

# Preface

This book contains the contributions presented during the *International Workshop on Advanced Dynamics and Model-Based Control of Structures and Machines*, which took place in St. Petersburg, Russia, in July 2012. The workshop aimed at bringing together scientists with an outstanding expertise in mechanics and control, with emphasis on the application of advanced structures and machines. The workshop was intended as a scientific event for the area mechanics and model-based control within the Austrian Center of Competence in Mechatronics (ACCM), which served as the steering organization for the workshop.

Mechanics and model-based control are both rapidly expanding scientific fields and fundamental disciplines of engineering. They share demanding mathematical and/or system-theoretic formulations and methods. One of the challenges in mechanics and model-based control is utilizing the ever-increasing computer power with respect to both the simulation of complex physical phenomena in mechanics and the design and real-time implementation of novel control systems. Further challenges follow from the availability of efficient multifunctional materials, the so-called smart materials, allowing the design and implementation of new types of actuator/sensor fields and networks. The key objectives of the workshop were:

- Enabling the interchange of ideas from advanced mechanics of structures and from control theory
- Clarification of expectations of research in the field of mechanics from advanced control theory, and vice versa
- Development of joint research proposals and teams with participation from other countries
- Encouragement of collaborations among industry and universities across the borders of the participating countries

The workshop continued a series of international workshops, which started with a Japan-Austria Joint Workshop on Mechanics and Model-Based Control of Smart Materials and Structures and a Russia-Austria Joint Workshop on Advanced Dynamics and Model-Based Control of Structures and Machines. Both workshops took place in Linz, Austria, in September 2008 and April 2010, respectively. We

believe that such workshops will result into the creation of research teams with participation not only from Austria, Japan, and Russia but also from other countries; the latter is enabled by the participation of widely renowned scientists from Europe and Taiwan. Such teams should push the frontiers of mechanics and control of advanced structures and machines to new dimensions.

The undersigned editors of the present book, which is entitled *Mechanics and Model-Based Control of Advanced Engineering Systems*, are happy to present in the following 10 full-length papers of presentations from Russia, 9 from Austria, 8 from Japan, 3 from Italy, one from Germany, and one from Taiwan. It is hoped that these contributions will further stimulate the international research and cooperation in the field.

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