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Nota di contenuto	Preface; Contents; Contributors; Acronyms; 1 Aerodynamic Shape Design by Evolutionary Optimization and Support Vector Machines; 1.1 Introduction; 1.2 Literature Review; 1.3 Proposed SBGO Approach; 1.3.1 Geometry Parameterization with Non-rational Uniform B-Splines; 1.3.2 The DLR TAU Solver; 1.3.3 SVMs as Surrogate Model; 1.3.4 Evolutionary Optimization Algorithm; 1.3.5 Intelligent Estimation Search with Sequential Learning; 1.4 Numerical Results; 1.4.1 Test Cases Definition; 1.4.2 Parameterization and Design Space Definition; 1.4.3 Grid Sensitivity Analysis; RAE2822 Airfoil; DPW-W1 Wing 1.4.4 Metamodel Obtention (SVMr)1.4.5 Multi-Point Optimization of the RAE2822 with Geometric Constraints; 1.4.6 Multi-Point Optimization of the DPW-W1 with Geometric Constraints; Conclusions; References; 2 Adaptive Sampling Strategies for Surrogate-Based AerodynamicOptimization; 2.1 Introduction; 2.2 Literature Review; 2.3

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ConclusionsReferences; 4 Multi-Objective Surrogate Based Optimization of Gas Cyclones Using Support Vector Machines and CFD Simulations; 4.1 Introduction; 4.1.1 Cyclone Geometry; 4.1.2 Cyclone Performance; 4.1.3 Literature Review; 4.1.4 Target of This Study; 4.2 Least Squares: Support Vector Regression; 4.2.1 LS-SVR Parameter Optimization; 4.3 Results and Discussion; 4.3.1 The Training Dataset; 4.3.2 Geometry Effect; 4.3.3 Geometry Optimization; Conclusions; References

Sommario/riassunto

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.