

## Preface

The articles contained in this volume are related to presentations at the international “Conference on Optimal Control of Coupled Systems of Partial Differential Equations”, held at the “Mathematisches Forschungsinstitut Oberwolfach” from March, 2 to 8, 2008. The contributions by internationally well-known scientists in the field of Applied Mathematics cover various topics as controllability, feedback-control, optimality systems, model-reduction techniques, analysis and optimal control of flow problems and fluid-structure interactions, as well as problems of shape and topology optimization. The applications considered range from the optimization and control of quantum mechanical systems, the optimal design of airfoils, optimal control of crystal growth, the optimization of shape and topology in engineering to switching or hybrid systems. The applications are thus across all time and length scales, and range from smooth to non-smooth models.

The field of optimization and control of systems governed by partial differential equations and variational inequalities is a very active area of research in Applied Mathematics and in particular in numerical analysis, scientific computing and optimization with a growing impact on engineering applications. In return, the field benefits from fascinating and challenging applications in that new mathematical often multiscale-modeling and new numerical tools as well as novel optimization results and corresponding iterative strategies are required in order to handle these problems. In particular, it becomes amply clear that constraints have to be taken into account, both on the control- and design-variables as well as on the state variables and the domains of their governing models. Moreover, structure exploiting discretizations, adaptive and multilevel methods become predominant in large-scale applications.

The aim of the conference and hence the aim of this book was to bring together mathematicians and engineers working on challenging problems in order to mark the state-of-the-art and point to future developments. Consequently, the book addresses researchers in the area of optimization and control of infinite-dimensional systems, typically represented by partial differential equations, who are interested in both theory and numerical simulation of such systems.

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