

COMPUTERS & INFORMATION IN ENGINEERING DIVISION



Chair's Message

The past five years have been an exciting time to serve on the Executive Committee of ASME's Computers and

Information in Engineering Division. Although the renaming of the Division from Computers in Engineering to Computers and Information in Engineering occurred more than five years ago, the evolution in focus associated with the change has taken place gradually in that time. New Division Constitution and Bylaws were developed and approved, the Division structure has matured with some Technical Committees changing and new ones being created, and leadership has firmly embraced the Division's new emphasis on information technology as an essential element of the mechanical engineering profession. One of the more exciting changes associated with the CIE

Division's activities has been the launching of a new ASME Transactions journal, the Journal of Computing and Information Science in Engineering (JCISE), which is now in its fifth year of publication. And this year, the CIE Division is preparing to celebrate its 25th anniversary.

The coming years will continue to be interesting times for CIE given the Continuity and Change Transition that is taking ASME into a new phase as a professional society. Changes in organization, processes, and fundamental philosophy regarding roles and responsibilities of different components of the Society will affect how all of the elements of ASME do business, including the CIE Division.

From the perspective of the CIE Division in particular, I view this as a key to identifying and reemphasizing the ways in which the Division can provide value to ASME membership. This, in turn, is an important requirement for developing greater interest in CIE among ASME members, and increased engagement by members in Division activities.

Long Beach, California – Venue for the 25th CIE Conference



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The Division has been working to take steps in this direction.

At the leadership level, diversity among members of the CIE Division's Executive Committee has been viewed as an important part of representing the interests of different constituents and stakeholder groups among the broader membership; the CIE Executive Committee has a healthy mix of representatives from academia, industry and government. At a more operational level, the Division is experimenting with outreach to the local chapter level, to help identify technical activities that CIE can foster and participate in at local levels. If representatives or leadership of any local chapters have an interest in pursuing such activities, please drop an email to Plamen Bliznakov (contact information on page 8 in this newsletter), who will be the new Division Chair by the time you've received this issue.

As I mentioned earlier, this year marks the 25th anniversary of the CIE

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Division. This anniversary is being commemorated in several ways. The CIE Division web site has a new section relating to the 25th anniversary, which includes a compilation of 25 years of CIE-related publications. A special issue of JCISE is being planned, which will provide retrospective overviews of key technical areas that have been influential in the scope of computers and information in the mechanical engineering field. There will also be a variety of 25th anniversary events taking place at this year's CIE Conference (taking place in Long Beach, CA, on September 24-28), including a reception,

Committee News: From EUC to CINEMAS

The Embedded and Ubiquitous Computing (EUC) Technical Committee began in 1998 and hosted its first technical and panel sessions at DETC/CIE Atlanta. Dr. Harry Cheng of the University of California Davis started the Committee, which focused on networked computers embedded in a wide variety of applications. Commercial off-the-shelf integration and web technologies featured prominently in EUC; indeed, papers at the Atlanta conference described the application of embedded PCs for highway maintenance systems, and the use of Java for the design and diagnosis of real-time systems. The popularity of web-based systems using Java and VRML (Virtual Reality Modeling Language) was evident, both in papers presented at EUC sessions and through other CIE technical committees.

Industry involvement in EUC is encouraged, and at the 2003 conference in Chicago the Best Paper Award went to Andy Suri and Viswanath Ananth from Pathway Technologies Inc. for their paper on hardware-in-the-loop embedded control of stamping processes. That presentation included a demonstration of Pathway's system and a lengthy Q&A period followed.

In 2004 EUC was recast as Computers in Electromechanical Systems (CINEMAS) so that it could be more closely identified with ASME members' core interests. The focus continued to be embedded systems, described as "the computer in the system". Unlike other CIE technical committees in which computers play a part in design or analysis, CINEMAS considers those systems in which the computer is an integral

keynote, and a series of special sessions organized around the anniversary theme. I'd like to thank David E. Lee, past Chair of the CIE Division, for spearheading the 25th anniversary effort, as well as all of the other people (too many to name individually) who have contributed time to these activities.

