

Message from the Chair

Monica Bordegoni



Welcome to the 2016–2017 edition of the CIE Division Newsletter. As the Chair of the division, I would like to extend my sincere thanks to the technical committees, executive committee members, and volunteers for making the 2016 *Computers and Information in Engineering Conference* held in Charlotte a great success. We had 161 papers submitted to the conference, out of which 130 were accepted and presented in 29 sessions.

The keynote address was given by Reza Sadeghi, managing director at Dassault Systemes. We would like to thank him for an inspiring presentation on “Multiscale Modeling in Support of Virtual AM”. Several panels were also offered to bring a renewed focus within the division on industrial needs and capabilities. In addition, an industry presentation was organized on “Computer and Information Technology Trends”.

The organization of the CIE conference is a long process and requires the contribution of many volunteers. We have already started working towards the next conference that will be held in Cleveland, Ohio, and we count on your help. One way to help is to join one of our technical committees and/or assist in reviewing papers. For recent graduates and young faculty, this is an excellent means of getting recognized within the community. If you would like to volunteer, please contact me at monica.bordegoni@polimi.it.

One of CIE’s strategic goals continues to be increasing our membership. We hope that if you are not already a member of CIE, you will consider CIE as your home

CIE NEWSLETTER

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Division. We also seek your help in promoting the Division and recruiting new members. At Cleveland, we encourage you to participate in one of our technical committee meetings.

A second strategic goal is to develop new CIE technical sessions that are well aligned with interests of the community. For the coming year, we plan to add several such sessions, including industry-focused sessions that encourage academia–industry partnerships.

Our awards program has been very successful in highlighting the achievements of our members, and we need your help in identifying deserving colleagues. Please contact Krishnan Suresh (ksuresh@wisc.edu), our Awards Chair, with nominations and questions.

Effective July 1st, 2016, the new Executive Committee members are: Chair: Monica Bordegoni, Vice Chair: Ian Grosse, Program Chair: Cameron Turner, Secretary: Yan Wang, Jitesh Panchal is our member-at-large and Mahesh Mani is our incoming member-at-large. Marc Halpern, Vice President, Research, Manufacturing Advisory Services, Gartner Inc., continues to be our Industry Executive. Our past chair, Krishnan Suresh, is now the chair of the Honors and Awards Committee.

More information about the activities of our division can be found at

https://community.asme.org/computers_information_engineering/default.aspx/

The 37th CIE conference will be held in Cleveland, OH, from August 6–9, 2017. We look forward to seeing you in Cleveland.

Monica Bordegoni
Full Professor, Politecnico di Milano, Italy
Chair, CIE Division of ASME

Feature Article – Topology Optimization for Additive Manufacturing

Krishnan Suresh, Xiaoping Qian

There is significant interest today in integrating additive manufacturing (AM) and topology optimization (TO) [1]. While there are several challenges, this article focuses on support structure minimization.

Recall that in several AM technologies, if a surface is overhanging (beyond a typical threshold of 45°), support structures are essential to prevent drooping and burning; see Figure 1; this adds to fabrication and clean-up costs.



Figure 1: Support structures[<http://www.albanyprinting.xyz/>]

Support structure play an important role within the context of topology optimization. Consider the classic MBB problem in Figure 2a; the objective is to find the topology of minimal compliance for a volume fraction of 0.6. The optimized topology, without imposing any overhang constraint, is illustrated in Figure 2b. Observe that, for a vertical build, significant amount of support structures is needed.

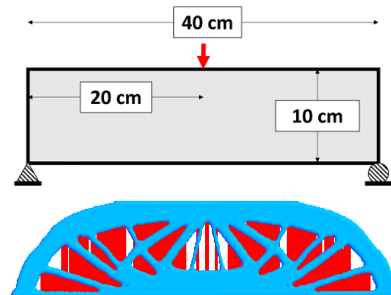


Figure 2: (a) MBB problem, and (b) optimized topology with support structures for a vertical build.

This raises a number of questions. Can one impose support structure constraints during topology optimization? How would this affect structural performance?

Balancing Performance and AM Costs

In Prof. Suresh's Lab (www.ersl.wisc.edu) at University of Wisconsin, Madison, a topological sensitivity based approach is being pursued to address such questions. Specifically, in [2], the concept of *support structure sensitivity* was introduced and combined with classic topological sensitivity to balance structural performance and support structure reduction.

For example, Figure 3 illustrates an MBB topology where a 100% reduction in support structures was achieved, with a compliance increase of 18%.



Figure 3: Optimized topology with no overhangs.

However, it is not always possible to eliminate support structures. For example, Figure 4a illustrates a 3D design problem where it is impossible to eliminate support structures entirely. Indeed, Figure 4b illustrates two different topologies [2]: the first corresponds to unconstrained compliance minimization, while the second corresponds to a 20% reduction in support volume. Further reduction leads to a serious degradation in structural performance.

