Fraunhofer

In the Fraunhofer Alliance "Numerical Simulation of Products, Processes" 20 Fraunhofer Institutes are pooling their expertise. The alliance deals with the development and improvement of simulation methods. Today, the simulation of products and processes plays a crucial role in all phases of the product life cycle – from model-materials development and simulation of the fabrication process to operating characteristics and product placement in the market.

The goal of the alliance is to offer expertise and solutions to customers in industry and public areas. In particular, sharing specialized knowledge from the ICT sector with materials and component know-how, and with the surface and production technology promises to yield innovative results.

Intention of the Conference and Contribution of Abstracts

Multiphysics simulation is one of the fastest growing research fields in industrial engineering. This conference will concentrate on some aspects of this emerging research field, and will be organised in mini-symposia.
Paper contributions therefore should cleary show the novelty of the presented method as well as its practicability in real engineering cases. Such advanced methods may be numerical algorithms, software solutions, modelling procedures, or engineering guidelines.

DEADLINES

January 31, 2010 Deadline for Abstracts
February 28, 2010 Preliminary Agenda
April 30, 2010 Paper Contributions ready
June 22|23, 2010 Conference

CONFERENCE FEES

(including documentation, beverages and lunch)

- € 500 per Attendee
- € 250 for Students

EXHIBITION

Industrial partners, software and service providers may present their solutions. Fees for a booth are € 1200 – including logos on the conference website and free entrance for two participants.

CONFERENCE PROCEEDINGS

The conference proceedings will be published as a Fraunhofer Publication. Selected papers shall be collected in a special edition of The Multiphysics Journal.

ORGANIZATIONAL CONTACT

scapos AG
Schloss Birlinghoven
53754 Sankt Augustin
www.scapos.com
events@scapos.com

1ST CONFERENCE ON MULTIPHYSICS SIMULATION

ADVANCED METHODS FOR INDUSTRIAL ENGINEERING

www.multiphysics.fraunhofer.de

JUNE 22|23, 2010
BONN, GERMANY

Supported by:

NAFEMS

VDI VDE KÖLN BONN KOBLENZ
Kölner Bezirksvereine

PROGRAM COMMITTEE

Andreas Burblies
Fraunhofer Institute for Manufacturing Technology and Applied Materials Research IFAM

Arno Klomfass
Fraunhofer Institute for High-Speed Dynamics EMI

Görge Deerberg
Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT

Klaus Wolf, Tanja Clees
Fraunhofer Institute for Algorithms and Scientific Computing SCAI

Konrad Steiner, Klaus Dressler, Joachim Linn
Fraunhofer Institute for Industrial-Mathematics ITWM

Michael Jöckel, Holger Hanselka
Fraunhofer Institute for Structural Durability and System Reliability LBF

Peter Schneider, Andreas Wilde
Fraunhofer Institute for Integrated Circuits IIS EAS

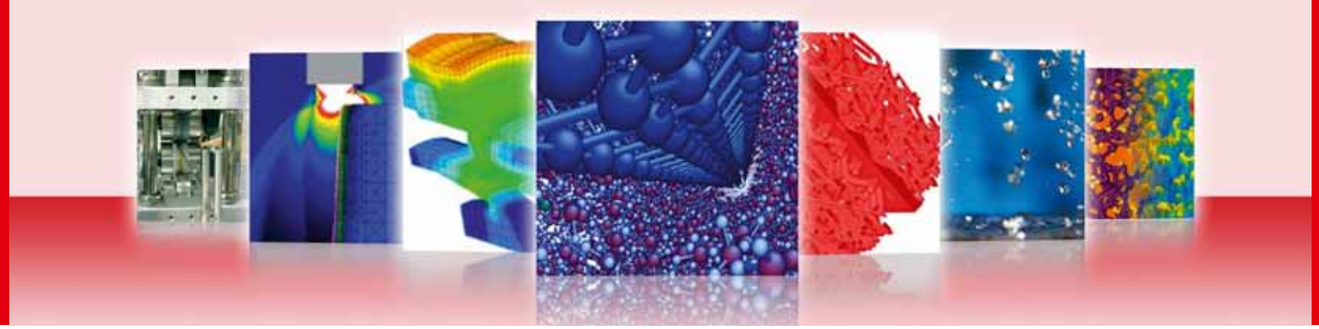
Tobias Preusser
Fraunhofer Institute for Medical Image Computing MEVIS

Torsten Kraft, Dong-Zhi Sun
Fraunhofer Institute for Mechanics of Materials IWM

Markus Niessen, Wolfgang Schulz
Fraunhofer Institute for Laser Technology ILT

MULTIPHYSICS SIMULATION

- Materials Design
- Laser Induced Manufacturing Processes
- Integrated Manufacturing Process Chains
- Process and Environmental Engineering
- Multiphysics Simulation in Bio-Medical Applications



