

## Preface

The international **Conference on Optimal Control of Coupled Systems of Partial Differential Equations** was held at the **Mathematisches Forschungsinstitut Oberwolfach** ([www.mfo.de](http://www.mfo.de)) from April, 17 to 23, 2005. The scientific program included 30 talks covering 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 discussed during the conference range from the optimization and control of quantum mechanical systems, the design of piezo-electric acoustic micro-mechanical devices, optimal control of crystal growth, the control of bodies immersed into a fluid to airfoil design and much more. Thus the applications are across all time and length scales.

Optimization and control of systems governed by partial differential equations and more recently by variational inequalities is a very active field of research in Applied Mathematics, in particular in numerical analysis, scientific computing and optimization. In order to be able to handle real-world applications, scalable and parallelizable algorithms have to be designed, implemented and validated. This requires an in-depth understanding of both the theoretical properties and the numerical realization of such structural insights. Therefore, a ‘core’ development within the field of optimization with PDE-constraints such as the analysis of control-and-state-constrained problems, the role of obstacles, multi-phases etc. and an interdisciplinary ‘diagonal’ bridging regarding applications and numerical simulation are most important.

The aim of the conference, therefore, was to bring together applied mathematicians and also engineers in order to provide a state-of-the-art and to establish new standards in the field. It became apparent that the analysis of state-constrained nonlinear optimal control problems, of such problems governed by variational inequalities and the analysis of free boundary value problems are a key issues. Moreover, shape and topology optimization becomes critical in material sciences, light-weight materials, complex chambers and flexible structures. Shape-calculus in combination with top-level optimization algorithms and in particular the combination of topological and shape gradients are subject to analysis and simulation.

The editors express their gratitude to the contributors of this volume, the Oberwolfach Institute, and the Birkhäuser-Verlag for publishing this volume.

K. Kunisch, G. Leugering,  
J. Sprekels and F. Tröltzsch

Control of Coupled Partial Differential Equations

Kunisch, K.; Leugering, G.; Sprekels, J.; Tröltzsch, F.  
(Eds.)

2007, VII, 384 p., Hardcover

ISBN: 978-3-7643-7720-5

A product of Birkhäuser Basel