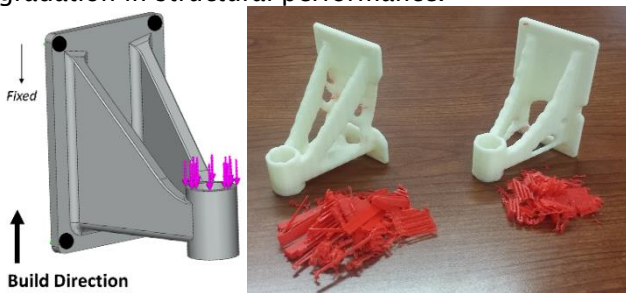


Figure 4: (a) A bracket design problem. (b) Optimized designs, without and with, support structure constraint.

This is a first step towards a more comprehensive framework for integrating TO and AM. Efforts are underway to include additional AM constraints, such as surface roughness, volumetric error, etc.

Undercut Control with Projected Perimeter

In Prof. Qian's lab (cdm.me.wisc.edu) at University of Wisconsin, Madison, a method for controlling undercut in topology optimization has been recently developed [3]. This method allows users to directly specify the perimeter length (or areas) in 2D (or 3D) designs that can have undercut. Figure 5 illustrates the basic idea of *projected undercut perimeter* (PUP). It measures the horizontal length of boundary with undercut. Figures 6, 7 and 8 compare a set of optimized designs without any PUP constraint, with decreasing PUP constraint, and with PUP constraint approaching zero, respectively. It is clear that when the PUP becomes smaller, the area that needs support becomes asymptotically smaller. These

designs demonstrate that the PUP can be used to control the amount of support allowed in the optimized design.

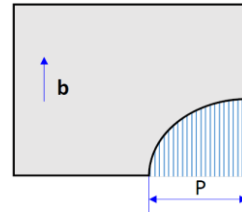


Figure 5 Projected undercut perimeter measures horizontal length (area) for a 2D (3D) design that needs support.

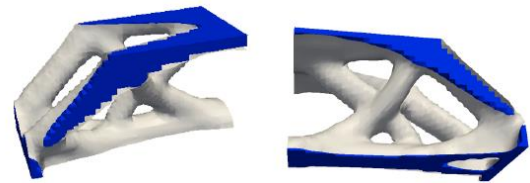


Figure 6 Optimized design without undercut control

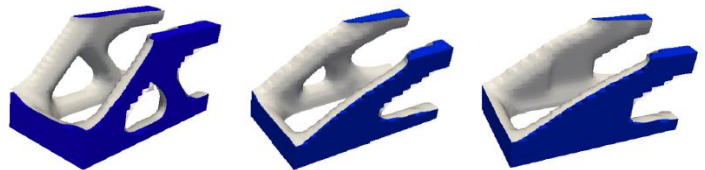


Figure 7 Optimized designs with decreasing allowed projected undercut perimeter.

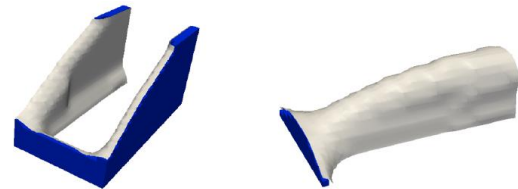


Figure 8 As the allowed projected undercut perimeter approached zero, the resulting design is free from any overhang.

References

- [1] D. Brackett, I. Ashcroft, and R. Hague, "Topology optimization for additive manufacturing," in 22nd Annual international solid freeform fabrication symposium, 2011, pp. 348–362.
- [2] Mirzendehtel, A. M., Suresh, K., "Support structure constrained topology optimization for additive manufacturing," *Computer-Aided Design*, accepted, dx.doi.org/10.1016/j.cad.2016.08.006, 2016.

[3] X. Qian, "Undercut and overhang angle control in topology optimization," *International Journal of Numerical Methods in Engineering*, in press, 2016.

Honors and Awards

Our division's honors and awards were awarded, as usual, during our annual conference, the 36th CIE conference that took place August 21–24, 2016 in Charlotte, North Carolina.



Dr. Ram Sriram

The CIE Lifetime Achievement Award was awarded to Dr. Ram Sriram, Chief of the Software and Systems Division, Information Technology Laboratory, at the National Institute of Standards and Technology. Before joining the Software and Systems Division, Sriram was the leader of the Design and Process group in the Manufacturing Systems Integration Division, Manufacturing Engineering Laboratory, where he conducted research on standards for interoperability of computer-aided design systems and healthcare informatics. He was also the founding manager of the Sustainable Manufacturing and the Manufacturing Metrology and Standards for the Healthcare Enterprise programs. Prior to joining NIST, he was on the engineering faculty (1986–1994) at the Massachusetts Institute of Technology (MIT) and was instrumental in setting up the Intelligent Engineering Systems Laboratory. Sriram has co-authored or authored over 250 publications, including several books. His book entitled "Intelligent Systems for Engineering" is an encyclopedic volume on the use of artificial intelligence techniques to solving engineering problems. The three volume series on artificial intelligence applications to engineering design that he co-edited remains as a

classic on artificial intelligence applications. He has made dozens of invited presentations around the world on a wide range of topics. Sriram has served on the ASME CIE Executive Board, including as its Chair. Sriram was a founding co-editor of the *International Journal for AI in Engineering*. In 1989, he was awarded a Presidential Young Investigator Award from the National Science Foundation, U.S.A. He is the recipient of the ASME's 2011 Design Automation Award and the Washington Academy of Sciences' (WAS) 2015 Distinguished Career in Engineering Sciences Award. Sriram is a Fellow of ASME, AAAS and WAS, a life member of ACM and AAAI, a Senior Member of the IEEE. Sriram has a B.Tech. from IIT, Madras, India, and an M.S. and a Ph.D. from Carnegie Mellon University, Pittsburgh, USA.



