Abstract:

For aeroelastic analyses in the industrial context, the Doublet Lattice Method (DLM) is a widely used method since it provides conservative results with low computational effort. However, the DLM lacks in predicting discontinuous transonic phenomena (shock positions and intensity) and effects of complex three-dimensional geometries. Several other authors have established the need for an improvement of the DLM results with CFD or experimental data while preserving its advantage of low computational costs. The introduction of small-disturbance CFD aerodynamics into the aeroelastic analysis process led the way to combine an enhanced accuracy of the aerodynamics combined with a moderate computational effort. However, linearized CFD methods are still unhandy to use in the development process of a configuration since they are inflexible to design changes of the configuration. Therefore, the authors present a correction method to enhance the quality of DLM results by introducing few results from the small-disturbance CFD method AER-SDEu developed at the Institute of Aerodynamics at the Technical University of Munich. The method employs densely...
populated, diagonal dominant correction matrices to correct the downwash or the forces of the DLM based on an equality between the forces predicted by the corrected DLM and the CFD method. This leads to a significantly higher quality of the DLM results, even throughout potential design changes. The developed correction method is applied to two well-known configurations, namely the AGARD Wing 445.6 (weak. 3) and the Goland+ Wing.