

Active Systems for Dynamic Markets

2011



07-08 SEPTEMBER 2011 · DARMSTADIUM, DARMSTADT

PROGRAM



Fraunhofer

LBF

Fraunhofer LBF's Mechatronics/Adaptronics team can assist you in your research and development in

Technology areas

- structure analysis and vibration control,
- energy harvesting and monitoring,
- novel actuators.

Core competencies

- experimental analyses,
- modelling and numerical simulation,
- design and prototyping,
- control engineering and system integration,
- system evaluation and reliability.

Examples from our technical offer

- domestic and abroad measurement projects
- feasibility studies and consulting
- concept development and implementation

We will be happy to support you in your product optimization. Get in touch with us!

Contact:

Prof. Dr.-Ing. T. Melz

Competence Center
Mechatronics/Adaptronics
Fraunhofer LBF
Bartningstr. 47
64289 Darmstadt
info-kc-ma@lbf.fraunhofer.de
www.lbf.fraunhofer.de/mechatronics-adaptronics





Adaptronics, an active structural technology that is applicable across all branches of industry, opens up completely new possibilities for the development of innovative products. The basis for this is smart material system that incorporate sensor and actuator functions into components. If these functions are used for appropriate control technology purposes, the mechanical properties of the component may be changed in a targeted manner.

This way structures and products can adapt to changing operating and surrounding requirements. Vibrations, noise, deformations can be actively controlled; energy can be recovered from vibrating mechanical systems; structures can be monitored and influenced.

Finally, this will allow for a new design of mechanical systems, the use of new lightweight potential, for the improved performance of technical products and for expanded product profiles.

Fraunhofer has been working on the development and application of adaptronics for over 10 years now with increasing commitment. We are convinced that this technology is of central importance for the implementation of competitive pro-

ducts. This is necessary in order to meet the increasing and changing demands on modern products, the simultaneously shortened development times and increased pressure with regard to development flexibility.

Cooperation between different technical disciplines and experts from science and industry is essential for the success of adaptronics. For Fraunhofer, a leading application-oriented research establishment, this interaction is self-evident.

We welcome this year's Adaptronic Congress all the more since it emphasizes this very dialog between research and development and commercial application.

A handwritten signature in blue ink, reading "Ulrich Buller".

Prof. Dr. rer. nat. Ulrich Buller

Senior Vice President Research Planning, Fraunhofer-Gesellschaft

GREETINGS



09.30

Greetings

Prof. Dr.-Ing. Holger Hanselka, Fraunhofer-Institut für Betriebsfestigkeit und Systemzuverlässigkeit LBF

Eva Kühne-Hörmann, Hessische Ministerin für Wissenschaft und Kunst

09.55

KeyNote Lecture: Frontloading the engineering of adaptive systems based on approach of Model Based Systems Engineering

Dr. Jan Leuridan, Executive Vice-President & CTO - LMS International

COMPONENTS

Chairman: Dr. Daniel Jendritza, Johnson Controls GmbH

10.25

Hybrid Actuator for the Primary Mirror of the 42m E-ELT Telescope

Dr. Christian Enkrich, Physik Instrumente (PI) GmbH & Co. KG

10.45

A Revolution in Damping Systems by Using the Electrorheological Effect

Dr. Matthias Puff, FLUDICON GmbH

10.45 – 11.45 Coffee Break & Exhibition

11.45

Survey on linear inchworm and inertial piezoelectric actuators

Dr. Camilo Hernandez, Laboratoire de génie électrique de Paris (LGEP)

12.05

Development of dielectric elastomers and ferroelectrets at Bayer MaterialScience

Dr. Werner Jenninger, Bayer MaterialScience AG

12.25

Electro-active polymers and polymer composites: New trends in material developments for actuators and sensors

