



CIE

Computers in Engineering Division Newsletter

Winter 1994

Gary A. Gabriele, Editor

Message From The Division Chair

Gary A. Gabriele



It is my pleasure to greet all the members, new and old, of the Computers in Engineering Division with this recent publication of the division's newsletter. This newsletter is long overdue but I'm happy that we can finally get something out to the membership to let you know that we are still alive and doing well.

The last five years have been tough on the computing industry with cutbacks and major financial losses hitting many of the companies we thought were 'bullet proof'. No doubt many of us are feeling the impact of the massive cutbacks and layoffs that have occurred in the industry. We certainly have seen this in our own division. While attendance at our conferences has been good, there has been a steady drop off since the late 80's, particularly among the industry participants. This is very evident in our annual exhibit held with our conference. Where at our peak we had perhaps 50 exhibi-

tors, we now can only attract a handful. After significant effort on Ned Patton's part over the past two years to sustain the exhibits, we have decided to drop the formal exhibition as a part of our conference. However, we still intend to provide a means for companies to display their products for those still interested.

The irony of this downturn in the computer industry is that the computer has continued to make steady gains into all areas of our lives. And more importantly for us, it has continued to be an important engineering tool. There have been significant advances in hardware and engineering related software that were not anticipated when this division was started. The array and quality of design and analysis tools available to today's engineer continue to grow and surprise us in their capabilities. I hope that this division has contributed in some way to the growth in this technology.

As the use of computers becomes a more essential part of engineering practice, we as a division must also play a more essential role in helping define and develop this technology for mechanical engineering. This year's conference in San Diego is a good example of the role we can serve in this regard. In addition to the traditional technical sessions demonstrating recent research results, Dr. Mohammed Kosrowjerdi (University of Western New England) organized a series of panel discussions featuring the major FEM and CAD developers. These sessions continually filled their session rooms, with the vast majority of the audience coming from industry. The attendees at these sessions heard leaders from

these companies discuss the current state and future of this technology.

Another way that this division can contribute to our professional use of computer technology is to provide a means for standardization. Of course we all know that ASME has had a long history of being involved with standardization efforts. Those working in industry and academe recognize the need to standardize software and its documentation. In this regard you will find an article in this newsletter contributed by Stephen Schoonmaker that deals with the issue of software quality control and the need for standards for engineering software.

A big change for the division will occur in 1994 as we hold our annual conference in conjunction with the 1994 Design Technical Conferences. A call for papers for this conference is presented elsewhere in this newsletter. Holding this conference jointly with the Design Division does three things for us, it provides conference attendees with a much broader program to choose from, it will help educate attendees about our division, and most importantly, it should help keep costs down. Hopefully these factors will help convince more employers to send their engineers to our conference. For our part, we will try to continue to organize conferences that include not only our typical technical sessions but important panel sessions that provide timely information for conference attendees.

Please read through the newsletter and feel free to contact me (or other members of the Division's Executive Committee)

with suggestions on how the Division might better serve your needs.

Past Chair's Report

Gary L. Kinzel



I have enjoyed being the chair of the CIE Division during the last year. This division is probably immersed in an aspect of mechanical engineering which is changing faster than any of the others, and this makes it an exciting area to be in. When the division started in 1979, many engineers were still programming with cards on mainframe computers, CAD and CAM were not household words, and software tools such as spreadsheets and math packages were little known by practicing engineers. Now many engineers take computers for granted in their work and some of the workstations used on a daily basis on an engineer's desk are as powerful as the original CRAY supercomputers, and almost all design engineers use some kind of CAD package.

The changes in how computers are used in engineering are also reflected in the Division. Currently, more than 17,000 ASME members are either primary or secondary members in the CIE Division. This makes CIE one of the largest divisions in ASME, and the membership continues to rise. We have had more than a 15 percent increase in membership during the last two years.

One of the most visible activities of the Division is the annual Computer in Engineering Conference, Exposition and Data Base Symposium, and the nature of this activity has also changed. In the "early" days, the conference and especially the exposition featured a number of large exhibits and a wide range of hardware vendors reflecting the fact that engineers in general were not very familiar with the hardware available. The conference now deals more with information exchange and software. The Data Base Symposium has been a major contributor to the conference, and its ses-

sions are always well attended. Some of the major issues in CAD/CAM are data base area.

Another change that the CIE Division decided on this year was to have the 1994 CIE Conference in Minneapolis with the Design Technologies Conference. This is intended to serve the membership by allowing engineers to attend both conferences at less cost than attending either conference separately. While this is an experiment, we expect the combined conference to be a great success.