Dr. Charlie C.L. Wang

The CIE Excellence in Research Award was awarded to Dr. Charlie C.L. Wang, a Professor and Chair of Advanced Manufacturing in the Department of Design Engineering at Delft University of Technology, The Netherlands. Prior to this position, he was a Professor of Mechanical and Automation Engineering at the Chinese University of Hong Kong, where he started his academic career in 2003. He received a BEng degree (1998) in mechatronics engineering from Huazhong University of Science and Technology, Wuhan, China. He received his MPhil (2000) and PhD (2002) degrees in mechanical engineering from Hong Kong University of

Science and Technology. Prof. Wang is a Fellow of American Society of Mechanical Engineers (ASME) and his research interests include geometric computing, computer-aided design, advanced manufacturing and computational physics. He received a few awards from professional societies including the ASME CIE Young Engineer Award (2009), the Best Paper Awards of ASME CIE Conferences (in 2008 and 2001), the Prakash Krishnaswami CAPPD Best Paper Award of ASME CIE Conference in 2011, the NAMRI/SME Outstanding Paper Award in 2013, and the Best Paper Award of Computational Visual Media journal in 2015. He serves on the editorial board of a few journals including Computer-Aided Design, IEEE Transactions on Automation Science and Engineering, ASME Journal of Computing and Information Science in Engineering, and International Journal of Precision Engineering and Manufacturing.



Dr. Mahesh Mani

The CIE Young Engineer Award was awarded to Dr. Mahesh Mani, a Senior Research Scientist with Dakota Consulting Inc. Dr. Mani has been associated with the Systems Integration Division, Engineering Laboratory, National Institute of Standards and Technology since 2006. Prior to his current position, Dr. Mani was a Research Faculty at the University of Maryland, College Park (UMD) where his research focused on sustainable manufacturing. At UMD, he continues to teach a course in Manufacturing and Automation. Dr. Mani also worked as a Research Engineer at the Centre for Intelligent Products and Manufacturing Systems, National University of Singapore. Dr. Mani received his PhD in Mechanical Engineering from the National University of Singapore in 2005. He earlier received a Bachelor's degree in Mechanical Engineering from Annamalai University. Dr. Mani's primary research interests include sustainable and smart manufacturing, modeling and

simulation for sustainability, rapid response manufacturing, distributed and collaborative manufacturing including reconfigurable systems, manufacturing information networks and interoperable solutions. Dr. Mani has authored or co-authored more than 60 articles in journals, conference proceedings, technical notes and book chapters. Dr. Mani serves on the scientific and technical committees for both ASME and ASTM International. He is a voting member for additive and sustainable manufacturing standards developed within ASTM International.



Dr. John Steuben



Dr. Athanasios Iliopoulos



Dr. John Michopoulos

The Best of Conference Paper was awarded to Drs. John Steuben, Athanasios Iliopoulos, and John Michopoulos for their paper entitled *"Implicit slicing for functionally tailored additive manufacturing"*.



Dr. Briana Lucero

The Best Dissertation of this year was awarded to Dr. Briana Lucero, a Postdoctoral Researcher working in the Advanced Engineering Technologies Division at Los Alamos National Laboratory, for her dissertation entitled *"Design-Analogy Performance Parameter Systems"* completed at the Colorado School of Mines.



IDETC/CIE

International Design Engineering Technical Conferences & Computers & Information in Engineering Conference

Charlotte Convention Center, Charlotte, North Carolina, USA

CONFERENCE

August 21-24, 2016

EXHIBITION

August 22-24, 2016

CIE 2016 Conference Report

Yan Wang

- 161 papers submitted
- 130 accepted papers
- 2 Keynote
- 4 Panels
- 1 Industry Session
- 1 Graduate Student Poster Session
- 21 Symposia
- 29 Sessions

The 36th CIE conference was held in Charlotte, North Carolina, August 21–24, 2016. We received 161 papers for review, out of which 130 papers were accepted for 21 symposia and organized into 29

parallel sessions. As usual, the conference provided an excellent forum for the exchange of ideas. We truly appreciate the hard work of our technical committees, symposia organizers, and our referees.

CIE members were also involved in the organization of four panels. Shuichi Fukuda (Keio University) and Monica Bordegoni (Politecnico di Milano) organized a panel on “Creating Multisensory Experience” to discuss the potentials of using multiple channels of sensing and actuation to create new user experiences from products. Robert Wendrich (University of Twente), Hunter Hoffman (University of Washington), and Theodore Lim (Heriot-Watt University) organized a panel on “VES 2020: A Virtual Exploration in Real Usefulness”, where the combination of virtual reality and serious gaming to enhance decision making and user experiences were discussed. Chris Hoyle (Oregon State University), Pramita Mitra (Ford Motor Company), and Monica Bordegoni (Politecnico di Milano) organized a panel to discuss “The Internet of Things (IoT) and Its Impact on Driver Safety and Wellness” where panelists demonstrated the application of the latest IoT technology to in-vehicle health monitoring. Sudarsan Ruchuri and Mahesh Mani (National Institute for Standards and Technology) organized a panel on “Smart

Manufacturing: Industrial Internet of Things”, where the potentials of IoT and cyber-physical technologies in enhancing efficiency and productivity of future manufacturing processes.