Dr. Michael Wegener, Fraunhofer-Institut für Angewandte Polymerforschung IAP

12.45

Dielectric Elastomers for Energy Harvesting from Ambient Sources

Prof. Dr. Jürgen Maas, Ostwestfalen-Lippe University of Applied Sciences

13.05 – 13.45 Chairman: Prof. Dr.-Ing. Thilo Bein, Fraunhofer LBF

Architecture and Components of Adaptive Control Signal Processors based on Floating-Point Arithmetic for Adaptronic Applications

Dr.-Ing. Faizal Arya Samman, TU Darmstadt

Ciliae-Based Actuator with Piezoelectric Excitation

Dr. rer. nat. Peter P. Pott, TU Darmstadt

Soft magnetic elastomers for actuators in view of new products

Dr. Christoph Gund, Freudenberg Forschungsdienste KG

Additive Manufacturing of Adaptive Components by Selective Laser Melting

Jacob Fischer, PTW - TU Darmstadt

Academy

13.45 - 15.00 Lunch & Exhibition



APPLICATIONS

Chairman: Prof. Dr.-Ing. Tobias Melz, Fraunhofer-Institut für Betriebsfestigkeit und Systemzuverlässigkeit LBF

15.00

Active absorbers for convertible cars

Dr. Christopher Klatt, Vibracoustic GmbH & Co.KG

15.20

Design and Implementation of an Active Vibration Absorber for Vibration Reduction of Piping Systems in Chemical Plants

Dr. Steffen Pankoke, Wölfel Beratende Ingenieure GmbH + Co. KG

15.40

Development of a Piezohydraulic Pump for Automotive Applications

Karl-Heinz Hoffmann, Ricardo Deutschland GmbH

16.00 – 17.00 Coffee Break & Exhibition

17.00

Operation-proven active mount for marine and alike applications

Hubertus Siebald, ERAS GmbH & Detlef Kurth, MAN Diesel & Turbo SE

17.20

Piezo Technology for Active Rotor Control at EADS Innovation Works

Stephan Friedl, EADS Innovation Works

17.40 – 18.20 Chairman: Dr. Arthur P. Berkhoff, TNO / University of Twente

Experimental sensitivity analysis for robustness studies of a controlled System

Ying Li, TU Darmstadt

Finite element model of a beam structure with piezoelectric patches using RL shunt circuits

Hassan Hariri, Laboratoire de génie électrique de Paris (LGEP)

Numerical modelling of the magnetorheological Fluid

Ruslan Herlein, LOEWE-Zentrum AdRIA

Response surface methodologies in design exploration of active shell structures

Johannes Tschesche, TU Darmstadt

Academy

18.30

Evening Event in the darmstadtium

Opening: Jochen Partsch, Mayor of the city of Darmstadt

07 September 2011



09.00

KeyNote Lecture: Adaptronic sound and vibration control in engineering and nature

Prof. Stephen Elliott, Institute of Sound and Vibration Research, University of Southampton

09.30 – 10.10 Chairman: Dr.-Ing. Joachim Bös, TU Darmstadt

Active Vibration Control of Large Satellite Solar Array Panels with Regional Mode Shapes

Gunar Reinicke, TU Munich

Sensor-Actuator-Integration for static and quasistatic force control

Stefan Herder, Karlsruhe Institute of Technology (KIT)

Performance enhancement of highly dynamic excited serial structures by means of adaptronics

Marcus Schönherr, Leibniz Universität Hannover - Institute of Production Engineering and Machine Tools

Development of lead-free Piezoceramics and first implementation in lead-free multilayer actuators

Claudia Groh, TU Darmstadt

Academy

10.10 – 11.00 Coffee Break & Exhibition

DEVELOPMENTS

Chairman: Stephan Friedl, EADS Innovation Works

11.00

Investigation and advanced development with electro-active polymers for application in automotive interiors

Dr. Daniel Jendritza, Johnson Controls GmbH

11.20

A technique for improved stability of adaptive feed forward controllers without detailed uncertainty measurements