ASME and Software Standards

Stephen J. Schoonmaker, P.O. Box 133,
Corning, NY 14830

It should come as no surprise to the readers of this newsletter that computer programs are an essential element of all aspects of mechanical engineering. Computer software is used pervasively by mechanical engineers- from project management to CNC machine control to word processing. However, some computer software actually does the engineer's most fundamental task - modelling and predicting the laws of physics. And in many cases, the engineer himself or herself writes the software.

Since this analytical or engineering software is performing such an important task, it should be clear that this activity must be viewed in a critical manner to assure quality results. Users and developers of this software should be asking:

"How does one know that the program is used correctly?"

"How does one make sure the methods are preserved for future use?"

"How does one know that the results are correct?"

These questions should be valid for the mechanical engineering profession as a whole to address. This is particularly true since virtually all mechanical engineers will need to write this type of software at some time, and a fair number of mechanical engineers (such as myself) do virtually nothing else.

Probably the only way for the profession to address AND solve the questions posed above is to draft standards or guidelines for the documentation of engineering software written by mechanical engineers. This does not mean a standard on how to write a program, what language, what paradigm, etc.; it simply means a standard on how to write

documents that explain how to use a program correctly, how it works, and how to verify the results. This may be a difficult problem, but an attempt must be made just the same.

At my request during the 1993 CIE conference, the Computers In Engineering executive committee decided to draft a request to the ASME Council on Codes and Standards to address this issue. Other members who would like to express an opinion on the subject can contact ASME, Council on Codes and Standards, 345 E. 47th Street, New York, NY 10017 or contact me at the address above or by calling 607-937-2568.

The need for this software standard is reinforced in light of the ISO 9000 standards. ISO 9001 covers quality assurance of design and development, INCLUDING the use of engineering software. In my firsthand experience, a company standard on engineering software is absolutely essential to success with an ISO 9001 audit. It is my hope that an ASME standard will help other American companies benefit from this experience.

During my two year effort to arouse ASME to this issue, the following questions have arisen:

Q. Why does this activity of engineering need a standard? There isn't a standard for use of calculators, is there?

A. There are a number of reasons. First of all, programs have legacy. Once a program is written, it takes on a life of its own. It may be used for years, and it may be copied and passed on to other groups of people unknown to the originator of the program. Therefore, it is essential to document "how to use it properly." Secondly, the complexity can be enormous. These programs can be too complex for even a single engineer alone to understand. Therefore, it is critical to document the methods, i.e. the engineering, so that it is not lost. Obviously, any company can set their own policies for this, but wouldn't it be nice to have the ASME provide a starting point in this process?

Q. Aren't there computer science types of standards that apply to this issue?

A. First of all, engineering software is unique. These programs can only approximate the physical world; therefore, even when some ACM or IEEE standard declares a program "bug-free", it is still "wrong" to some degree. Only experienced engineers can judge whether the results are "close enough", so engineers should write the standard that controls this software. Secondly, I

have reviewed 10CFR50, NQA 2a 2.7, ISO 9000-3, and found them lacking; they seem to be written for use by specialists in the Quality Assurance field. Although NQA 2a 2.7 is basically understandable, it is meant for "Nuclear Facility Applications", and it is probably too involved for basic engineering. Hopefully, a new ASME standard would be simple enough to make sense to engineers directly without a great deal of extra training.

Q. Won't Object Oriented Programming (OOP) negate the need for this standard since code from this paradigm is supposed to be independently verified, reusable, and "unbreakable"?

A. To anyone practicing in industry, it is obvious that the languages of choice for general engineering software are FORTRAN and BASIC. Since these are not object oriented languages, and since there is an enormous amount of software already in FORTRAN and BASIC, it seems quite unlikely that the OOP technology will be of much help. Furthermore, the OOP technique is apparently best used for programs beyond a certain large size or complexity (I have seen 6000 lines of executable code taken as a threshold). In the industrial arena, programs often do not reach that size. If the program is that large, it may be purchased instead of being written "in-house". In any case, computer programming is only an occasional activity for most mechanical engineers. The "C" language alone (never mind C++) requires a bigger learning curve than most engineers have time for, so again OOP is not likely to be of much help.

Q. Won't it be difficult to write a standard to fit the wide range of sizes and types of engineering software?

A. Absolutely, but I do not feel it is impossible. Any useful standard must be written to apply generally, yet be specific enough to be useful. My experience is with "in-house" engineering software used by a group of no more than 100 engineers. Perhaps sections of the standard could apply to programs written by individuals for their own use; another section could be for programs written for small groups of users; yet another section for whole libraries of programs applied to complex systems. With respect to commercial engineering software, there probably is no need for a new standard since software vendors are already registering for ISO 9000-3, and they may already use 10CFR50, NQA, etc.

