

Tutorials and Workshops

The following Tutorials and Workshops will be offered on Sunday, August 15, 2010, just prior to the start of the technical sessions at this year's conference. The cost of the tutorial is \$75 for Professionals and \$50 for Students. This fee will increase for late and onsite registrations. There is no cost to attend the workshops. However, you are required to indicate your participation when processing your registration for the main conference.

Full descriptions of each workshop are noted below:

Room	Capacity	8:00am-12:00pm	Lunch	1:00pm-5:00pm
		WS1		WS1
		WS2		TU1
		WS3		WS4
		WS5		WS5
		WS6		WS6
		WS7		WS7
		WS8		WS10
		WS9		

PROGRAM

Tutorials:

TU1: Isogeometric Modeling, Analysis and Optimization

Workshops:

WS1: Efficient High-Fidelity Modeling of Physical Systems

WS2: Static Balancing: Linkages and Planar Compliant Mechanisms

WS3: Operationalizing Experiential Learning in a Curriculum

WS4: From Product Dissection to Product Archaeology: Understanding the Global, Economic, Environmental, and Societal Foundations of Engineering Design

WS5: NSF Workshop on Design Methods for Sustainability

WS6: Teraflop Parallel Computing on a Budget, Applications of GPU Computing in Mechanical Engineering

- WS7:** Challenging the Triangle: Engineering, Culture and Emotion
- WS8:** Implementing Product Lifecycle Management: Cross Industry patterns, Systemic Life Cycle, and Deploying Framework vs. Applications
- WS9:** Structural Design of Micromachines and Microelectromechanical Systems (MEMS)
- WS10:** Networking Skills and Strategies

TUTORIALS

TU1: *Isogeometric Modeling, Analysis and Optimization* - Sunday

Date: Sunday, August 15, 2010

Time: 1:00pm – 5:00pm

Room: TBA (Upon check-in at the registration desk)

Presenter(s):

Xiaoping Qian
Illinois Institute of Technology,
Email: qian@iit.edu
Phone: +1 312 567 5855

Description:

This tutorial offers an introduction on an emerging computational design method. This method uses the same mathematical basis underlying the geometry representation of the current CAD systems to approximate the physical fields in analysis. It is hence referred to as the isogeometric method.

Salient features of this method include:

- 1) superior numerical properties in analysis, e.g. in terms of per-degree-of-freedom accuracy over traditional finite element analysis.
- 2) easy integration between CAD and analysis. Due to the shared geometry representation, it can avoid labor-tediousness in mesh generation and geometric inaccuracy in mesh approximation of the CAD model.
- 3) being conducive for shape optimization. The shared geometry representation allows for easy mesh refinement and update during the optimization process.

This method opens up many interesting research issues for both CAD and finite element analysis communities.

Outline

This tutorial will include three components:

- 1) non-uniform rational B-spline (NURBS) based object modeling;
- 2) Isogeometric analysis; and
- 3) Isogeometric shape optimization.

WORKSHOPS

WS1: *Efficient High Fidelity Modeling of Physical Systems*

Date: Sunday, August 15, 2010

Time: 8:00am – 5:00pm

Room: TBA (Upon check-in at the registration desk)

Presenter(s):

Derek Wright (Point of contact)
Maplesoft Inc.
E-mail: dwright@maplesoft.com
Phone: +1 519 747 2373

Venkat N. Krovi, University at Buffalo – SUNY
Aden Seaman, University of Waterloo
Orang Vahid, University of Waterloo
Paul Karam, Quanser
Tom Lee, Maplesoft

Description:

Conventional engineering modeling software packages are reaching the limits of their usefulness for emerging modeling challenges, such as the multidomain systems found in robotics, green engineering, and hybrid vehicles. This Workshop and Tutorial offers practical insights and techniques for overcoming these modeling challenges. Using the modeling software MapleSim, attendees will learn how to quickly develop high fidelity models of multidomain physical systems. The application focus will be control system development with a special emphasis on plant modeling and HIL testing. The techniques and examples are drawn from real industrial and research applications in automotive, aerospace, and robotics among others.