Dr. Arthur P. Berkhoff, TNO – University of Twente

11.40

Adaptive lightweight reflectors for future space telescopes

Prof. André Preumont, Active Structures Laboratory, Université Libre de Bruxelles

12.00

Active, regulated system for long haul free space laser communications

Thomas Dreischer, RUAG Schweiz AG

12.20

Active Vibration Control approaches in mechanical engineering applications

Prof. Dr.-Ing. Tobias Melz, Fraunhofer LBF



12.40 – 13.30 Chairman: Prof. Yves Bernard, LGEP - Univ. Paris 11

Active Damping with Robust Optimal Control Technique
Oliver Janda, TU Darmstadt

Hybrid micro-production system driven by piezoelectric actuators and a linear motor for a flexible production
Daniel Schlote, Fraunhofer LBF

MRF-ball-clutch: A novel magnetorheological clutch design
Marco Jackel, Fraunhofer LBF

Development of a self sustaining adaptive mountainbike shock absorber system as an example for simulation and optimization of mechatronical-biomechanical coupled systems
Dr. Mario Heller, University of Vienna

Strain measurement on stiff structures – Experimental comparison of three integrated measurement principles
Christian Hatzfeld, TU Darmstadt

Academy

13.30 – 14.50 Lunch & Exhibition

SHM

Chairman: Prof. Stephen Elliott, Institute of Sound and Vibration Research, University of Southampton

14.50

Experimental investigation of a Random Decrement based modal estimation on a pedestrian bridge
Manfred Nottbeck, SWIFT GmbH

15.10

Design and manufacturing of piezoelectric energy harvester for bridge applications

Carsten Ebert, WÖLFEL Beratende Ingenieure GmbH + Co. KG (Matthias Kurch, Fraunhofer LBF & Stefan Linke, INVENT GmbH)

15.30

Advanced Maintenance Concepts for Commercial Vehicles

Samuel Artus, RENAULT s.a.s. & Prof. Dr.-Ing. Thilo Bein, Fraunhofer LBF

15.50 – 16.20 Coffee Break & Exhibition

TOOLS

Chairman: Dr. Steffen Pankoke, Wölfel Beratende Ingenieure GmbH + Co. KG

16.20

Piezoelectric valve modeling and design

Prof. Yves Bernard, LGEP - Univ. Paris 11

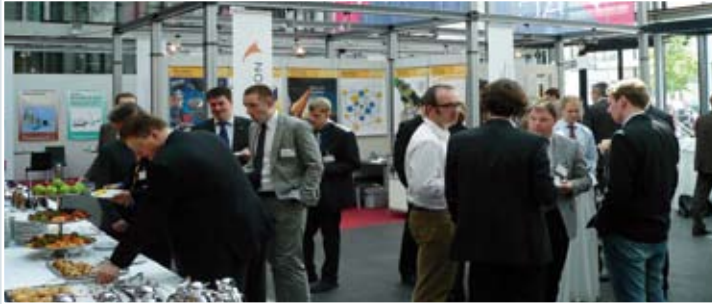
16.40

Active and passive piezoelectric vibration and noise control of plates

Georg Zenz, Linz Center of Mechatronics GmbH

17.00 Summary

08 September 2011



Evening event for all participants in the darmstadtium

Within the scope of the evening event on the 07th of September 2011 we invite all participants to the official Get Together in the darmstadtium in Darmstadt. This year evening event is realised with friendly support of the city of Darmstadt. The Mayor Jochen Partsch takes over the ceremonious opening.

We offer you in the midst of the exhibition a pleasant frame to intensify the talks of the first event day with other participants, speakers and exhibitors with a snack, drinks and music and to attach new commercial contacts.

Please be our guests and discuss in the circle of experts from economy and science the chances and challenges in the target field of adaptronics.