It has been a privilege to serve on the CIE Executive Committee for the past five years. I am confident that my colleagues on the Executive Committee will continue to bring about positive changes for the Division and Society membership, and I look forward to seeing what the future will bring. ●

—Simon Szykman

part of the function. EUC founder and chairman Harry Cheng was joined by Fred Proctor of the National Institute of Standards and Technology as co-chair, and the program committee was populated by several members from SUNY Buffalo (Chin Pei Tang, Rajan Bhatt) and UC Davis (Zhao-qing Wang, Bo Chen).

At the 2004 Salt Lake City conference the committee conducted a tutorial on real-time Linux and the embeddable C/C++ interpreter Ch. Linux is becoming increasingly popular since it is freely distributed and ported to a wide variety of processor architectures, and several real-time variants are available. Papers in the 2001 and 2002 conferences showed that real-time Linux is deterministic down to tens of microseconds, and the 2004 tutorial showed this with a variety of tabletop demonstrations driven by a laptop. The Ch interpreter makes a good companion to RT Linux for real-time applications, and Dr. Harry Cheng and his colleagues demonstrated Ch in tandem with RT Linux.

CINEMAS continues to look for interesting applications of "computers in the system" that resonate with mechanical engineers interested in mechatronics, measurement and control. Software is becoming increasingly important and the committee's hope is to provide value to ASME members through conference papers, tutorials and other material designed to make software and computing very much part of an ME's professional career.

For more information on CINEMAS, contact the committee chairs (see Page 5). ●

Fred Proctor

The Young Engineers Forum



The Young Engineers Forum (YEF) was started in 1992 by the ASME to provide young engineers with firsthand advice and information on issues relevant to their careers. While the YEF is intended for engineers with less than 10 years experience, more experienced engineers may find the topics presented of interest. Students are also welcome to participate.

The primary purpose of the program is to increase young engineers' awareness of trends and opportunities in the profession, both locally and globally. It provides "practical" advice and information to help you advance in your career through accounts of "real life" experiences and success stories by professionals in industry. The program is delivered as a one-day event at Society events consisting of lectures and panel discussions.

Exploring the opportunities available in the engineering industry can be difficult especially when you are not aware of the industry or know someone who can enlighten you about that industry. The YEF brings guest speakers from many diverse and multi-disciplined companies and universities to educate students and young professionals of what is out there in industry. This is extremely beneficial to the students and young engineers because it allows them to expand their horizon and see the numerous opportunities available.

In addition, the YEF provides a great networking opportunity. Attendees are able to meet and network with managers and employers. Bring your resumes and make some business cards for this event because you never know who you may run into at the next YEF in your area!

For information on organizing a Young Engineers Forum in your town, please contact Howard Berkof at berkofh@asme.org.

We are also looking for energetic young engineers who want to help organize web-based seminars on Computers and Information topics of interest to your mechanical engineers. So get in touch with us! ●

Howard Berkof

Don't Forget!
25th CIE Conference
Sept. 24-28, 2005
Long Beach, California

The ASME International 25th Computers and Information in Engineering (CIE) Conference will be held on September 24-28, 2005, in Long Beach, California. This year's conference provides a forum for enhancing the practice of engineering by understanding the application of emerging technologies that impact critical engineering issues of representation, product design and product development, exchange, management and integration of information throughout the entire engineering product and process life-cycle. The 25th CIE Conference, will particularly reflect the technical maturity of computing in engineering and the emergence of the fundamental role of computers and information in engineering. This conference will also mark the 25th Anniversary of the CIE Division and perspectives on where the division has been and where it is headed will be highlighted. In addition, 2005 is the 125th Anniversary of ASME and will be celebrated throughout the conference. The conference will feature 124 paper presentations organized in 33 sessions. In addition, there will be a tutorial on *Product Lifecycle Management*, and five panel sessions on topics ranging from CAD for *bio/micro/nano systems*, to *SysML* and *Enterprise Applications Interoperability*. Finally there will be two special sessions in the context of the 25 th anniversary, and a joint session with The Japan Society of Mechanical Engineers. ●