The conventional plant modeling process requires extensive effort on the part of the engineer in the form of manual derivation and manipulation of equations, and implementation of those equations in a signal-flow representation. Physical modeling in MapleSim provides an intuitive interface for constructing complex models from components. MapleSim also allows direct access to all of the model equations that are automatically generated and maintained in symbolic form, thus avoiding the error-prone process of manual derivation. Model development time can be significantly reduced – in many cases from months to days.

One further consequence of the MapleSim approach is increasing the fidelity of plant models for Hardware In the Loop (HIL) simulation while maintaining very fast realtime computation speeds. Using symbolic algorithms, model equations can be simplified and then converted into highly optimized source code that can run significantly faster than models and code developed with other software systems.

Outline

This session will consist of two parts each consisting of a half day:

- a) A hands-on tutorial where participants are welcome to bring their laptops and learn to use MapleSim. Trial licenses will be provided so that participants can follow along in MapleSim as these important topics are presented:
 - Discussion of the principles of physical modeling

- Demonstration of the design techniques of physical modeling using MapleSim
 - HIL capabilities and demonstrations on key platforms such as Simulink, and National Instruments
 - Code generation examples
 - Control design examples
 - Select modeling examples from key industries and research areas
- b) A workshop consisting of various case studies from industry and academia presented by researchers and practitioners from respective fields. Each case study will present the industrial or research challenge, the details of the resulting model, and the results of the study. Application areas will include:
- Robotics
 - Mechatronics
 - Green engineering
 - Automotive engineering (vehicle dynamics, powertrain, battery)
 - Engineering education

WS2: *Static Balancing: Linkages and Planar Compliant Mechanisms* (8:00am - 12:00pm)

Date: Sunday, August 15, 2010

Time: 8:00am – 12:00pm

Room: TBA (Upon check-in at the registration desk)

Presenter(s):

Juan A. Gallego (Point of Contact)
 Delft University of Technology
 Email: j.a.gallegosanchez@tudelft.nl
 Phone: +31 63 49 90263

Nima Tolou , Delft University of Technology
 Just L. Herder, Delft University of Technology

Description:

Statically balanced mechanisms are a kind of mechanisms which are in static equilibrium throughout a certain range of motion rather than in a single point, even in the absence of friction. This is achieved by creating constant potential energy, so that the system has no preferred position and, quasistatically, can be moved effortlessly. Static balancing increases performance of mechanisms by reducing the effect of undesired conservative forces and allows the design of multi-stable mechanisms, gravity compensators, constant force mechanisms, vibration isolators, etc. This tutorial presents the principles of static balancing of linkages and its extension to planar compliant mechanisms. The methodology of static balancing of linkages will be clarifying based on energy approach and building block concepts and will further be discussed by some practical examples and exercises. Finally, an introduction to static balancing of compliant mechanisms in macro and micro scales will be presented.

WS3: *Operationalizing Experiential Learning in a Curriculum*

Date: Sunday, August 15, 2010

Time: 8:00am – 12:00pm

Room: TBA (Upon check-in at the registration desk)

Presenter(s):

Farrokh Mistree (Point of Contact)
School of Aerospace and Mechanical Engineering,
University of Oklahoma
Email: farrokh.mistree@ou.edu
Phone: +1 405 306 7309

Patricia Hardré, University of Oklahoma
Aarnout Brombacher, Technical University of Eindhoven
Zahed Siddique, University of Oklahoma
Amy Bradshaw, University of Oklahoma
Dirk Schaefer, Georgia Tech

Description:

Motivation

Educators have reported on the benefits of experiential, hands-on, student-directed learning and recently the effects of design courses in engineering. Design courses serve as a platform to facilitate application of basic science and engineering principles on open-ended problems that require students to first apply divergent thinking and then converge to one solution. Much has been written about successes associated with the introduction of project-based learning that provide students with “real world” and “hands-on” design experiences. We observe that whereas all learning is an experience all experience does not result in learning. Hence, our motivation to offer this workshop.