It is perhaps unfortunate that computers in engineering are becoming so routine

that an ASME standard has been requested. In a sense, it signals the end of an era of exciting experimentation and discovery. However, for most engineers, engineering is first and foremost a means to secure the industrial prowess of the United States, and not an interesting intellectual exercise. In that light, Computers In Engineering must fulfill its duty to serve the profession and provide the technological expertise needed to see that computers are used in the best way possible, and to lead the world in this regard. I believe this is happening now, and I am looking forward to excellent progress in the year ahead.

1993 Conference Report

The 13th International Computers in Engineering Conference, Database Symposium & Showcase was held on August 8-11 at the Loews Coronado Bay Resort, Coronado Island, San Diego, CA. The theme for the conference was "Engineering in the Global Marketplace" addressed issues related to tools and environments for engineering design and rapid prototyping, and strategic issues which must be faced by all companies to stay competitive in the global marketplace.

The opening keynote speech was given by Henry Menzies, Executive Director, 3M Division and International Engineering, on "The Business of Engineering in a Global Marketplace". The awards luncheon keynote was delivered by, William Dean of Turnkey Engineering Company, on "The Changing Patterns of Engineering Employment and Engineering in the Next Ten Years". The Wednesday morning keynote was given by Dr. Joel Orr, Orr Associates, on "Where is the Computer-Aided Engineer?"

A highlight of the conference was a series of panel sessions on CAD, and FEM with participants from many of the top companies. These included Swanson Analysis, SDRC, Algor, EMRC, Rasna, Parametric Technologies, McNeal-Swinder, Marc Analysis, and Computervision. These sessions were always packed and provided the audience with an important opportunity to hear the opinions of the leaders in this industry on their future.

In total, there were 40 technical paper sessions, with 125 technical papers. Of these, about 35% were international papers, indicating that concerns about the global market apply to all industries across the globe.

Technical Chapters

Richard Hirsh (Excepted from the Design Division Newsletter).

When an individual becomes a member of ASME, he or she is automatically assigned to a Section based upon the zip code of the preferred mailing address indicated in the application. Each member is also given the opportunity to become a member of at least one of the Society's 37 Technical Divisions. The Technical Divisions are national in scope and until recently there was no formal structure to establish local technical units. This has now been changed through the cooperative efforts of the Council on Engineering and the Council on Member Affairs. It is now possible for interested members in a local area to form what are called Technical Chapters.

In this new ASME policy document, a Technical Chapter is defined as follows:

It is an administrative subunit of an ASME Section and a technical subunit of an ASME Division.

It consists of a minimum of 25 members of the parent Section who show the related Technical Division as their primary or secondary interest.

The Technical Chapter has its own Bylaws and Officers.

The Technical Chapter will receive a yearly allotment of \$175 administered through its parent Section.

The Technical Chapter provides a mechanism by which the members of a Section with a common technical interest can organize programs and activities within their local area and be recognized as a part of their national Technical Division. All it takes is a core group willing to assume leadership roles and get things moving. The chartering procedure is simple and the details can be obtained from your local Section Chairman or your Regional Office.

1994 Conference Announcement

14th Annual ASME INTERNATIONAL COMPUTERS IN ENGINEERING CONFERENCE

September 11-14, 1994 Hyatt Regency, Minneapolis, MN

Today, and in the future, business will focus on the engineering enterprise which involves all aspects of the product cycle from customer need to product maintenance and recycling. This will affect the ability to bring products to market quickly, to reduce total product cost, and to increase product life. The integration aspects will include conceptual design tools, analysis tools, manufacturing software, product support software, and design, manufacturing, and support/maintenance hardware. Software will include traditional and multimedia products, and the information may be in the form of voice, text, or graphics. The goal will evolve beyond making engineering more efficient; instead, the computer will become a tool for creativity, discovery, and education.

The Fourteenth Annual ASME International Computers in Engineering Conference and Exposition will focus on the computers and computer tools required to support the engineering enterprise. These tools provide part of the infrastructure which will help to bring quality products to market in the shortest possible time with the lowest possible life-cycle costs. Technical paper sessions, panel discussions, and conference speakers will address the issues associated with these problems on every level of the corporate infrastructure. Topics will range from highly technical and results-oriented papers and panel discussion to the corporate changes that must be implemented to compete in the world marketplace. Vendors on the Exposition floor will show off the computer products (hardware and software) and devices that corporations need to solve these problems, and in the Exhibitor's Forum, they will discuss future trends in their products and the directions that their companies will take.

