Boeing has resulted in the development of the necessary synthetic judgment in which the importance of accurate reconstruction on unstructured grids has been fully recognised by the CFD researchers at Boeing and has helped them to make an informed decision on the choice of a discretization method in their CFD code. Efficient use of CFD in the design of new aircraft has allowed The Boeing Company to further strengthen their core operations, improve their execution and competitiveness and leverage their international advantage.