LOCATION

darmstadtium

A place of inspiration - for science, business and culture

The darmstadtium wissenschaft | kongresse (science|congresses) is the meeting place of the future for the science, business and culture at the heart of the prosperous conurbations of the Rhine-Main region.

The congress centre is easy to get to no matter which form of transport you choose, and lies at the heart of Darmstadt, city of science, just a few steps from the pedestrianised city centre.

The avant-garde architecture gives the visitor a whole new sense of space and is ideally suited for scientific congresses and conferences.

darmstadtium wissenschaft | kongresse

Wissenschafts- und Kongresszentrum

Schlossgraben 1

64283 Darmstadt

www.darmstadtium.de



Hotel suggestions

A limited number of rooms are available to participants of the AC 2011 at special rates if reserved by 22 July 2011. Please reserve the rooms using the key-word „AC“.

Welcome Hotel Darmstadt

Karolinenplatz 4, 64289 Darmstadt

Phone: +49 6151 391 4 0, www.welcome-hotel-darmstadt.de

info.dar@welcome-hotels.com

(from 160.00 EUR)

Hotel Atlanta

Kasinostraße 129, 64293 Darmstadt

Phone: +49 6151 178 9 0, www.hotel-atlanta-darmstadt.de

info@hotel-atlanta-darmstadt.de

(from 74.00 EUR)

RAMADA Hotel Darmstadt

Eschollbrücker Straße 16, 64295 Darmstadt

Phone: +49 6151 385 0, www.ramada.de

darmstadt@ramada.de

(from 98.00 EUR)

Best Western Hotel Darmstadt

Grafenstraße 31, 64283 Darmstadt

Phone: +49 6152 810 0, www.bestwestern.de

info@hotel-darmstadt.bestwestern.de

(from 112.00 EUR)

Adaptronics

Consulting for NVH

Vibration Analysis

Modelling

Simulation

Signal Processing

Electronics & Control

Sensors & Actuators

Design & Testing

Vibration Control

Noise Control

Controlled Motion

Monitoring



www.eras.de

Adaptronics that work



www.ceramtec.com

CeramTec GmbH – Multifunctional Ceramics Division

Luitpoldstrasse 15, 91207 Lauf



www.eras.de

ERAS GmbH

Hannah-Vogt-Straße 1, 37085 Göttingen



www.fludicon.com

Fludicon GmbH

Landwehrstr. 55, 64293 Darmstadt

CeramTec GmbH – Multifunctional Ceramics Division

Manufacturer in the fields of sensorics, actorics and new materials.

Parts made of PZT (Lead-Zirconate-Titanate-Ceramics) under the brand name Sonox®P in various designs. Examples for fields of applications are:

- in the automotive industry: parts for knock sensors or level sensors;
- in the medical field: parts for tartar removal or lithotripters;
- in machine building: discs and rings for ultrasonic welding or ultrasonic cleaning;
- in plant engineering: piezoceramics for level sensors of flow meters.

Further innovative application areas are sonar (sound, navigation and ranging) and non-destructive material testing as well as multilayer-actuators for dynamic and static applications.

Contact: Stephan Höhl, Phone +49 7153 611-873, s.hoehl@ceramtec.de

ERAS GmbH

Manufacturer, engineering office and consultant in the areas of sensor technology, actuating elements, measurement and control technology and adaptronics.

ERAS provides you with professional support concerning active and passive vibration reduction – starting with consulting via substantiated analyses up to mature concepts and function proved technical solutions for various industrial branches.

Contact: Joachim Bokemeyer, Phone +49 551 370 70 51, bokemeyer@eras.de

Fludicon GmbH

Manufacturer in the fields of actorics, automation technology and semi active damping systems.

Fludicon develops various standard ER-dampers, resistors and actuators as well as custom-made systems for special requirements.