This year, there was a special industry presentation session organized by Marc Halpern (Gartner Inc.) and Pramita Mitra (Ford Motor Company), where four speakers from industry gave presentations on the most current industry practice in computer and information technology in product development and innovation.

This year’s CIE keynote speaker was Dr. Reza Sadeghi, Managing Director at Dassault Systèmes. He delivered a speech of the need and path to have computer-aided materials design integrated with product design using a suite of multiscale simulation packages that range from traditional continuum scale to molecular and quantum scales. The speaker of a joint AM3D/CIE keynote session was Jose Coronado from PTC, who demonstrated the need of applying new design principles with the consideration of additive manufacturing processes.

The four technical committee meetings: Advanced Modeling and Simulation (AMS), Computer-Aided Product and Process Development (CAPPD), Systems Engineering, Information and Knowledge Management (SEIKM), and Virtual Environments and Systems (VES) were held on August 23, 2016, where new committees for 2016–2017 were formed.

A CIE luncheon was organized on August 23, 2016, including award ceremony. Our awards ceremony recognized contributions to CIE in several categories: Lifetime Achievement, Excellence in Research, Young Engineer, Best Paper awards, and Best Thesis

Dissertation awards. The various award winners and their citations are provided later in the newsletter.

Student Poster Awards were given for each technical committee. This year the award recipients consisted of 8 students from different universities. A full list of the award recipients and their research poster titles is available in the *Poster Session and Awards* section of this Newsletter.

Technical Committee Reports

Advanced Modeling and Simulation (AM&S)

Seung Ki Moon

The goal of the AMS technical Committee is to promote the use of advanced modeling and simulation for engineering problems and simultaneously encourage the development of new algorithms and methods that lead to faster and more accurate simulation tools. This year 62 papers were accepted among the nine symposiums in AMS. The presented topics ranged from new numerical methods for solving differential equations to applied engineering analysis with commercial modeling software. We continued co-hosting the new topics: Design and Simulation for Additive Manufacturing (jointly organized with SEIKM and CAPPD) and Modeling & Simulation of Humans in Engineering (jointly with CAPPD). The AMS symposium topics presented at Charlotte includes the following:

1. AMS General: A broad range of topics on modeling and simulation, especially those not included in the special sessions below.
2. Inverse Problems in Science and Engineering: Papers focused on the solution to inverse problems including shape design, material properties determination, boundary values/initial value identification, force and source determination, and governing equation determination were presented.
3. High Performance Computing: This topic incorporates the development and applications of Graphics Processing Unit (GPU) computing and has been expanded to include other areas of high performance computing including heterogeneous GPU/CPU

The 37th CIE conference will be held in Cleveland, Ohio, from August 6–9, 2017. A list of planned symposia is available in *CIE 2017 Call for Paper* section of this Newsletter. We look forward to seeing you in Cleveland.

computing and cloud computing. The organizers hosted contributions that demonstrated high performance computing in various fields including CAD, CAE, CAM, CFD, and life sciences.

4. Computational Multiphysics Applications: The models and numerical methods to capture the interactions among different physical phenomena in real-life systems, as well as phenomena with multiple length and time scales were the topics of this symposium.

5. Uncertainty Quantification in Simulation and Model Verification & Validation: Uncertainties are inherent in computational models because of abstraction and numerical treatments. In this symposium, methods for rigorous quantification of uncertainties in simulation and their applications in manufacturing, reliability assessment, and battery design were presented.

6. Simulation in Advanced Manufacturing: A forum for researchers and industry practitioners who are interested in various aspects of advanced modeling and simulation to promote smart manufacturing.

7. Design and Simulation for Additive Manufacturing: Simulation plays an important role to understand the detailed processes of additive manufacturing. In this symposium, papers on various aspects of additive manufacturing including computational geometry, microstructural design, process control, multiphysics simulation were presented.

8. Simulation in Manufacturing: Simulation tools are useful to understand manufacturing processes and predict outcomes. In this symposium, simulation methods were demonstrated in various manufacturing processes, such as machining, laser hardening, and casting.

9. Modeling and Simulation of Humans in Engineering: Most engineered products have human interaction at some point in their life cycles. The aspects of human safety, comfort, ergonomic and cognitive issues, as well as user interaction with the product, service, and environment in general were the discussed topics in this symposium.

This year, the graduate student poster session was jointly organized and closely coordinated by the four CIE technical committees.

AMS Sponsored Panel

The 2016 AMS sponsored panel focused on Smart Manufacturing: Industrial Internet of Things. The smart manufacturing has tremendous potential to improve productivity, efficiency, and overall sustainability for manufacturing industries across the globe. The panelists shared their vision and purpose as well as fostered lively discussion on the challenges,

opportunities in the manufacturing technologies and the role of standards in the widespread adoption of the smart manufacturing for both OEMs and SMEs in American manufacturing. The panel was moderated by Sudarsan Rachuri, NIST, USA.