Also, in its eighth very successful year, the ASME Engineering Database Symposium will again be held in conjunction with this conference. This symposium will focus on the critical issues of engineering data management and control from initial product conceptualization, through design, manufacturing, and product maintenance, and will include corporate financial and strategic planning functions that are vital to survival in our competitive global environment.

The 1994 CIE Conference and Database Symposium will be held in conjunction with the ASME Design Technical Conferences. By attending the CIE Conference, Database Symposium, and Design Technical Conferences, the attendees

will have a unique opportunity to attend sessions on most of the critical aspects of design and manufacturing in a single location.

For the Fourteenth Annual ASME International Computers in Engineering Conference and Eighth Annual Database Symposium, technical papers are solicited in the general areas of CAD/CAM/CAE/CIM, Engineering Analysis, Rapid Prototyping, Expert Systems, Robotics, Modeling and Simulation, Graphical User Interfaces and Multimedia, and Engineering Information Management. Papers should be sent directly to the appropriate Co-Chair for review in preparation for the conference. All papers will be given a thorough peer review and if found acceptable, will be published in the proceedings of the conference, and presented at the conference. Papers which are deemed to have lasting or archival quality will be recommended for forwarding to the appropriate ASME Journal for their review and potential publication.

DEADLINES FOR TECHNICAL PAPERS

- 2/1/94: Submission of four copies of paper from the US
- 1/1/94: Submission of four copies of paper from outside US:
- 4/1/94: Notification of acceptance to authors
- 5/1/94: Submission of final paper on mats

Conference Chair

Prof. Gary L. Kinzel, Dept. of Mechanical Engineering, The Ohio State University, 206 West 18th Avenue, Columbus, OH 43210, Ph: (614) 292-6884, FAX: (614) 292-3163, kinzel.1@osu.edu

Technical Program Chair

Prof. Kosuki Ishii, Dept. of Mechanical Engineering, The Ohio State University 206 West 18th Avenue, Columbus, OH 43210, Ph: (614) 292-8486, FAX: (614) 292-3163, ishii.2@osu.edu

TECHNICAL AREAS & PROGRAM CHAIRPERSONS

- Computer Aided Engineering
- Computer Graphics
- CAD/CAM Integration and CIM
- Concurrent Engineering

Dr. Richard Crawford, Dept. of Mechanical Engineering, ETC II 5.160, University of Texas at Austin, Austin, TX 78712-1063, Ph: (512) 471-3030, FAX:

(512) 471-7682, richc@mcl.cc.utexas.edu

- AI in Engineering
- Geometric and Visual Reasoning
- Process Planning
- Feature-based Design and Mfg.

Dr. Yong Se Kim, Dept. of General Engineering, University of Illinois, 104 South Mathews Avenue, Urbana, IL 61801-2996, Ph: (217) 333-1180, FAX: (217) 244-5705, E-Mail: yskim@ux1.cso.uiuc.edu

- Computers in Energy Systems
- Computational Fluid Mechanics
- Computational Heat Transfer
- Combustion Modeling/Diagnostics

Prof. Ashwani K. Gupta, Dept. of Mechanical Engineering, University of Maryland, College Park, MD 20742, Ph: (301) 405-5276, FAX: (301) 314-9477

- Finite Element Techniques
- Computational Mechanics
- Computational Geometry

Dr. Kenneth Bannister, US Army Research Lab., Weapons Technology Directorate, AMSRL-WT-PD (Ken Bannister), APG, MD 21005-5066, Ph: (410) 278-6121, FAX: (410) 278-6135, kab@brl.mil

- Robotics
- Real-Time Control
- Adaptive Control
- Process Control

Dr. Tony De Sam Lazaro, Dept. of Mechanical Engineering, St. Martin's College, Lacey, WA 98503, Ph: (206) 438-4553, FAX: (206) 459-4124

- Finite Elements in the Classroom
- Microcomputers in the Classroom
- CAD in Higher Education
- Software Tools in the Classroom

Dr. Mohammad Khosrowjerdi, Dept. of Mechanical Engineering, Western New England College, Springfield, MA 01119, Ph: (413) 782-1337, FAX: (413) 782-1746,

- Graphical User Interface
- Multimedia and Vision Technology
- Microcontroller Applications
- Test and Measurement

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