Contact: Dr-Ing. Matthias Puff, Phone +49 6151 279 89 40, matthias.puff@fludicon.com

LIST OF EXHIBITORS



Fraunhofer

ADAPTRONIK



With smart structures' technology, vibrations, noise emissions and deformations can be actively controlled, damages can be monitored and new smart components can be designed

Within the Adaptronics Alliance, 11 institutes cooperate to serve our customers as RnD partner.

Competencies:

- Smart materials, actuators and sensors
- Numerical and experimental analysis
- Electronics and control engineering
- Production technology

We would be pleased to help you improve your products.
Contact us!

Contact:

Prof. Dr.-Ing. H. Hanselka
Prof. Dr.-Ing. T. Melz

Fraunhofer Alliance Adaptronics
P.O. 10 05 61
64205 Darmstadt
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www.adaptronik.fraunhofer.de



Adaptronics – Research, Innovation, Application

**Joint Initiative by LBF, TU Darmstadt and h_da
funded by the State of Hesse**

Contact:

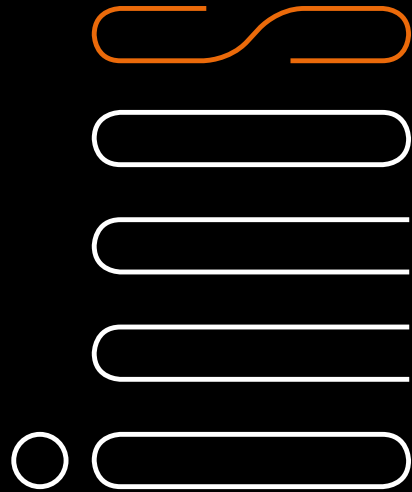
Prof. Dr.-Ing. Holger Hanselka

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www.innos-sperlich.de

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www.lbf.fraunhofer.de/
mechatronics-adaptronics

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Bartningstr. 47, 64289 Darmstadt



www.pfh.de

PFH Private Hochschule Göttingen, Campus Stade
Airbus-Straße 6, 21684 Stade



www.piceramic.de

PI Ceramic GmbH
Lindenstraße , 07589 Lederhose

Fraunhofer-Institut für Betriebsfestigkeit und Systemzuverlässigkeit LBF

Research institution

Fraunhofer LBF's Mechatronics/Adaptronics team can assist you in your research and development in the following technology areas (e.g.)

- structure analysis and vibration control
- energy harvesting and monitoring
- novel actuators

Contact: Prof. Dr.-Ing. T. Melz, Phone +49 6151 705 252, info-kc-ma@lbf.fraunhofer.de

Private Hochschule Göttingen

University of Applied Sciences

The extra-occupational Adaptronics Master study program (Adaptronics - Master of Science, M.Sc.) takes place at the campus in Sta-

de. The study program lasts for 3 semesters with a total of 60 ETCS and contains 7 modules that are coordinated with each other.

Contact: PFH Campus Stade, Phone +49 4141 7967-0, stade-studieninfo@pfh.de

PI Ceramic GmbH

Manufacturer in the areas of sensorics, actorics, automation technology and new materials.

PI Ceramic GmbH will present latest solutions concerning PZT components, OEM subassemblies and nanopositioning.

Contact: Frank Möller, Phone +49 36604 882 20 0, f.moeller@piceramic.de

Fatigue Life Monitoring and Diagnosis for more than 33 years



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www.rhein-main-adaptronik.com

Rhein-Main Adaptronik e.V.

Bartningstraße 47, 64289 Darmstadt



www.schenck-rotec.com

Schenck RoTec GmbH

Landwehrstr. 55, 64293 Darmstadt



www.swift-online.de

SWIFT GmbH

Am Dieburger Berg 18, 64354 Reinheim

ONLY A LIMITED NUMBER OF EXHIBITION BOOTHS AVAILABLE! YOUR CONTACT FOR AN INDIVIDUAL PACKAGE: INFO@ADAPTRONIC-CONGRESS.COM

Last
Chance

Rhein-Main Adaptronik e.V.