25th Computers and Information in Engineering Conference

The Computers and Information in Engineering (CIE) Conference stands out among the meetings that take place under the auspices of the IDETC/CIE Conferences due to the unique vision that the CIE Division has set out for itself. Whereas many of the other IDETC conferences focus on a well defined technical discipline (e.g., vibrations, mechanisms, and various aspects of design), the CIE division has defined its domain as existing at the interfaces between three complementary, yet distinct, disciplines. The CIE conference is aimed at disseminating research that takes place at the boundaries between mechanical engineering, software engineering, and computer engineering, and that enhances the integration of these technical fields. Technical areas of interest to the conference fall broadly into themes of product development, systems development, management and use of information, and related emerging technologies. More specifically, conference topics include Enterprise Information Management, Computer-Aided Product Development, Internet-Aided Design, Manufacturing and

Commerce, Virtual Environments and Systems, Computers in Electromechanical Systems, Non-Traditional Computing, Energy Systems, Computational Technologies for Engineering Sciences Applications, and Computers in Education. As this year is the CIE Division's 25 th anniversary, an additional theme for the 2005 conference is a 25th anniversary celebration. Special events related to this occasion include a 25 th Anniversary Showcase and Reception with a special papers highlighting important conference themes that have arisen over the years, and the formal unveiling of the Online Conferences Project, which aims to provide comprehensive information on 25 years of conferences (including lists of publications, conference leadership, awards, etc.). These conference activities will complement other 25 th anniversary activities, which include a 25th anniversary edition of the CIE Division Newsletter, and a commemorative special issue of the ASME Journal of Computing and Information Science in Engineering. ●

David E. Lee

Organizing a New Technical Committee in Systems Engineering

We'd like to invite members of the CIE Division who are working in or interested in the field of system engineering to help us start up a new technical fundamentals of system engineering (requirements definition and flowdown, validation and verification, etc.), the infrastructural issues in developing and using computing tools for system engineering, as well as the application of system engineering to specific domains within mechanical systems and broadly applied to engineered systems. If you're interested, please send e-mail to leed515@asme.org. ●

David E. Lee

Journal of Computing and Information Science in Engineering

Special issue celebrating the 25th Anniversary of the CIE Division

JCISE is a multi-disciplinary journal at the junction of Mechanical Engineering and Computer Science. It was created with the specific purpose of providing an avenue for papers in computing and information science related to mechanical product development. It publishes archival research results and advanced technical applications in the areas of computer aided product development, simulation and visualization, and engineering informatics (including AI/Knowledge based systems).

Coming up later this year will be a special issue celebrating the 25 th anniversary of the CIE Division. This special issue will feature review articles looking back at the most important trends in Computing and Information Science over the last decade, and prominently features the impact the CIE division has had in this important domain.

Note: ASME members can get their personal subscription to JCISE at a highly reduced rate (U.S. \$50/year). Remember to check the box when renewing your membership this year! ●

Committee News: From CTFE To CTESA

You may have noticed that there was a name change for the Finite Elements Computational Technologies Committee (CTFE) to that of Computational Technologies for Engineering Sciences Applications (CTESA). This article describes some of the reasoning and the process behind the change.

The CTFE committee as it existed and operated addressed only a few of the CIE goals (www.divisions.asme.org/cie). It certainly covered some activities into the use of computers and information management, but predominately it was exposing activities on a very narrow area of the “computing methods” segment as it corresponded to Finite Element Analysis. Discussions with the outgoing co-chair of the committee Dr. C.S. To, confirmed that this was a consequence of the evolutionary heritage of this committee.

During the 2003 CIE conference in Chicago, David Lee and Simon Szykman requested that the incoming chair of the committee draft a proposal for a new future for the committee. The main ideas that developed into such a proposal are:

- Change the name of the Committee to one more encompassing of the specific aspects of the CIE division's mission areas, and less restricting from a thematic perspective. (After all finite element technology is one of many methods available to deal with the problem of solving PDEs). The new name that was selected is:

Computational Technologies for Engineering Sciences Applications (CTESA).

- Establish a clear list of objectives to expand the scope of algorithmic development of computational technologies beyond finite element methods. The new objectives are: Promote research, development, cross-fertilization, cooperation, sharing, and distribution of emerging and established technologies and their utilization for various application contexts in the following eight areas:

1. Algorithmic development of modeling of continua including analog and discrete methods in space and time for ODE and PDE models including Finite Element/ Volume, Boundary

Element, Finite Differences etc. modeling and analysis techniques.

