

Preface – Full Papers CD Volume

At MATHMOD Vienna scientists and engineers using or developing models or interested in the development or application of various modelling tools are offered an opportunity to present ideas, methods and results and discuss their experiences or problems with experts of various areas of specialisation.

The scope of the *MATHMOD Conference Series* covers theoretic and applied aspects of various types of mathematical modelling. Comparison of modelling approaches, model simplification, modelling uncertainties, and port-based modelling are discussed. Moreover, besides applications of modelling in traditional areas such as engineering and natural sciences also new ones are of growing importance. Further, the topics to be discussed during the conference reflect also the fact that mathematical modelling is now used more and more in industries. Moreover, numerical aspects are now often already part of the modelling process and, automation of modelling and the use of IT are of growing importance. All these facts can be recognized on one hand in the many special sessions, which were organized by experts in the specific area. But, on the other hand, also the various sessions, where submitted papers will be presented and discussed, show the broad variety of the MATHMOD conference.

Moreover, it is to be observed that traditional classifications such as theory, applications, numerics, computer science, simulation etc. becomes more and more obsolete. Scientific work often presents new results in several areas.

A look on the special sessions illustrates this quite well and underlines the fact that working teams are now often already international:

Modelling the Swarm

Thomas Schmickl (Univ. Graz, Austria), Heiko Hamann (Univ. Karlsruhe, Germany)

Numerical Methods in Quantum Simulations

Othmar Koch (Vienna, Austria)

Modeling and Simulation in Systems Biology

Wolfgang Wiechert (Univ. Siegen, Germany),
Aljoscha Wahl (Delft Univ. of Technology, The Netherlands)

Advances in Model Order Reduction

Boris Lohmann (TU München, Germany),
Peter C.Müller (Univ Wuppertal, Germany), Tatjana Strykel (TU Berlin, Germany)

Tools for Modelling of Reaction Systems

Rudibert King (TU Berlin, , Germany)

Modelling of Fuel Cells and Chemical Engineering Applications

Kurt Chudej (Univ. Bayreuth, Germany), Michael Mangold (Max-Planck-Institute
for Dynamics of Complex Technical Systems, Magdeburg, Germany)

Mathematical Modelling and Control of Chemical and Bio-chemical Processes

Philippe Bogaerts (Univ. Libre de Bruxelles, Belgium),
Jan Van Impe (Katholieke Univ Leuven, Belgium)

Numerics of Ordinary Differential Equations with Uncertainties

Michael Günther (Univ Wuppertal, Germany),
Utz Wever (Siemens AG, Corporate Technology, Germany),
Peter Rentrop (TU München, Germany)

Mathematical Models and their Correspondence to the Physical Reality

Peter Dabnichki (Univ. of London, England)

Computational Micromagnetics

Markus Melenk, Dirk Praetorius, Dieter Suess (all: TU Vienna, Austria)

Nonlinear Oscillations

Alois Steind, Horst Ecker (both: TU Vienna, Austria)

Selected Examples in Biomechanical Modelling and Simulation

Arnold Baca (Univ. Vienna, Austria)

Modeling of Decentralized Service Systems in Automation Technologies

Ulrich Epple, Henning Mersch (both: RWTH Aachen, Germany)

Object-oriented Modelling and Simulation

Gianni Ferretti, Francesco Casella (both: Politecnico di Milano, Italy)

Control of Dynamical Systems

Felix L. Chernousko (Russian Acad. Sciences, Moscow, Russian Federation)
Georgy Kostin (IPM RAS, Moscow, Russian Federation)

Discrete and Hybrid Simulation: Methodologies, Techniques and Applications

Gaspar Music (Univ. Ljubljana, Slovenia)

Modelling, Simulation and System Dynamics through E-Learning

Maja Atanasijević-Kunc (Univ. Ljubljana, Slovenia)

Computational Modeling and Simulation in Multi-Modal Transportation

Dietmar P. F. Moeller (Univ. Hamburg, Germany)

Carbon Capture and Storage

Bernt Lie (Telemark Univ. College, Norway)

Meeting With IT Advances in Modeling and Simulation Tool Developments

Kaj Juslin (VTT, Finland)

Modelling and Simulation of Biological Water Treatment

Esko Juuso (Univ. Oulu, Finland)

Modelling, Analysis and Control of Distributed Parameter Systems

Markus Schöberl, Kurt Schlacher (both: Univ. Linz, Austria)

Circulating Fluidized Beds

Erik Dahlquist (Sweden)

Also the invited lectures reflect to some extent this wide spectrum of important topics of current interest ranging from applications in engineering, biology to methodological and theoretic aspects of various types and also that scientific work now usually belongs to more than one area of classification:

Networked Control Systems

Frank Allgoewer (Univ. Stuttgart, Germany)

Modeling and Control in Heavy Plate Mills

Andreas Kugi (TU Vienna, Austria)

Hybrid Modelling - Control and Optimisation

Alberto Bemporad (Univ. Siena, Italy)

Design of Nonlinear CMOS Circuits in the Nano-GHz Era and its Mathematical Challenges

Wolfgang Mathis (Univ. Hannover, Germany)

Modeling and Finite-element Simulation of Heating Effects in Semiconductor Devices

Ansgar Juengel (TU Vienna, Austria)

System-theoretic Methods for Model Reduction of Large-scale Systems: Simulation, Control, and Inverse Problems

Peter Benner (TU Chemnitz, Germany)

Model Order Reduction for Object-oriented Models: a Control Systems Perspective

Gianni Ferretti, Francesco Casella, Dr. Filippo Donida (Politecnico di Milano, Italy)

Adaptive Extremum Seeking Control : A Survey

Denis Dochain (CESAME, UCL, Louvain-la-Neuve, Belgium)

Modelling in Systems Biology, Neurology, and Pharmacy

Ales Belic (Univ. of Ljubljana, Slovenia)

Furthermore, two plenary contributions deal with mathematics and fine arts:

Algorithms, Mathematics and Art

Vlatko Ceric, Univ. Zagreb, Croatia

Laura and Petrarca - True Emotions vs. Modelled Emotions

Felix Breiteneker (TU Vienna, Austria)

A novelty in MATHMOD 2009 is the contribution type *Short Papers*. *Short Papers* are intended for presentation of recent developments and work in progress in all areas of modelling and simulation. *Short Papers* are published in the Conference Proceedings with a 1-page abstract and with a 4-page full text paper. Short papers are presented with a poster in the Poster Session (no oral presentation).

MATHMOD 2009 Proceedings consist of two volumes. *Proceedings MATHMOD 2009 Vienna – Abstract Volume* contains (ISBN 978-3-901608-34-6) one-page abstracts of all invited plenary talks, of contributed papers to regular sessions and to special session, of short papers, and of student posters. *Proceedings MATHMOD 2009 Vienna – Full Papers CD Volume* (ISBN 978-3-901608-35-3) consists of the full text versions of invited papers, of regular papers, of regular papers in special sessions, and of short papers.

Both volumes of these Proceedings start with the manuscripts of the plenary lectures (abstract or full paper resp.). Then follow contributed papers (*Regular Papers*) which were either contributed upon invitation of a session organizer or, which were selected for presentation after a reviewing process which was based on extended abstracts. All these contributions (abstract or full paper resp.) were collected and arranged in sessions according to their main thematic point. Such a grouping is by no means easy because many contributions address several different aspects in a balanced manner.

Therefore, the arrangement chosen for this volume follows rather closely the one of the conference where also time limitations had to be observed:

- Control Systems
- Discrete Systems and Manufacturing
- Robotics – Applications, Tools
- Traffic and Transportation Systems, Guidance
- Environmental Systems and Processes
- Numerical Methods and Algorithms
- Modelling in Physics and Natural Sciences
- Process Engineering
- Electrical/Electronic Engineering and Communication
- Modelling Methods, Theory and Tools
- Biology, Physiology, Medicine
- Fuzzy Systems – Modelling and Applications
- Mechatronics – Applications, Modelling, Tools
- Stochastic Modelling
- Modelling in Economics and Finance
- Agent-based and Alternative Modelling Techniques

The number and sequence of papers in these sessions may differ in *Abstract Volume* and *Full Papers CD Volume*, because of session changes and because of lack of full papers or lack of abstracts for some few contributions.

This *Full Papers CD Volume* contains as its last part the full text papers of the *Short Papers*, which have been peer reviewed in the same way as the *Regular Papers*. abstracts of the *Student Posters*, which were undergoing also a review procedure. Poster presentations of *Short Paper* contributions (and of the *Student Poster* contributions) were on display during the whole conference and discussed in a special *Poster Session*.

As editors we wish to express our sincere thanks to all who have assisted us by making the idea of this symposium known within the scientific community or by acting as sponsor or cosponsor. We want to thank especially the members of the International Program Committee who assisted us in the reviewing process – some of them did indeed a tremendous work by reviewing some 30 extended abstracts in rather short time. Further, we want to thank all colleagues who have done an excellent job by putting together special sessions devoted to one main topic. Last but not least we like to thank the ARGESIM team for their support in the preparation of these Proceedings.