Technology network in the areas of sensorics, actronics, automation & structural technology, research, new materials, measurement and control technology and R&D in business.

The objective of Rhein-Main Adaptronik is to develop innovative research results into competitive products. The launching of adaptronic concepts is to be accelerated and the high-tech profile of the region to be sharpened by common projects, dialogue between science and economics as well as exchange of experience among the members. The members are small and medium-sized enterprises, industrial enterprises, universities and research institutes, which complement each other along the value chain.

Contact: Dr. phil. nat. Ursula Eul, Phone +49 6151 705 605, eul@rhein-main-adaptronik.com

Schenck RoTec GmbH

Manufacturer in the area of measurement and control technology.

Balancing technology for one off and series production in automotive, electrical, turbo machine industry, airlines industry and general industry; mounting and test technology for the production of wheel assemblies, overspeed spin test stands, diagnostic

systems, counseling, planning, engineering, service, balanced service, field balancing, certification, modernization, customer training, removal of balancing equipment.

Contact: Wolfgang Kunkel, Phone +49 6151 32 3167, marketing.rotec@schcnck.net

SWIFT GmbH

Manufacturer in the area of measurement and control technology.

- Measuring products for Fatigue Life Monitoring and Diagnosis in the car, ship, aircraft and windcraft industry and heavy machinery.
- MICRO-system for long-term measurements (4-40 channels) with high-capacity data storage.
- MATCH-system for mobile applications (short- and longterm measurements).
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- All products incl. high tech methods like GPS, CAN-Bus, Damage Evolution etc.

Contact: Manfred Nottbeck, Phone +49 6162 820 86, info@swift-online.de

LIST OF EXHIBITORS



Organization

Adaptronic Congress Management GbR

info@adaptronic-congress.com, www.adaptronic-congress.com

Company Partners

innos - sperlich GmbH

Bürgerstraße 44/42, 37073 Göttingen

Phone +49 551 496 01 0, Fax +49 551 496 01 49

info@innos-sperlich.de, www.innos-sperlich.de

ERAS GmbH

Hannah-Vogt-Straße 1, 37085 Göttingen

Phone +49 551 370 70 0, Fax +49 551 370 70 77

info@eras.de, www.eras.de

Legal Notice

You will receive an invoice on the participation fee upon receipt of your registration. The number of participants is limited due to organizational reasons. In justified cases, e.g. due to the cancellation of a speaker or too few participants, we reserve the right to cancel the congress up to one week before the appointed day. The paid fees will be reimbursed in this case. Any further claims to Adaptronic Congress Management GbR will be excluded. With your signature, you consent that your data may be entered into the Adaptronic Congress Management GbR database. Your data will be treated confidentially and not be disclosed to third parties.

INFORMATION



Fax reply: +49 551 496 01 49 or info@adaptronic-congress.com
Adaptronic Congress 2011, 07-08 September 2011

Registration deadline: 26 August 2011

Last name, First name, Title

Complete name of company / institute

Position, Department

Street, P.O. Box

Postal Code Town

Phone Fax

e-mail

Withdrawal

In the interest of the Congress, withdrawal from a contract is only possible under special circumstances and only with a written agreement from ACM GbR. When withdrawing from a contract, the exhibitor shall pay the following fees: 75% up to one month before the Congress begins and 100% of the calculated amount up to one week before the Congress begins.

I agree that my personal data may be added to the conference proceedings.

Binding registration

(Please check appropriate item)

- whole event (780,00 EUR*)
- every additional person of company/institute (650,00 EUR*)

Participation evening event yes no

 I'm/we are interested in the exhibition - please contact me/us.

Date

Signature

* incl. conference, exhibition, conference proceedings / CD-ROM, catering, evening event (Prices include VAT)

REGISTRATION

Adaptronic Congress Management GbR
Bürgerstraße 44/42
37073 Göttingen

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