AMS Best Paper Award:

The 2016 AMS Best Paper was awarded to: IDETC2016-59027, Tolerance analysis with polytopes in HV-description by Santiago Arroyave-Tobon, Denis Teissandier, and Vincent Delos on the topic: Advanced Modeling and Simulation General Session.

2016–2017 AMS TC Leadership

Chair: Seung Ki Moon, Nanyang Technological University, skmoon@ntu.edu.sg

Vice Chair: Krishnanand N. Kaipa, University of Maryland, kkrishna@umd.edu

Secretary: Ravi Burla, Autodesk, ravi.burla@autodesk.com

Past Chair: Mahesh Mani, Dakota Consulting Inc., mahesh.mani@nist.gov

Computer-Aided Product and Process Development (CAPPD)

Rahul Rai, Chi Zhou

At the 2016 CIE conference, CAPPD sponsored five conference tracks: a) CAPPD general, b) Emotional Engineering, c) Human-Centric Design, d) Human Modeling for Engineering Application organized with AMS, and (e) Design, Simulation and Optimization for Additive Manufacturing organized with AMS and SEIKM.

In total 47 draft papers were submitted; 43 papers were accepted, with an acceptance rate of 91%. The geographical distribution of the papers with regard to authors' affiliation was quite balanced: about 44% from USA, 34% from Europe and 22% from Far East.

This year CAPPD also proposed an interactive Panel entitled "Creating Multi-sensory Experience" coordinated by Prof. Shuichi Fukuda.

Every year, the CAPPD technical committee selects one paper for the Prakash Krishnaswami best paper award based on novelty, completeness, relevance, potential impact, clarity and presentation. This year Prakash Krishnaswami CAPPD Best Paper Award was given to *Erhan Arisoy, Guannan Ren and Suraj Musuvathy* from *Siemens Corporate Technology* and *Erva Ulu, Nurcan G. Ulu* from *Carnegie Mellon University* for their paper A Data Driven Approach to Predict Hand Positions for Two-Hand Grasps of Industrial Objects (DETC2016-60095). The paper was presented in the session: CIE-16-2 (CAPPD/AMS) – Human Modeling: Methods and Applications in Engineering.

CAPPD technical committee continued to organize the CIE Division Graduate Student Poster Session. A total of 15 abstracts were submitted. The ASME CIE Division was able to provide travel awards of \$750 per student to 8 students (two for each technical committee) selected based on the quality of their abstracts.

Virtual Environments & Systems (VES)

Francesco Ferrise, Robert E. Wendrich

This year the Virtual Environment & Systems (VES) technical session hosted 18 presentations organized in the five sessions which addressed a wide variety of topics such as: Interaction, UX and Interfaces; Augmented, Virtual and Mixed Reality; Smart Devices; Gaming and Gamification; Social Virtual Environments and Democratization of VR.

Researchers from ten different countries participated in VES, including; Italy, The Netherlands, United Kingdom, Finland, Sweden, Germany, Japan, Romania, Saudi Arabia and the United States.

The VES community has expressions of interest and focus towards the use of virtual reality technologies applicable to a plethora of domains. One of the concerns is the real and effective usefulness of VR and VES now and in the near future.

VES hosted a very successful panel session on the topic 'VES 2020 - A Virtual Exploration in Real Usefulness'. The panel presented and discussed a wide selection of topics ranging from the pervasiveness of virtual environments and systems, the current democratization of VR, Gamified CAD on the Cloud, the role of VR in Gender (e.g. gender swap, being there) and the applicability of VR (e.g. blended spaces, emotions and sensorial experiences, therapy) in education, industry (i.e. aerospace, automotive, building & construction, manufacturing) and public domains.

2016–2017 CAPPD TC Leadership

Chair: Chi Zhou, University of Buffalo (chizhou@buffalo.edu)

Vice-Chair: John Stueben, U.S. Naval Research Laboratory (john.stueben.ctr@nrl.navy.mil)

Secretary: Yayue Pan, University of Illinois at Chicago (yayuepan@uic.edu)

Past Chair: Rahul Rai, University of Buffalo (rahulrai@buffalo.edu)

Furthermore, real-life demonstrations of advanced interactive devices were given (e.g. HTC Hive, Sony PS VR, Oculus Rift) in conjunction with showing videos of applied research and development of VES community.

In September 2016 a JCISE Special Issue (Vol. 16, Issue 3) on "Virtual Environment Systems: Emerging Technologies and Applications" was published.

This demonstrates the high scientific quality reached in years by the VES community.

2016–2017 VES TC Leadership

Chair: Robert E. Wendrich, University of Twente (info@rawshaping.com | r.e.wendrich@utwente.nl)

Co-Chair: Pramita Mitra, Ford Motor Company | Research & Adv. Engineering (pmitra3@ford.com)

Systems Engineering, Information and Knowledge Management (SEIKM)

Ashis G. Banerjee

The Systems Engineering, Information, and Knowledge Management (SEIKM) division continues to pursue activities and research related to the design and engineering of systems where *complexity, large size, uncertainty*, and the availability of *big data* present unique challenges. To help both the research community as well as industry, several efforts have been advanced by the SEIKM Technical Committee (TC).

