

Preface

Aiming at the design and analysis of complex engineering systems, computational engineering combines engineering sciences, mathematics, and computer science. It comprises the development, application, and validation of computational models as well as the visualization of simulation results. Taking advantage of continuing advances in computer hardware, software technology, and numerical algorithms, computational engineering plays an increasingly important role in the development and operation of engineering products and systems.

The book provides an overview of the broad spectrum of research activities within the framework of the research center *Computational Engineering* at the University of Innsbruck. The topics covered focus on mathematical modeling, numerical simulation, and experimental validation in several fields of engineering sciences. In particular, constitutive models and their implementation into finite element codes, sensitivity and reliability analysis of engineering structures including applications in aerospace engineering and earthquake engineering, multi-phase models and multi-scale models in civil engineering, applications of scientific computing in urban water management and numerical simulations in hydraulic engineering, and—last but not least—the application of a genetic algorithm for the registration of laser scanner point clouds in geoinformation science are presented.

The research center *Computational Engineering* is part of the research focal point *Scientific Computing* at the University of Innsbruck. The latter integrates research activities of the University of Innsbruck in the fields of information technology and e-science. As the success in those scientific disciplines crucially depends on the powerful computer hardware, the financial support by the Austrian Federal Ministry of Science and Research (BMWf) within the framework of the University Infrastructure Program is gratefully acknowledged.

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