Variable-Fidelity Aerodynamic Analysis for Multidisciplinary Wing Design

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Presented at the STAR Global Conference 2012.

Aerospace engineering problems are characterized by great complexity, typically concerning large-scale systems involving numerous, different and often not independent issues. The need to maintain competitiveness in terms of design quality and reduction of design time and the need to reduce development costs are reflected in the necessity to develop an optimal design. This must be achieved in the early stages in order to reduce the entity and amount of cumbersome changes to be done in further design phases.

A good response to these demands is the use of tools and methodologies such as Concurrent Engineering (CE), Multidisciplinary Analysis (MDA) and multi-fidelity analysis. The multi-fidelity strategy involves the use of analysis models which are characterized by different levels of fidelity allowing a significant reduction of both, running time and computing resources.

Our investigation concerns the development and usage of a variable fidelity approach to address the aerodynamic analysis involved in an integrated wing design context. In particular, the definition of the high fidelity computational fluid dynamics model, able to represent with a good confidence the flow field and the force distribution around the wing, has been done with the CFD software STAR-CCM+ and with the large crucial use of parametric java macros.

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