



Simulation-Driven Aerodynamic Design Using Variable-Fidelity Models

Leifur Leifsson

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Computer simulations is a fundamental tool of the design process in many engineering disciplines including aerospace engineering. However, although high-fidelity numerical models are accurate, they can be computationally expensive with evaluation time for a single design as long as hours, days or even weeks. Simulation-driven design using conventional optimization techniques may be therefore prohibitive.

This book explores the alternative: performing computationally efficient design using surrogate-based optimization, where the high-fidelity model is replaced by its computationally cheap but still reasonably accurate representation: a surrogate. The emphasis is on physics-based surrogates. Application-wise, the focus is on aerodynamics and the methods and techniques described in the book are demonstrated using aerodynamic shape optimization cases. Applications in other engineering fields are also demonstrated.

State-of-the-art techniques and a depth of coverage never published before make this a unique and essential book for all researchers working in aerospace and other engineering areas and dealing with optimization, computationally expensive design problems, and simulation-driven design.

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