2. Qualification, Validation and Verification of Computational Technologies associated with the behavior of continua modeling and simulation areas.
3. Automated Technologies for Code/ Application/Environment/Framework Generation.
4. Symbolic Algebra-based model and software generation.
5. Intra- and inter-application data exchange technologies for behavioral modeling and simulation
6. Technologies supporting synthetic and compositional behavior simulation of systems
7. Heterogeneous and Distributed Application Integration methods and IT systems and resources for M&S of behavior of continua.
8. Modeling and Simulation driven Problem Solving Environments.

(Note: The order of the items in the list does not reflect by any means the priorities of the committee.)

- Establish clear guidelines/bylaws of the committee operation
- Examine the possibility of a distinct or included web presence under ASME's domain.
- Create a list of attainable goals and a corresponding plan focusing on creating a web resource/repository (links, software, papers etc.) that gives exposure to the committee and the division in the realm of “hands-on utility” for engineers and technologists. This should also serve as the historical archiving place for all conference related activities.

In general as a Technical Committee of the CIE division this committee should be a champion on using “C” and “I” technologies to promote and achieve its objectives as much as possible for both internal (organizational, discussion, paper reviews etc) and external (activity/event marketing, collaborative efforts etc.) matters.

If you are interested in becoming an active participant in the new CTESA committee, contact the committee chair. ●

John Michopoulos
(john.michopoulos@nrl.navy.mil)

Great Moments in Computing

1972: HP 35 calculator; Atari and Pong

1974: Intel 8080 (64 KB memory); Zilog Z-80; Xerox PARC Alta (first computer with mouse, windows, menus and icons)

1975: Altair 8800 (first “personal computer”, featured Bill Gates' BASIC interpreter)

1976: Cray-1; Apple I (\$500)

1977: Apple II; TRS-80 1978: 5-1/4" floppy debuts

1979: VisiCalc (first “killer app”, for Apple II); Motorola 68000; first “worm” program written at Xerox PARC

1980: Hard disk drive debuts (Seagate 5 MB)

1981: IBM-PC; Osborne I (first “portable computer”); Apollo workstation

1982: Cray-XMP

1983: Compaq IBM-PC clone; Microsoft Word

1984: Apple Macintosh; IBM PC-AT (80286); 3-1/2" floppy debuts

1985: CD-ROM debuts; MS Windows ships; C++ introduced

1986: Compaq DeskPro (first PC with 80386); Thinking Machines' Connection Machine; RISC architecture appears

1987: IBM chases Compaq with PS/2 and 80386; IBM OS/2 arrives to take on Windows

1988: Steve Jobs' NeXT introduced; Robert Morris' Internet Worm spreads

1990: Tim Berners-Lee invents World Wide Web (HTML, HTTP and URL); Windows 3.0

1991: Linus Torvalds releases Linux

1992: DEC Alpha 64-bit RISC; Windows NT

1993: Apple Newton (first personal digital assistant); Pentium; Mosaic web browser

1994: Netscape web browser

1995: Windows 95; Sun introduces Java

1997: IBM's Deep Blue beats Gary Kasparov at chess 1998: Windows 98; USB debuts; courts ban domain-name “cybersquatting”

1999: Apple PowerMac G4 (first personal computer running at 1 teraflop)

2000: Windows 2000; RSA public-key cryptography patent expires

2001: Windows XP; Mac OS/X; Microsoft XBox; Apple iPod

2003: Apple PowerMac G5 ●

The CIE Technical Seminar Series

The CIE Division has been working with the Council on Member Affairs and the Southeastern Michigan Section to develop a technical event called the CIE Technical Seminar Series. The series targets:

- Practicing Engineers: Provide opportunities for engineers in industry to learn how current developments in computing and IT may impact their jobs
- Early Career Engineers (New Professionals): Enable engineers who typically do not have travel budgets to attend meetings but are interested in new developments in computing and IT

Topics considered include: Systems Engineering, PLM (product life cycle management), grid computing, simulation based design, and virtual environments.