Foundational construct

In the mid-eighties Kolb put forward the notion of experiential learning. Bloom has defined domains of knowledge. The Kolb and Bloom constructs have been blended into the *Intentional Reflection* model for learning and is foundational to our goal for this workshop

Our goal for this workshop is to identify like-minded educators who, in the context of the Intentional Reflection Kolb+Bloom Model, are interested in forming a learning community to address questions such as:

- *What are the career sustaining metacompetencies that need to be developed in engineering students for the innovation economy?*
- *What steps can be taken so that engineering students become accustomed to thinking along interdisciplinary lines in their approach to solving complex problems?*
- *How well are these metacompetencies developed in students using the current engineering curriculum?*
- *How can we efficiently develop these metacompetencies in students? How do we measure the level of developed metacompetencies?*
- *Based on learning and motivational theory, what are proper ways to infuse experiential learning into existing engineering curricula to develop student competencies for the innovation economy?*
- *Once we have created experiential learning activities, how do we measure their effectiveness?*

Outline and Format

We plan to develop and send a workbook to all participants prior to the workshop

Framing the workshop – 60 minutes. Framing the workshop

Innovation in the post-recession (innovation) economy

All learning is an experience. All experience is not learning. So what is experiential learning and what is it not. End panel with a game / thought exercise aimed at helping people understand what experiential learning is and is not.

Break – 15 minutes

Experiencing experiential learning – 120 minutes

Part A - Introduction to the Intentional Reflection Kolg+Bloom Model

Part A - Practice

A concrete example ...

A reflective observation ...

Part B - Introduction to the Intentional Reflection Kolb+Bloom Model

Part B - Practice

Abstract conceptualization ...

Active experimentation ...

Break – 15 minutes

Take aways– 30 minutes

What are some of the take aways from this workshop?

What are some of the questions worthy of investigation?

What should be the format of the next workshop to further the infusion of experiential learning in an engineering curriculum?

WS4: *From Product Dissection to Product Archaeology: Understanding the Global, Economic, Environmental, and Societal Foundations of Engineering Design*

Date: Sunday, August 15, 2010

Time: 1:00pm – 5:00pm

Room: TBA (Upon check-in at the registration desk)

Presenter(s):

Kemper Lewis, (Point of Contact)

University at Buffalo – SUNY

E-mail: kelewis@buffalo.edu

Phone: +1 716 645 2685

Timothy W. Simpson, Penn State University

Gül Kremer, Penn State University

Ann McKenna, Northwestern University

Description:

Many engineering departments often struggle with meeting “the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context” (Outcome h) that is required by ABET. In this workshop, we present the foundations of product archaeology – a platform upon which to address Outcome h through a series of design-related

courses. The workshop will build upon our efforts in cyberenabled product dissection-based pedagogy and will provide scalable learning materials, strategies, and educational innovations that develop students' understanding of the broader context of engineering. Assessment instruments for curricular development will also be presented. Also, participants will create their own learning modules using products and templates provided by the workshop. Laptops are strongly encouraged.

Outline

1. Introduction to Product Archaeology and Instructional Framework
2. Current Product Archaeology Implementations
 - a. Penn State – sophomore
 - b. Univ. at Buffalo – junior/senior
 - c. Northwestern – capstone
3. Product Archaeology Exercise
 - a. Problem Definition
 - b. Problem Implementation
 - c. Exercise Formation
4. Assessment Instruments

WS5: *NSF Workshop on Design Methods for Sustainability*

Date: Sunday, August 15, 2010

Time: 8:00am – 5:00pm

Room: TBA (Upon check-in at the registration desk)

Presenter(s):

Deborah L. Thurston (Point of Contact)
Department of Industrial and Enterprise Systems Engineering
University of Illinois at Urbana-Champaign
Email: thurston@illinois.edu,
Phone: +1 217 333 6456

Harrison Kim, University of Illinois at Urbana-Champaign

Description:

This workshop will help define the agenda for interdisciplinary research in design for sustainability. Sustainability poses unique challenges to the design community because it redefines the traditional scope of design analysis. The “Design for Sustainability” community has evolved from a short term, special interest group to one which has grown in importance and breadth. Sustainability has now become a permanent consideration in the design process. There are many different venues in which design for sustainability researchers operate and present their work. At this workshop, researchers across a range of communities can meet, establish a common understanding of the current status of this rapidly evolving field, define the limits of the current state of the art, and develop an agenda for future research. There will be approximately 40 participants from both academia and industry. Participant will be admitted on the basis of a short essay in which the potential attendee describe their reasons for interest in the workshop, and what they hope to add to the workshop discussions.

