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Aerodynamic design, like many other engineering applications, is increasingly relying on computational power. The growing need for multi-disciplinarity and high fidelity in design optimization for industrial applications requires a huge number of repeated simulations in order to find an optimal design candidate. The main drawback is that each simulation can be computationally expensive – this becomes an even bigger issue when used within parametric studies, automated search or optimization loops, which typically may require thousands of analysis evaluations.

The core issue of a design-optimization problem is the search process involved. However, when facing complex problems, the high-dimensionality of the design space and the high-multi-modality of the target functions cannot be tackled with standard techniques.

In recent years, global optimization using meta-models has been widely applied to design exploration in order to rapidly investigate the design space and find sub-optimal solutions. Indeed, surrogate and reduced-order models can provide a valuable alternative at a much lower computational cost.

In this context, this volume offers advanced surrogate modeling applications and optimization techniques featuring reasonable computational resources. It also discusses basic theory concepts and their application to aerodynamic design cases. It is aimed at researchers and engineers who deal with complex aerodynamic design problems on a daily basis and employ expensive simulations to solve them.

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Application of Surrogate-based Global Optimization to Aerodynamic Design (Springer Tracts in Mechanical Engineering) From Springer Bibliography

- Published on: 2015-10-06
- Original language: English
- Number of items: 1
- Dimensions: 9.21" h x .25" w x 6.14" l, .0 pounds
- Binding: Hardcover
- 72 pages

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