

Workshop on „Multibody System Dynamics, Robotics and Control“

September 26th – 27th, 2011,
Johannes Kepler University Linz,
Science Park, MT127,
Altenbergerstraße 69, 4040 Linz, Austria

Programme

Sponsors



JOHANNES KEPLER
UNIVERSITY LINZ | JKU



Mechatronics Group
Technical Mechanics



HOSTING ORGANIZATION

Johannes Kepler University Linz, Austria

STEERING ORGANIZATION

Austrian Center of Competence in Mechatronics, Linz, Austria

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Index

AIMS, SCOPE AND OBJECTIVES.....	3
HOSTING ORGANIZATION.....	4
INVITING ORGANIZATIONS.....	4
WORKSHOP VENUE.....	4
REGISTRATION (EXCEPT INVITED SPEAKERS).....	5
CONFERENCE FEES (EXCEPT INVITED SPEAKERS).....	5
GENERAL INFORMATION.....	8
PRESENTING AUTHOR INDEX.....	10
ACKNOWLEDGEMENTS.....	11

Aims, Scope and Objectives

The *Multibody System Dynamics, Robotics and Control Workshop* is aimed at bringing together top researchers in the multi-disciplinary field of mechatronics.

The workshop is intended as a scientific event for the Area Mechanics and Model Based Control within the Austrian Center of Competence in Mechatronics (ACCM), which serves as the steering organisation 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 challenge in mechanics and model based control is to use the still increasing computing 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 multi-functional materials, so-called smart materials, allowing the design and implementation of new types of actuator/sensor fields and networks. The latter topics are the goals of the present workshop.

We believe that the workshop will result into the creation of research teams especially within Europe. Such teams should push the frontiers of mechanics, robotics and control of advanced structures and machines to new dimensions. The present workshop continues a series of international workshops, which started with a *Japan – Austria Joint Workshop on Mechanics and Model Based Control of Smart Materials and Structures* in September 2008 and a *Russia – Austria Joint Workshop on Advanced Dynamics and Model Based Control of Structures and Machines* in April 2010, both took place in Linz, Austria.

The key objectives of the workshop are:

- Enabling the interchange of ideas from multibody system dynamics, robotics and control.
- Clarification of expectations of researches in the field of mechanics from advanced control theory and vice versa.
- Encouragement of collaborations among industry and universities across the borders of the participating countries.

Hosting Organization

The *Multibody System Dynamics, Robotics and Control Workshop* will take place at the Johannes Kepler University Linz, Austria. The Johannes Kepler University Linz is one of the younger institutions in Austrian higher education and constitutes a new type of university. From the beginning, the university's aims have been based on a close interdisciplinary connection between Economics and Business, Social Sciences, Law, Sciences and Engineering and on the fulfillment of the current demands of business and society.

As the largest research and teaching institution in Upper Austria, and thus as a center of knowledge transfer, the university contributes to the maintenance and the development of the region. It participates in centers of competence and develops spin-off programs supporting business start-ups. JKU has also close links with business and industry and an international network of partners and cooperations.

The Johannes Kepler University Linz has a perfect location in the north east of the city. The campus lies in green surroundings directly at the foot of the neighboring Mühlviertel hills. Unlike many other universities, where the individual faculties are spread out throughout the town, all faculties of the JKU are situated on a single campus covering some 350,000 m². The athletic grounds and three student residences are located directly on site.

Inviting Organizations

The ***Institute of Technical Mechanics*** of the Johannes Kepler University works in the research areas of finite elements and boundary elements, mechanics of smart structures, multibody system dynamics, nonlinear continuum mechanics, plasticity and viscoplasticity, plates and shells, control of structural vibrations, vibration measurements, stability and vibrations, thermal stresses and wave propagation.

The research areas of the ***Institute for Robotics*** of the Johannes Kepler University are modeling and control of flexible link/joint robots, redundant modular robots, pneumatically driven robots, mobile robots, walking machines, realtime systems and multibody system dynamics.

The ***Linz Center of Mechatronics (LCM)*** is the leader in Austria when it comes to mechatronics research. LCM sets new standards through intelligent networking of information technology, mechanics and electronics.