WS6: *Teraflop Parallel Computing on a Budget, Applications of GPU Computing in Mechanical*

Engineering

Date: Sunday, August 15, 2010

Time: 8:00am – 5:00pm

Room: TBA (Upon check-in at the registration desk)

Presenter(s):

Dan Negrut, Assistant Professor (Point of Contact)
Department of Mechanical Engineering
University of Wisconsin-Madison
Email: negrut@wisc.edu
Phone: +1 608 262 3594

Krishnan Suresh, University of Wisconsin-Madison
Sara McMains, University of California, Berkeley
Roshan D'Souza, University of Wisconsin - Milwaukee

Description:

As the computer microprocessor industry rallies behind a new design paradigm that emphasizes massively parallel architectures, today's computational methods in Mechanical Engineering are gradually becoming obsolete and ill-positioned to answer the ever growing challenges posed by Simulation-Based Engineering. This workshop will present a series of inroads made in the use of GPU computing for speeding up multibody dynamics analysis, finite element applications, bone modeling, mold design, agent-based modeling, and simulation of granular material. Enabling speedups by factors of 10 to 100, the emerging massively parallel commodity hardware ushers in an era where each one of us will have Teraflop level computational speed at our fingertips.

Beyond strictly showcasing research that leverages this hardware, the workshop will walk the participant through the C-for-CUDA programming model (developed and supported by NVidia corporation). C-for-CUDA is a gentle C-with-extensions language that simplifies the programming of the 240 parallel Scalar Processors available on today's commodity GPUs. We will also touch on other emerging platforms for programming the CUDA architecture such as the cross-platform OpenCL standard.

Outline

First session (9 AM to 11:30 AM) will focus on basics of GPU computing, and how to get started on GPU computing.

Second session (12:30 pm to 3 pm) will highlight various computational problems that have been successfully ported to the GPU.

WS7: *Challenging the Triangle: Engineering, Culture and Emotion*

Date: Sunday, August 15, 2010

Time: 9:00am – 4:00pm

Room: TBA (Upon check-in at the registration desk)

Presenter(s):

Shuichi Fukuda (Point of Contact)
Stanford University
E-mail: shufukuda@cdr.stanford.edu

Phone: +1 650 798 5040

Masatoshi Yamanaka, University of Tsukuba, Japan
Mark Fox, University of Toronto, Canada
Simon Shuette, Linkoping University, Sweden
Yong Zeng, Concordia University, Canada
Yuzo Ota, McGill University, Canada

Description:

This workshop is intended to prove engineers with multi-dimensional glasses to see the engineering in a very different perspective. Engineering is nothing other than creation. So let us be creative and find out together what new ideas or things we can come up with.

Outline

Engineering goes more and more global and it is no more just a means to provide goods to people. People are more and more pursuing their own lifestyles and they are asking us more how their expectations can be met. We should provide satisfaction to our customers who are very active and creative. They are no more passive consumers. What engineers should develop now are services. Culture and emotion are leading players to change the game.

WS8: *Implementing Product Lifecycle Management: Cross Industry Patterns, Systemic Life Cycle, and Deploying Framework vs. Applications*

Date: Sunday, August 15, 2010

Time: 8:00am – 12:00pm

Room: TBA (Upon check-in at the registration desk)

Presenter(s):

Ravi Rangan (Point of Contact)
Centric Software, Inc.
E-mail: rangan@centricsoftware.com
Phone: +1 408 574 7802 EXT622

Bipin Chadha, Centric Software, Inc.
Ram Sriram, NIST

Description:

This workshop will explore the industry based implementation trends and patterns as it deals with PLM deployments. Specifically, we will review:

- the trend towards more systemic lifecycle assessments (e.g. sourcing, costing, systems engineering, project integrated process and information management) in addition to traditional engineering and manufacturing processes.
- targeted applications vs. frameworks
- maturity of deployment methodologies and approaches
- business- transformation initiative led deployments vs. house-keeping initiatives

In addition, we will review:

- research issues such as the maturity of ontologies, standards and domain models for deployability, and discuss key emerging areas and gaps.

- research, technology, process and business dimensions of PLM, based on real-world PLM implementation experiences spanning multiple industries (aerospace/ defense, automotive, high-technology, medical devices, etc.) across different domains (part/ BOM release, systems engineering, strategic decision support, etc., including multiple industries).
 - real-world case studies, research experiences and standards efforts
 - business motivations, implementation drivers, first principles and solution techniques, the success (or lack of) standards, business process patterns, industry case studies, and trends in PLM, including system demonstrations and team exercises where appropriate.
- In addition, we will discuss how academic communities, industries, researchers and government organizations can better mobilize to address the demands of PLM opportunities.