For the 2016 ASME IDETC/CIE conference in Charlotte, NC, a new joint DAC/CIE special session on *Design for Resilience and Failure Recovery* was introduced. It addressed a wide range of topics related to the design of resilient engineered systems and processes, including advanced system engineering methods for resilience, new performance measures for system resilience, novel design concepts and techniques for autonomous resilience realization, new approaches to integrate post-design failure recovery activities in early design stage of engineering systems, advanced system performance awareness techniques for engineering resilience, and advanced techniques for design integration towards engineering resilience. The session had 5 accepted papers in its inaugural offering.

Another special session was the combined AMS/SEIKM/CAPPD session called *Design, Simulation and Optimization for Additive Manufacturing*. These set of sessions received 19 papers distributed over 4 sessions. In addition to the special sessions, the established SEIKM sessions were conducted, consisting of SEIKM General, Design Informatics, Systems Engineering, Knowledge Capture, Reuse and Management, and Smart Manufacturing Informatics. These sessions received 32 submissions total, with 24 papers accepted for the conference.

SEIKM contributors have hosted several workshops over the past several years at the IDETC/CIE conference, and for 2016 a panel session was organized on *The Internet of Things and Its Impact on Driver Safety and Wellness*. It was moderated by Pramita Mitra from Ford Motor

Company. The panel comprised Yifan Chen (Ford Motor Company), Monica Bordegoni (Politecnico di Milano), Peter Freer (Freer Logic), and Cherita Corbett (SRI International). This panel provided a wonderful opportunity to engage in a lively discussion on the challenges and possibilities of enhancing driver experience through the smart use of IoT systems.

Also, in recognition of significant research achievement, the 2016 SEIKM Best Paper Award was given to the paper titled IDETC2016-60196: *A Design for Additive Manufacturing Ontology*, by Mahmoud Dinar and David Rosen from the Georgia Institute of Technology. The paper was selected by a committee based upon originality, research contribution, relevance, and completeness. Congratulations to the authors for their well-deserved recognition! Poster awards were also provided to students jointly by the 4 CIE Technical Committees. 12 posters were judged, out of which 8 travel awards were provided.

For the upcoming year, SEIKM looks to build on its success by offering new special sessions on emerging topics such as risk-aware cyber-physical systems and cognitive systems for 2017, providing greater support for graduate student and postdoc participation in the research community, and exploring a journal special issue of the top SEIKM conference papers. Look forward to seeing you in Cleveland, OH for the 2017 conference!

2016-2017 SEIKM TC Leadership

Chair: Ashis Banerjee, University of Washington (ashisb@uw.edu)

Vice Chair: David Jensen, University of Arkansas (dcjensen@uark.edu)

Past Chair: Chris Hoyle, Oregon State University, (chris.hoyle@oregonstate.edu)

Smart Manufacturing: Industrial IoT – AMS Sponsored Panel

Mahesh Mani

The Advanced Modeling and Simulation (AMS) Technical Committee sponsored a panel on Smart Manufacturing: Industrial Internet of Things. The panel was held on Tuesday, August 23 2:00 PM – 3:40 PM. The Session was chaired by Sudarsan Rachuri from the Department of Energy and Mahesh Mani.

Smart manufacturing has tremendous potential to improve productivity, efficiency, and overall sustainability for manufacturing industries across the globe. To design and deploy smart manufacturing across the extended and networked manufacturing enterprise, the industrial internet of things will play a critical role. There are various research and technology challenges as well as opportunities, for example: information fusion; advanced sensing and instrumentation; process monitoring, control and optimization; advanced hardware and software platforms; and real-time and predictive modeling; and simulation technologies that will have far-reaching impacts on smart manufacturing.

The panel was represented by the industry, academia and government.

Enrique Herrera – OSIsoft

CIE Industry Presentations

Marc Halpern, Pramita Mitra

The industry session, organized by Marc Halpern (Gartner Inc.) and Pramita Mitra (Ford Motor Company), addressed three of the most important and challenging issues facing engineering organizations today; 1) requirements compliance in systems design, 2) enabling scalable engineer-to-order practice with traceability throughout a product lifecycle, and 3) enhancing design and analysis with composite materials. Dr. Hubertus Tummescheit, CEO of Modelon Inc., shared how the two open standards Modelica and Functional Mock-up

Joe Beamen – University of Texas at Austin

Gloria Wiens – University of Florida

Phil Westmoreland – NC State University

Jim Davis – University of California, LA

Ram D. Sriram, National Institute of Standards and Technology

The panel was moderated by **Sudarsan Rachuri**. The panel format involved a short presentation from the panelists, followed by questions from the audience.

The short presentations by the panelists touched on opportunities and challenges for pursuing smart manufacturing technologies across different industry sectors, role of standards for smart manufacturing, SMEs role in Smart Manufacturing and opportunities and challenges for high performance computing for manufacturing. The questions from the audience also reflected the opportunities and immediate challenges in smart manufacturing technologies and the role of standards in the widespread adoption of smart manufacturing.