The ***Austrian Center of Competence in Mechatronics (ACCM)*** is a research and innovation center for collaborative research between science and industry in the field of mechatronics at an international level with the goal of achieving scientific knowledge and results with high innovation potential for one of the most important economic, export and research areas in Austria.

Workshop Venue

The workshop will take place at the Science Park (MT 127) of the Johannes Kepler University Linz. The presentations are scheduled for Monday 26th September and Tuesday 27th September.



Conference venue

Final tram stop
Universität

The Johannes Kepler University Linz can be easily reached by public transportation. Participants arriving by train should take the tram line 1 or 2 from the railway station towards Universität and get off at the final stop Universität.

Registration (except invited speakers)

The registration of participants should be done via E-Mail to Silvia.Weilhartner@lcm.at. Please also indicate if you will participate to the dinner on Monday. We cordially invite you to inform us about any change of your participation. Concerning accomodation, we can recommend you some hotels in Linz. However, we encourage you to use internet platforms like "www.hotel.de" and "www.booking.com". In general, moderately priced hotels are the "Ibis" hotel ("www.ibishotel.com/de/hotel-1722-ibis-linz/index.shtml"), which is close to the railway station with direct tram connection to the university, and the hotel "Harry's Home Linz" ("<http://www.harrys-home.com/index.php?id=14>").

Conference Fees (except invited speakers)

For non-speakers of the workshop, a fee of 100 Euro will be charged. This fee mainly covers the expenses for coffee breaks, refreshments, lunches and the dinner. The participants will receive an invoice at the conference desk, which shall be paid via bank transfer after the conference.

Technical Programme

Monday, September 26th

Opening		
8:30 - 9:00	Gattringer / Gerstmayr	Welcome and presentation of ACCM
Session 1		
Time	Presenting Author	Title of Presentation
9:00 - 9:30	A. Kecskemethy	Time-optimal path planning along specified trajectories
9:30 - 10:00	M. Diehl	Embedded Optimization for Control of Mechatronic Systems
10:00 - 10:30	L. Messner	Efficient online computation of smooth trajectories along geometric paths for robotic manipulators
Discussion and Coffee Break: 10:30 - 11:00		
Session 2		
Time	Presenting Author	Title of Presentation
11:00 - 11:30	S. Leyendecker	Optimisation and optimal control of multibody dynamics
11:30 - 12:00	P. Eberhard	Particle Swarm Optimization with Real Robots
12:00 - 12:30	J.A.C. Ambrósio	Multibody Dynamics Approaches to Biomechanical Applications to Human Motion Tasks
Lunch Break: 12:30 – 14:00		
Session 3		
Time	Presenting Author	Title of Presentation
14:00 - 14:30	A. Siuka	Modelling and control of infinite-dimensional mechanical systems - A port-Hamiltonian approach
14:30 - 15:00	P. Staufer	Passivity based tracking control of a flexible link robot
15:00 - 15:30	H. Aschemann	Norm-Optimal Iterative Learning Control for a Pneumatic Parallel Robot
15:30 – 16:00	A. Kugi	Swing-up of a triple pendulum on a cart
Discussion and Coffee Break: 16:00 - 16:30		
Guided Lab Tours		
Time		Institute
16:30 - 17:30		Institute of Technical Mechanics
16:30 - 17:30		Institute for Robotics
16:30 - 17:30		Institute of Automatic Control and Control Systems Technology
19:00 Workshop Dinner		

Tuesday, September 27th

Session 4		
Time	Presenting Author	Title of Presentation
9:00 - 9:30	C. Ott	From Compliant Manipulation to Whole Body Control of Humanoid Robots: An Overview of Biped Robot Research at DLR
9:30 - 10:00	C. Woernle	Robot-Based Hardware-in-the Loop Testing of Joint Endoprostheses
10:00 - 10:30	T. Buschmann	Dynamics and Control of the Biped Robot Lola
Discussion and Coffee Break: 10:30 - 11:00		
Session 5		
Time	Presenting Author	Title of Presentation
11:00 - 11:30	M. Hofbaur	Automated Kinematics Reasoning for Wheeled Mobile Robots
11:30 - 12:00	T. Bruckmann	Application Examples of Wire Robots
12:00 - 12:30	R. Ludwig	Genetic Parameter Identification for Mechatronic System
Lunch Break: 12:30 – 14:00		
Session 6		
Time	Presenting Author	Title of Presentation
14:00 - 14:30	A. Mikkola	A crane operators training based on the real-time multibody simulation
14:30 - 15:00	R. Aarts	Constraint and dynamic analysis of compliant mechanisms with a flexible multibody modelling approach
15:00 - 15:30	C. Zehetner	Vibration control and structural damping of a rotating beam by using piezoelectric sensors/actuators
Discussion 16:00 - 16:30		