Outline

1. Introduction
2. PLM – Overview and evolution
3. Solution patterns
4. Standards, Ontologies and domain models – for research or deployment
5. Case studies - what's worked and challenges
6. Team exercise 1
 - o PLM technologies - products, processes and solution approaches
7. Team exercise 2
 - o Implementation Methodologies and techniques
8. Team exercise 3
 - o Overcoming the challenges
9. Summarize team conclusion

WS9: *Structural Design of Micromachines and Microelectromechanical Systems (MEMS)*

Date: Sunday, August 15, 2010

Time: 8:00pm – 12:00pm

Room: TBA (Upon check-in at the registration desk)

Presenter(s) :

Brian Jensen (Point of Contact)
Brigham Young University
Email: bdjensen@byu.edu
Phone: +1 801 422 6030

Srikar Vengallatore, McGill University

Description:

Micromachines and microelectromechanical systems (MEMS) are being developed for a staggering array of applications ranging from sensing and communications to energy harvesting and drug delivery. As more of these devices make the transition from research laboratories to full commercialization, there is a growing need for rational methodologies that lead to designs enhancing the performance, reliability, and manufacturability of these systems. This workshop is organized by members of IFToMM's Technical Committee on Micromachines.

Outline

This tutorial will focus on recent advances in the theory and practice of microsystem design, including:

1. State-of-the-art: a comparison of the designs of micromachines and macromachines
2. How does scale influence the selection of materials, shapes and structures?
3. What constraints does micromachining technology impose on shape and material selection?
4. Use of compliance in the design of micromachines
5. Does miniaturization open up new regions of the design space?
6. Case studies: micro fuel cells vs. micro-engines, out-of-plane cell constraints

WS10: Networking Skills and Strategies

Date: Sunday, August 15, 2010

Time: 1:00pm-5:00pm

Room: TBA (Upon check-in at the registration desk)

**** Note: Registration for this workshop is being handled separately from the main conference registration. If you are interested in attending this workshop, please complete the workshop survey via the following link.**

<http://www.surveymonkey.com/s/asmenetworking>

Presenter(s):

Carolyn J. Emerson - Currently the Project Coordinator for the newly established Canadian Centre for Women in Science, Engineering, Trades and Technology and has worked with the NSERC/Petro-Canada Chair for Women in Science and Engineering for the Atlantic region. Since 2002, Carolyn has worked on projects in both Canada and the U.S. focusing on women's full participation in these fields. She is the co-author of *Becoming Leaders – A Practical Handbook for Women in Engineering, Science and Technology* published in 2008 by the American Societies of Civil and Mechanical Engineers and the Society of Women Engineers.

Valerie J. Davidson is NSERC Chair for Women in Science and Engineering for the Ontario region. The objectives of the chair program are to encourage women to study science and engineering and to consider careers in related areas and improve retention of women in undergraduate programs and early careers related to sciences and engineering. In 2002 Valerie was a co-recipient of the Canadian Council of Professional Engineers (CCPE) Award for Support of Women in Engineering, an award that recognises noteworthy support of women in the engineering profession and engineering excellence.

ASME Division of Engineering Design (DED) Committee on Broadening Participation: Janis Terpenny (chair), Judy Vance, Susan Finger, Deborah Thurston, and Gloria Weins

Janis Terpenny (Point of Contact)
Mechanical Engineering & Engineering Education
Virginia Tech
Email: terpenny@vt.edu

Phone: +1 540 231 3421

Description:

The goal of the workshop on Networking Skills and Strategies is to continue the development of a community within the American Society of Mechanical Engineers that supports and mentors researchers from underrepresented groups. The workshop is designed to provide faculty members and graduate students with professional development activities and to give them the opportunity to make connections with an international network of supportive researchers in their field. This workshop will be the second workshop event of the Broadening Participation committee of the ASME. The goal of the Broadening Participation committee is to develop, implement and oversee new and existing activities aimed at broadening the participation of women and underrepresented minorities in the activities of the Design Engineering Division of the American Society of Mechanical Engineers.