



INDUSTRIAL ELECTRONICS

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PRESIDENT'S MESSAGE

**Okyay Kaynak,
IES President**

Dear IES Members,

It has been about nine months now since I took over responsibility as your President. I would, at this time, like to take the advantage of this medium to address you and give a short briefing on the state of our society.

You may be aware that we celebrated our 50th anniversary during IECON 2001. Over these 5 decades, the society has gone through some transformations and I believe, through the last few years, we are going through yet another transformation, some reorientation, in trying to meet the demands of the information age. We have recently reconstructed our technical activities board, creating a new technical committee on Industrial Information Technology, alongside with the more conventional committees on (i) Power Electronics, (ii) Computer and Control Systems and (iii) Sensors & Actuators. Our future conferences will from now onwards be organized along these four tracks. We very much need you and therefore invite you to be active in these technical committees. Please contact our new VP for Technical Activities, Prof. Kouhei Ohnishi, in this respect.

On the matter of our conferences, I have some good news. Our regular conferences are now receiving a higher number of participants. Both IECON 2000 and IECON 2001 were highly successful. ISIE 2002 in L'Aquila had over 270 papers, and now IECON 2002 will set a record both in the number of paper proposals and the number of papers in the final program. It is yet to be seen whether we will have a record number of participants too. These healthy developments may be attributed to the recent consolidation we have been witnessing in the conferences that we are involved.

From a financial point of view, there are a few points to be made. You will see in your membership renewal form for 2003 that both the IEEE and the society dues are increased and I would like to offer an explanation for this and request your understanding. The recent economic downturn has had a serious effect on IEEE in general; the appreciable income we used to enjoy from our long-term investments has diminished, if not disappeared. *Continued on page 3.*

IN THIS ISSUE

President's Message	1
IES News	
Next AdCom meetings	3
Call for nominations	3
Summary of the last AdCom	3
IES members in IEEE Elections	3
Chapter News	
Maria Inês Castro Simas	5
Around the World	
Report from ISIE 2002	6
Invitation to attend ISIE 2003	7
Book Review	
Modern Power Electronics and AC Drives	8
New Technology	
Tutorials at IECON 2002	9
Calls for Papers	12-16
IES Event Calendar	17

Information for Authors

Announcements and letters to the editor are solicited from the membership. Please submit materials for consideration by the editor according to the schedule:

Due Date	Issue
February 15	March
May 15	June
August 15	September
November 15	December

Contributions Welcome

Material for Feature Articles, Opinions, Chapter News, Professional Activities, and Abstracts of Reports should be mailed directly to the editor by the deadlines listed above.



IEEE

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IES Publications

<http://www.ewh.ieee.org/soc/ies/publications.html>

IES Newsletter

<http://sant.bradley.edu/ienews/>

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PRESIDENT'S MESSAGE continued

Continued from page 1. Such an income used to subsidize both the headquarters' operations and ours. Now that it has disappeared, the societies have had to contribute to the overall operation of the corporate IEEE and appreciable amounts from society reserves have been used for this purpose. Nevertheless, our financial situation is still very healthy, our major income revenues being (i) library subscriptions to our publications and (ii) conference surpluses. The overall income from the membership dues is negative, i.e.

we are, in reality, subsidizing our members. This is true even after the recent hikes IEEE higher levels have urged us to carry out.

Finally, in a nutshell, I can state that we are a healthy, dynamic and forward-looking society, with a very high level of international participation. I thank you very much for your contributions as volunteers to our esteemed reputation. It is indeed both an honor and a pleasure to be the president of IES.

SOCIETY NEWS

Next Administrative Committee Meeting for the Industrial Electronics Society

The next Administrative Committee meeting will be held in conjunction with IECON 2002 in the Meliá Lebreros hotel in Sevilla, Spain on Friday, November 8.