General Information

Linz is all aglow

Linz, the city on the Danube, has transformed itself from grey industrial city to light and bright cultural metropolis, an attractive destination for city break tourists who come to relish the harmonious blend of past, present and future. Linz enjoys a reputation as one of the most successful cities in Austria, if not Middle Europe. All manner of scientists, writers and artists such as Johannes Kepler, Anton Bruckner and Adalbert Stifter thrived in the city and produced some of their most memorable work here.



Linz changes

The city's slogan is its agenda: The Linz cityscape features historic facades juxtaposed with futuristically lit, architecturally acclaimed buildings. There are several new constructions to celebrate Linz's status as European Capital of Culture 2009 and which have enhanced the broad spectrum of urban architecture. The Ars Electronica Centre - the museum of the future – has been extended to provide 6,500 m² of exhibition space and adorns the left bank of the Danube with its LED illuminated glass forms reminiscent of a ship. The new southern wing of Linz Palace provides a breathtaking view of the whole city. The World of Steel exhibition and visitor centre at voestalpine AG gives fascinating insight into the production of steel in every conceivable form. But Linz offers so much more: the city has a new, modern, cosmopolitan face and its variety, design and creativity are a powerful source of stimulation.

Art & Culture Zone Linz

The spectacular new Ars Electronica Center provides a unique platform for digital arts and explores the relationship between social and artistic aspirations and the huge potential of new technologies. The many interactive installations allow the visitor to experiment, research and experience the future.

On the opposite bank of the Danube just a few steps from the city centre, Lentos Museum of Art, provides a perfect architectural counterpoint, clad in mysterious black glass by day, and neon colours by night. Masterpieces of the 19th and 20th century can be viewed in here in changing exhibitions and world class artists such as Klimt, Schiele and Warhol feature in the broad palette of modern art.

The Castle Museum is the largest universal museum in Austria on one site. The permanent exhibit provides a virtual tour of the cultural, natural and scientific history of Upper Austria and there are numerous temporary exhibitions on special themes. A further highlight is the extension, opened in 2009, which reinstates the south wing of the palace, completely destroyed by a great fire in 1800. This highly acclaimed architectural project has created

space for additional exhibitions and events and provides a panoramic view over the city.

The OK Centre for Contemporary is an experimental laboratory for exploring art. It is intended to be both an exhibition centre and production studio for contemporary art, accompanying artists in the implementation of their work from conception to realisation.

Furthermore Linz boasts a large variety of other museums, the choice of themes ranging from a potted history of the city to its all-encompassing cultural scene to folklore and natural history.

Linz, haven of tranquillity

Linz provides not only artistic and cultural pleasures, but a welcome haven from the stresses of everyday life. You can wind down on a river trip on the Danube, savour the peace in one of its numerous churches, relax in one of the city's green spaces, stroll along the river bank or visit the former residence of author Adalbert Stifter, who wrote "Nachsommer" (Indian Summer) here, a nostalgic homage to innocent days in beautiful surroundings.

Language

The language spoken in Austria is German, but most Austrians speak English and some French and Italian, too, and are happy to be of service to visitors. The official language of the Workshop is English. No simultaneous translation will be provided.

Credit cards / cash machines

Major credit cards are accepted by hotels, restaurants and most shops. Please note that American Express credit cards may not be accepted everywhere in Austria. Cash machines are located throughout the city.

Tips

Service is usually included in the bill in bars and restaurants, but tips up to 10% are welcome.

Presenting Author Index

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TECHNICAL MECHANICS



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