MULTIPHYSICS SIMULATION

- Civil Engineering, Security and Defense
- System Simulation in Vehicle Engineering
- E-Mobility
- Electrical and Electronic Systems
- Multi-Disciplinary Functional Mock-Up
- General Multiphysics Methods

MATERIALS DESIGN

Modern functional materials are characterized by many needs. Mechanical, thermal and electrical properties must meet specific targets. In porous structures, fluid dynamic properties also have to be considered. Atomistic and micro-structural simulations can broadly support these developments. This symposium demonstrates the state-of-the-art in modelling. Typical methods include representative volume element (RVE) approaches to predict averaged properties or atomistic and quantum mechanics simulations to determine the influence of local defects and interface properties.

LASER INDUCED MANUFACTURING PROCESSES

Lasers have proven the ability to supplement or even to replace existing tools in materials processing. Modelling and simulation are key elements for achieving process knowledge. Most laser processes are represented by three-dimensional multi-scale free boundary problems, which comprise continuum physical problems like heat conduction and hydrodynamics in different phase volumes. These physical processes are accompanied by beam propagation and absorption phenomena as well as phase transitions like melting, vapourisation and solid phase changes.

INTEGRATED MANUFACTURING PROCESS CHAINS

Integrated modelling of manufacturing process chains is a new and efficient method for the optimization of different production processes at the same time and for the improvement of product quality. A coupling between forming simulation and crash simulation, for example, results in a better prediction of the crash safety of high strength steels. The great challenges for modelling of multidisciplinary manufacturing process chains are the development and combination of numerical tools, e.g. material models, mapping methods and modelling concepts.

PROCESS AND ENVIRONMENTAL ENGINEERING

Filtration, separation and mixing processes are core processes in process and environmental technology. In industrial application, the design and control of such processes require the simulation of multiphase flow phenomena under mechanical and thermal requirements. Moreover, the integration of different production steps into a production chain cause for a coupling of different levels of model description. The mini-symposium will show that modern multiphysics simulation techniques can be used to control and design production processes in chemistry, bio technology and environmental engineering.

MULTIPHYSICS SIMULATION IN BIO-MEDICAL APPLICATIONS

The necessity to develop low-price and competitive products in medical technology requires new and effective methods, such as virtual product development. By means of modern simulation procedures, product properties (consistency, flow, etc.) can be shown on the computer. Up to now, product properties were identified in isolated calculations, with a variety of factors strongly influencing the biomedical field. Therefore, coupled simulation methods become more and more important, requiring close cooperation between medical and engineering experts.

CIVIL ENGINEERING, SECURITY AND DEFENSE

Dynamic loading through wind or water forces impact or blast waves from explosions need to be considered for a secure design of buildings, vehicles and structures (including off shore structures).

SYSTEM SIMULATION IN VEHICLE ENGINEERING

Modern vehicles are complex mechatronic systems consisting of interacting structural, hydraulic, pneumatic and electrical components. These components are continuously monitored by sensorical devices, controlled by distributed software systems and actuated by active components. This symposium intends to highlight innovative mathematical technologies, their implementation and application in advanced simulation approaches on the system level to support the development of vehicles. The topics include mathematical methods to analyze and model system loads and usage variability, multidisciplinary system simulation techniques combining multibody dynamics, optimal control and nonlinear model reduction techniques.

E-MOBILITY

New concepts for hybrid or e-cars define a new challenge for design and simulation. There is a strong demand for alternative concepts for propulsion technologies, power generation, transmission and distribution of energy.

ELECTRICAL AND ELECTRONIC SYSTEMS

Electronic systems face an increasing demand for multiphysics analyses in the design process. This is caused by several trends: higher integration densities, higher requirements due to raw environmental conditions, stronger interactions with their surrounding nonelectrical systems. Important topics in that field are thermal management in electrical and electronic systems, electromagnetic coupling and parasitics extraction, magneto-hydrodynamics and specific problems in electrical machines.

MULTI-DISCIPLINARY FUNCTIONAL MOCK-UP

Mechatronic systems incorporate several physical domains as well as a variety of different design philosophies. Approaches are needed to integrate domain-specific simulation algorithms. The great challenges are on the algorithmic as well as on the interface side. Co-simulation for complex systems, algorithmic issues of co-simulation, software interfaces for co-simulation and combination of 3D with 1D-system simulations are of particular interest.

GENERAL MULTIPHYSICS METHODS

Multiphysics simulations can be realized by different approaches. Integrated environments include solvers for various physical disciplines. On the other side, engineers often want to combine simulators from different vendors through open interfaces. On the numerical level there are still lots of open issues, such as accurate and robust mapping in space, adaptive time stepping in coupled solutions, stability and convergence, overall solution performance.