Interface (FMI) improve the time, cost and quality of systems design. Timothy Baynes, VP Product Strategy at Configit, shared advances in information technology that streamline design and configuration of customized products and enable traceability throughout product lifecycles. Dr. Jaesung Eom, Senior Research Engineer at Autodesk, Inc., discussed advances in simulation of short fiber injection molded composites. The session was well attended and facilitated many post-session discussions between the speakers and attendees.

Poster Session and Awards

John Steuben

The eight Student Poster Awards of this year are:

- Matt Adams (Arizona State University), “Correlating Variations in Ligament Integrity with Knee Stability”
- Sean Fry (Clemson University), “6-DOF Test Frame Experimentation of Additive Manufacturing Materials Using High-Speed Inverse Characterization”
- Adam Short (Colorado School of Mines), “Active Mission Success Estimation for Autonomous Mission Control Decisions in a Multi-System Mission”
- Andrea Piazza (Florida Institute of Technology), “Gaze Data in Product Design”
- Marc-Andre Chavy-Macdonald (University of Tokyo) “Review and Evaluation of Modeling Methods for Architecting Socio-Technical Systems-of-Systems”
- Kirill Martusevich (Florida Institute of Technology), “Model-Based Causal Reasoning in Early Conceptual Systems Design”
- Ashish Chaudhari (Purdue University) “Crowdsourcing for Engineering Design: Theoretical and Experimental Studies”
- Phyoo Htet Hein (Florida Institute of Technology), “Measuring Requirement Volatility through Graph Theoretic Metrics”

News on the Production of the 2nd Volume of the Book Series on the Advances of Computers and Information in Engineering Research (ACIER)

John Michopoulos



After the success of the first volume, this year we begin the process for the production of the second volume of the ACIER book series. This initiative remains as the second major activity after the annual conference, in terms of CIE’s legacy and leadership. The editorial board consists of four individuals aligned according to each of the technical committees of CIE. They are John Michopoulos for AMS, Chris Paredis for SEIKM, David Rosen for CAPPD and Judy Vance for VES.

This series intends to collect and publish cutting advances in the CIE technical areas that describe progress in the last three to five years. The chapters authored by exceptional researchers will be published both in hard-copy and electronic forms.

As an ASME volunteer organization, CIE is governed by the rules of the ASME and therefore the default publishing house for such an effort will be ASME.

The content collection, management, and live distribution will be achieved by a new resource at <http://www.editorialmanager.com/asmepress/> for the necessary content management of the submitted chapter proposals and eventually the invited chapters. After registration potential authors are invited to submit their chapter proposals not exceeding 2 pages. We will also maintain a custom-developed web-based system for the collaborative LaTeX authoring of the chapters that will be announced when the decisions for the chapter proposals are issued. For more details of the call for chapters and the important dates please visit <http://cie-advances.asme.org> where all details are available.

The call for chapter proposals is active as of November 1, 2016 with a closing date February 28, 2017 and is also presented in the present Newsletter.

Call For Papers



IDETC/CIE

International Design Engineering Technical Conferences
& Computers & Information in Engineering Conference

CONFERENCE

August 6-9, 2017

Cleveland Convention Center, Cleveland, Ohio

Abstract and Full Paper Due Date: February 10, 2017

- CIE-1 Advanced Modeling and Simulation (AMS General)
- CIE-2 AMS: Inverse Problems in Science and Engineering
- CIE-3 AMS: Computational Multiphysics Applications
- CIE-4 AMS: Uncertainty Quantification in Simulation and Model Verification & Validation
- CIE-5 AMS: Simulation in Advanced Manufacturing
- CIE-6 AMS/SEIKM/CAPPD: Design, Simulation and Optimization for Additive Manufacturing
- CIE-7 AMS Panel
- CIE-8 Computer-Aided Product and Process Development (CAPPD General)
- CIE-9 CAPPD: Emotional Engineering
- CIE-10 CAPPD: Human Modeling-Methods and Applications in Engineering
- CIE-11 CAPPD: Multimodal INTERfaces for Engineering Design (MINTED)
- CIE-12 Systems Engineering Information Knowledge Management (SEIKM General)
- CIE-13 AMS/SEIKM/CAPPD: Design, Simulation and Optimization for Additive Manufacturing
- CIE-14 SEIKM: Design Informatics
- CIE-15 SEIKM: Systems Engineering
- CIE-16 SEIKM: Knowledge Capture, Reuse, and Management
- CIE-17 SEIKM: Smart Manufacturing Informatics
- CIE-18 SEIKM: Risk-Aware Cyber-Physical Systems
- CIE-19 SEIKM: Human Factors and Cognitive Systems
- CIE-20 SEIKM Panel
- CIE-21 Virtual Environments and Systems (VES General)
- CIE-22 VES: Technology and Applications (TA)
- CIE-23 VES: Game Ecosystems in Design and Engineering (GEcoDE)
- CIE-24 VES: Open Framework Version X: Transference of Knowledge over Multiple Domains
- CIE-25 VES Panel
- CIE-26 Graduate Student Poster Session
- CIE-27 CIE Industry Presentation: Computer and Information Technology Trends (Industry Proposals)
- CIE-28 CIE Panel: From a Researcher/Technology Developer to an Advanced Technology Visionary/Facilitator - A Perspective
- CIE-29 DAC/CIE Joint Session: Design for Resilience and Failure Recovery
- CIE-30 AMS: Material Characterization Methods and Applications
- CIE-31 Knowledge Engineering and Management for Smart Manufacturing
- CIE-32 CAPPD Panel