If you and your local section would like to host a series, please contact Fred Proctor (frederick.proctor@nist.gov). ●

Fred Proctor

CIE's Technical Committee Chairs

Computational Technologies for Engineering Sciences Applications (CTESA)	John Michopoulos U.S. Naval Research Laboratory
Computer-Aided Product Development (CAPD)	Xiaoping Qian Illinois Institute of Technology
Computers in Education (CIEd)	Mohammad Khosrowjerdi Western New England College
Computers in Electromechanical Systems (CINEMAS)	Frederick Proctor National Institute of Standards and Technology
	Harry H. Cheng University of California, Davis
Energy Systems (ES)	Ryo S Amano University of Wisconsin-Milwaukee
	Ashwani K. Gupta University of Maryland
Enterprise Information Management (EIM)	Russell Peak Georgia Institute of Technology
Internet-Aided Design, Manufacturing and Commerce (IADMC)	Karthik Ramani Purdue University
	Greg Roach Honeywell International
Non-Traditional Computing (NTC)	Anthony de Sam Lazaro St. Martin's College
Virtual Environments and Systems (VES)	Peter Ebbesmeyer University of Paderborn

www.divisions.asme.org/cie

Real-Time Linux for Data Acquisition and Control

Today's personal computers are so fast that they can effectively replace dedicated instrumentation for many data acquisition and control applications. The advantage of using PCs is their low cost and availability of a wide range of software. To fully exploit the power of the computer, a real-time operating system (RTOS) is needed. Without one, time-critical tasks must be handled by "smart" hardware such as data acquisition- or motion control boards, relegating the PC to user interface tasks. With an RTOS, much of the intelligence residing on these boards can be moved to the PC, with much cheaper "dumb" input/output boards that simply handle the electronics interfaces to external sensors and actuators. An example of the move from hardware to software is the WinModem, a modem in which much of the software previously residing in the modem chipset is moved into the software device driver. Fast computers can easily handle the timing required, eliminating the chipset and reducing cost.

No RTOS is required for the Win-Modem since data buffering can accommodate nondeterministic timing delays,

and average throughput is the only meaningful measure. For real-time tasks, particularly control, these delays can result in instabilities and system failure. For these applications, an RTOS is necessary. None of the most common operating systems (Microsoft Windows, Apple OS/X or Linux) are real-time, since this niche feature is seldom needed in home computing. However, there are many third-party extensions available commercially or as open source that bring real-time determinism to PCs. One popular choice is real-time Linux, available free as open source from several providers (see link at the end). RT Linux reduces the timing variation ("jitter") from about 10 milli-seconds for regular Linux to about 10 microseconds, or a factor of 1000. With some software tricks, jitter can be reduced to about 100 nanoseconds. This places the capabilities of RT Linux squarely in the domain of demanding real-time applications such as motion control.

Numerous interesting examples of RT Linux can be found on the web. A tutorial on RT Linux can be found at the link below, in the "Tutorial" section. This tuto-

rial was given at the 2004 ASME DETC/CIE conference in Salt Lake City. This tutorial features examples of using RT Linux to respond to interrupts on the parallel port (low-cost data acquisition), drive radio-control servomotors, and beam messages using an LED wand clock. RT Linux has also been applied successfully to commercial applications. A machine tool controller originally developed by the author to support U.S. Government manufacturing standards work was adopted by Sherline Inc. of Vista, CA for their stepper motor-based computer numerical control (CNC) milling machines.

Engineers and researchers who want to leverage their existing PCs for data acquisition and control applications should consider RT Linux. Linux' free C and C++ compilers, graphic user interface toolkits and office productivity software coupled with the microsecond-level determinism of the real-time extensions makes it a viable platform for a wide variety of demanding applications. For information, links and papers on real-time Linux See: www.isd.mel.nist.gov/projects/rtdlinux/. ●

Fred Proctor

**Looking back...To the first integrated
DETC/CIE—1994 in Minneapolis**



**Looking back...
1994 DETC/CIE in Minneapolis**





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2005-06 CIE Executive Committee

Chair:	Plamen Bliznakov, Parametric Technology Corp.	plamen@ptc.com
Vice-Chair:	Imre Horváth, Technical University of Delft	i.horvath@io.tudelft.nl
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