Call for Nominations

The IES Nominations Committee is seeking candidates who are interested in serving the society as an Officer and/or Administrative Committee member in 2003 and beyond. Candidates for the following officer position are needed: President Elect, Vice President for Membership Activities Vice President for Technical Activities, Vice President for Conference Activities, Vice President for Workshop Activities, Vice President for Publications, Vice President for Planning and Development, Secretary, Treasurer, Transactions

Editor, Newsletter Editor. Seven candidates for a three-year term of service on the Administrative Committee are also sought.

Nominations should be accompanied by a 2-page biography of the nominee if possible. Please submit nominations to the Chairman of the IES Nominations Committee: H. Troy Nagle at t.nagle@ieee.org. More details about submission at IES Web site.

Summary of the Administrative Committee Meeting for the Industrial Electronics Society

Charles W. Einolf, Jr., Secretary

- The IES AdCom meeting was held at the Embassy Suites Hotel in Piscataway, New Jersey on March 9 and 10, 2002.
- President Okyay Kaynak appointed four standing committee chairs: Nominations (H. Troy Nagle), Awards (Hiromasa Haneda), Fellows (Joachim Holtz), and Finance (Bogdan Wilamowski).
- Robert Begun and Bogdan Wilamowski were appointed to the Management Committee for the Transactions on Mechatronics.
- Hideki Hashimoto, Vice President for Membership Activities, presented a program for student travel grants to the ISIE and IECON conferences.
- Kouhei Ohnishi, Vice President for Technical Activities, presented a reorganization of the Technical Committee in order to better lead industries into new technologies.
- Carlos Couto, Vice President for Conferences, reported on the various IES conferences.
- Ramu Krishnan, Vice President for Publications, introduced the IES Newsletter editor, Aleksander Malinowski. The Newsletter is now on-line on the IES Web site.
- The next AdCom meeting will be held in November 2002 in conjunction with IECON 2002 in Seville, Spain.

IES Members in 2002 IEEE Elections

Candidates in IEEE 2002 Election are presented at <http://www.ieee.org/organizations/corporate/candidates.htm>. Please notice that two of our Society members are on the ballot:

- Enrique Ruspini is the candidate for the Division X Director
- Parviz Famouri is the candidate for Region 2 Director

Short candidate characteristics and candidate statements are shown below. For more detailed information please visit the following sites:

- <http://www.ai.sri.com/~Eruspini/ieeedivx.html> in the case of Enrique Ruspini
- <http://www.ems.wvu.edu/famouri/> in the case of Parviz Famouri

Please take active participation in the IEEE 2002 Election by filing and submitting the ballot.

Statements of IES Members in 2002 IEEE Elections

ENRIQUE H. RUSPINI (M'74-SM'92-F'96)

(Nominated by Division X)



Prior to joining SRI (formerly Stanford Research Institute), Enrique Ruspini (Ph.D., UCLA, 1977) held positions at the University of Buenos Aires, University of Southern California, UCLA's Brain Research Institute, and Hewlett-Packard Laboratories. As one of the earliest contributors to the development of fuzzy-set theory, he introduced its application to numerical

classification while making key contributions to the understanding of approximate-reasoning methods. His recent research has focused on autonomous-robot control, data mining, qualitative analysis, and intelligent data processing. He has authored over 100 research papers, has given numerous plenary and tutorial talks throughout the world, and is a member of the Editorial Board of numerous research journals. Dr. Ruspini is an IEEE Fellow, a Fulbright Scholar, an IFSA First Fellow, and an SRI Institute Fellow. During his recent tenure as President of the IEEE Neural Networks Council, he led the successful effort for its transition to Society status.

Statement: The IEEE faces significant issues to assure its continued success and viability. These issues require that those steering its course do so from a background of leadership and understanding. I am a member of five Division X Societies (Control Systems, Industrial Electronics, Robotics and Automation, Systems, Man, and Cybernetics, and Neural Networks), a member of the Technical Activities Board, and a Society Officer and Past-President.

