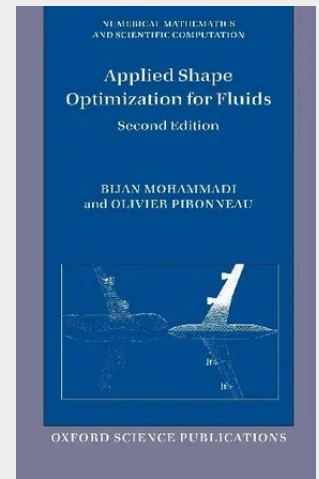


Applied Shape Optimization for Fluids (Revised)

The fields of computational fluid dynamics (CFD) and optimal shape design (OSD) have received considerable attention in the recent past, and are of practical importance for many engineering applications. This new edition of Applied Shape Optimization for Fluids deals with shape optimization problems for fluids, with the equations needed for their understanding (Euler and Navier Stokes, but also those for microfluids) and with the numerical simulation of these problems. It presents the state of the art in shape optimization for an extended range of applications involving fluid flows. Automatic differentiation, approximate gradients, unstructured mesh adaptation, multi-model configurations, and time-dependent problems are introduced, and their implementation into the industrial environments of aerospace and automobile equipment industry explained and illustrated. With the increases in the power of computers in industry since the first edition, methods which were previously unfeasible have begun giving results, namely evolutionary algorithms, topological optimization methods, and level set algorithms. In this edition, these methods have been treated in separate chapters, but the book remains primarily one on differential shape optimization. This book is essential reading for engineers interested in the implementation and solution of optimization problems using commercial packages or in-house solvers and graduates and researchers in applied mathematics, aerospace, or mechanical engineering, fluid dynamics, and CFD. More generally, anyone needing to understand and solve design problems or looking for new exciting areas for research and development in this area will find this book useful, especially in applying the methodology to practical problems.

Contents: PREFACE; ACKNOWLEDGEMENTS; 1. Introduction; 2. Optimal shape design; 3. Partial differential equations for fluids; 4. Some numerical methods for fluids; 5. Sensitivity evaluation and automatic differentiation; 6. Parameterization and implementation issues; 7. Local and global optimization; 8. Incomplete sensitivities; 9. Consistent approximations and approximate gradients; 10. Numerical results on shape optimization; 11. Control of unsteady flows; 12. From airplane design to microfluidic; 13. Topological optimization for fluids; 14. Conclusion and perspectives; INDEX.



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