

Adjoint Methods in High-Lift Design Optimization

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Abstract

Sensitivity analysis for aerodynamic shape optimization has recently become of increased importance for a variety of applications. It requires the computation of gradients of functionals in the design parameter space. Among sensitivity evaluation methods, local discrete methods are broadly used for practical applications. The discrete methods require the solution of a linear system that results from the differentiation of the discrete equations of the non linear problem. The discrete adjoint vector (AV) method uses Lagrange multipliers and is preferable to a direct differentiation method when the number of design variables is larger than the number of functionals to differentiate which is often the case in practice.

This contribution presents the comparison of results obtained in the DESIREH project where the possibility was investigated to use gradient-based optimization and adjoint Navier-Stokes or adjoint RANS solvers for the optimization of a three element airfoil at landing and take-off flight conditions.