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Autore	Keane A. J
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## Aerodynamics versus Structural Strength

1.6.4 Structures versus Control; 1.6.5 Robustness versus Nominal Performance; 1.7 Design Automation, Evolution and Innovation; 1.7.1 Innovation; 1.7.2 Evolution; 1.7.3 Automation; 1.8 Design Search and Optimization (DSO); 1.8.1 Beginnings; 1.8.2 A Taxonomy of Optimization; 1.8.3 A Brief History of Optimization Methods; 1.8.4 The Place of Optimization in Design - Commercial Tools; 1.9 The Take-up of Computational Methods; 1.9.1 Technology Transfer; 1.9.2 Academic Design Research; 1.9.3 Socio-technical Issues; 2 Design-oriented Analysis; 2.1 Geometry Modeling and Design Parameterization; 2.1.1 The Role of Parameterization in Design; 2.1.2 Discrete and Domain Element Parameterizations; 2.1.3 NACA Airfoils; 2.1.4 Spline-based Approaches; 2.1.5 Partial Differential Equation and Other Analytical Approaches; 2.1.6 Basis Function Representation; 2.1.7 Morphing; 2.1.8 Shape Grammars; 2.1.9 Mesh-based Evolutionary Encodings; 2.1.10 CAD Tools versus Dedicated Parameterization Methods; 2.2 Computational Mesh Generation; 2.2.1 The Function of Meshes; 2.2.2 Mesh Types and Cell/Element/Volume Geometries; 2.2.3 Mesh Generation, Quality and Adaptation; 2.2.4 Meshless Approaches; 2.3 Analysis and Design of Coupled Systems; 2.3.1 Interactions between Geometry Definition, Meshing and Solvers - Parallel Computations; 2.3.2 Simple Relaxation and Newton Techniques; 2.3.3 Systems Integration, Workflow Management, Data Transfer and Compression; 3 Elements of Numerical Optimization; 3.1 Single Variable Optimizers - Line Search; 3.1.1 Unconstrained Optimization with a Single Real Variable; 3.1.2 Optimization with a Single Discrete Variable; 3.1.3 Optimization with a Single Nonnumeric Variable; 3.2 Multivariable Optimizers; 3.2.1 Population versus Single-point Methods; 3.2.2 Gradient-based Methods

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### Sommario/riassunto

Over the last fifty years, the ability to carry out analysis as a precursor to decision making in engineering design has increased dramatically. In particular, the advent of modern computing systems and the development of advanced numerical methods have made computational modelling a vital tool for producing optimized designs. This text explores how computer-aided analysis has revolutionized aerospace engineering, providing a comprehensive coverage of the latest technologies underpinning advanced computational design. Worked case studies and over 500 references to the primary research literature

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