Relevant Journals, Conferences & Workshops



JOURNAL OF COMPUTING AND INFORMATION SCIENCE IN ENGINEERING

The Journal of Computing and Information Science in Engineering publishes archival research results and advanced technical applications. The scope includes: Solid and Geometric Modeling; Computational geometry; Reverse Engineering; Virtual Environments and Haptics; Tolerance Modeling and Computational Metrology; Rapid Prototyping; Internet-Aided Design, Manufacturing and Commerce; Information Models and Ontologies for Engineering Applications; PDM/Enterprise Information Management; AI/Knowledge Intensive CAD/CAM; Engineering Simulation and Visualization, including FEA and Meshing; Creative IT; and Computational Algorithms/Software Development for mechanical product development.

<http://computingengineering.asmedigitalcollection.asme.org/journal.aspx>



Founded in 1880 as the American Society of Mechanical Engineers, ASME is the premier professional membership organization for more than 127,000 mechanical engineers and associated members worldwide. ASME also conducts one of the world's largest technical publishing operations in the world, offering thousands of titles including some of the profession's most prestigious journals, conference proceedings, and ASME Press books.

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Call for Chapter Proposals

For 2nd Volume of ACIER Book Series

ADVANCES IN COMPUTERS AND INFORMATION IN ENGINEERING RESEARCH

Book Series Editorial Board

John Michopoulos Naval Research Laboratory john.michopoulos@nrl.navy.mil	David Rosen Georgia Institute of Technology david.rosen@me.gatech.edu	Chris Paredis Georgia Institute of Technology chris.paredis@me.gatech.edu	Judy Vance Iowa State University jmvance@iastate.edu
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An additional team of technical editors who will be responsible for specific thematic areas will also edit each volume of the series.

Series Objectives & Mission: This book series aims to capture advances in computers and information in engineering research. The books will be published in both traditional and e-book forms. The contributions in this series are expected to also serve as tools that will enable engineers not only to read but also to experience the fruits of authors' research by providing software or animations or videos that will be hosted on our deployment web site of ACIER.

Audience: The intended audience is primarily the academic, governmental and industrial mechanical engineering and computational science communities interested in recent research advances as they relate to computational and information technologies associated with engineering design along with product and process development.

Thematic Content: The series will focus on advances in computational methods, algorithms, tools, and processes on the cutting edge of research and development as they have been reported during the last five annual CIE conferences. The series will provide a resource for enhancing engineering practice by enabling the understanding and the application of evolving and emerging technologies that impact critical engineering issues related to the topics and themes under CIE's technical committees' areas of interest (but not limited to) as shown in the table below:

<i>Advanced Modeling and Simulation</i>	<i>Computer-Aided Product and Process Development</i>	<i>Systems Engineering, Information and Knowledge Management</i>	<i>Virtual Environments and Systems</i>
Discretization Methods (Finite Element Analysis, Mesh-Free Methods etc.) ▪ Inverse Methods ▪ Model Identification ▪ Symbolic Computing ▪ High Performance Computing ▪ Methods for Computational Metrology ▪ Computational Multiphysics	CAD & Geometric Modeling ▪ Computer-Aided Manufacturing ▪ Collaborative and Concurrent Engineering ▪ Emotional Engineering ▪ Computer Aided Industrial Design ▪ Design Automation	Information Modeling and Exchange ▪ Product Lifecycle Management ▪ Knowledge-capture and reuse ▪ Business Process Design, Integration, Deployment and Management ▪ Systems Engineering	Augmented & Mixed Reality Systems ▪ Collaborative & Networked Virtual Environments ▪ VR in Product Conceptualization & Design ▪ Virtual Process Planning ▪ Virtual Assembly & Maintenance ▪ Haptic & Multi-

Important Dates

Manuscript proposal for book chapter (1-3 pages): [February 28, 2017](#)

Notification to authors of submitted chapters: [April 15, 2017](#)

First Draft of the chapters from authors: [October 15, 2017](#)

Reviews back to authors: [January 30, 2018](#)

Revised Chapters back from authors: [February 28, 2018](#)

Final notification to the authors: [March 25, 2017](#)

Final chapters from authors: [April 15, 2018](#)

More details and Online Submission at URL: <http://cie-advances.asme.org>

Please e-mail all inquiries to: info@cie-advances.asme.org

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Photos from the 2016 CIE Conference



Conference Chair, Dr. Monica Bordegoni



CIE Awards Luncheon



Lifetime Achievement Award, Dr. Ram Sriram



CIE Excellence in Research Award, Dr. Charlie Wang



CIE Young Engineer Award, Dr. Mahesh Mani



CIE Best Paper Award



Best Dissertation Award



AMS Best Paper Award



CAPPD Prakash Krishnaswami Best Paper Award



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Panel on IoT for smart manufacturing



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