On the basis of my experience, I intend to actively promote policies that:

- Enhance current membership services by increasing accessibility to information sources, job banks, accredited learning programs, short courses, and student-support opportunities.
- Continue the development of new intellectual products by timely identification of emerging technologies.
- Increase the value of our products and improve their dissemination, particularly to engineers in industry.
- Expand Institute membership beyond traditional boundaries and disciplines.
- Increase interdisciplinary collaboration between technical, regional, and educational entities.
- Enhance fiscal responsibility and accountability by establishing guidelines for understanding the cost and value of existing and proposed programs.
- Expand member benefits and increase their world-wide availability

Rebuttal: The promotion of interdisciplinary and educational activities and the encouragement and nurturing of technological advances are among the most important services that the IEEE provides to its members.

As Past President and Officer of an IEEE Society, I led the development of many such programs, often in collaboration

with IEEE societies and other professional associations worldwide. I anticipate continuing and extending these programs within Division X and to all technical, educational, and regional IEEE units.

PARVIZ FAMOURI (M'90-SM'98)

(Nominated by Region 2)



Parviz Famouri received the B.S. degree, Applied Mathematics, Kentucky State University, 1981, and the B.S., M.S., and Ph.D., all in Electrical Engineering in 1982, 1986, and 1990, respectively. He joined West Virginia University, 1990, and is Full Professor. Famouri's primary research and teaching interests include design, analysis, modeling, and control of electromechanical systems including Micro-Electro-

Mechanical Systems. He founded and serves as director of the Electro-Mechanical Systems Laboratory, where undergraduate and graduate students study and conduct research in the area of electromechanics at micro and macro levels. The lab's main ongoing research projects are incipient fault detection of MEMS devices and linear alternator/engine combination for auxiliary power unit applications. He and his students have authored 60+ papers/presentations. He has served as Principal Investigator on projects over \$4,000,000 for NSF, DoD, DoE, and NASA. Famouri was elected to the WVU Faculty Senate, 1997, and Faculty Senate Executive Committee 2001-02 and 2002-03.

Statement: It is a distinct honor and privilege to be nominated as a candidate for Region 2 Delegate-Elect/Director-Elect, 2003-2004, by the Nominations and Appointments Committee. With this honor comes a responsibility to serve you well, which I will try my best to do.

As Director, I look forward with great pleasure to working with the many engineers and volunteers in the Region. I want to thank all of our volunteers who give their invaluable time to serve the membership by bringing and organizing new professional, technical, and social activities to the Region. As Director, I will raise the visibility of these efforts, and I will assist them in every way I can to continue to serve the members.

As Director, I will work with the industrial employers to be flexible so our members and volunteers can be involved with the Sections' and the Region's activities. By having an active Region, the employers, engineering employees, consultants, and students will all benefit.

Rebuttal: IEEE is in turbulent times financially and cannot afford new programs at this time. The Regions have been asked to cut back financially, and as Director, I will do my utmost to reduce the effect of any cut to the Region. Drawing on my project management experience, I will manage the Region's budget in a fiscally responsible manner.

If elected, I will be a grass roots voice for members, sections and chapters on IEEE Boards.

CHAPTER NEWS

Maria Inês Castro Simas (1952-2002)

Prof. Joao Costa Freire, Instituto Superior Tecnico, Lisboa, Portugal



Professor Inês Castro Simas passed away last August 8 after hard 5 months fighting against a liver cancer. During this period she had strength to obtain the degree of Professor «Agregado» (two days discussion on her scientific curriculum and synthesis lesson on “Power Electronics Devices and Circuits on CMOS Technology”),

support the conclusion of two Ph.D. thesis of her students and participate in all activities of the IEEE IAS European Working Group. Meanwhile, in May 9, she had to find additional strength to support the lost of her elder daughter Diana (1976-2002), handicapped in the last 9 years, after a car accident. Inês was the leader of her recovery during those years.

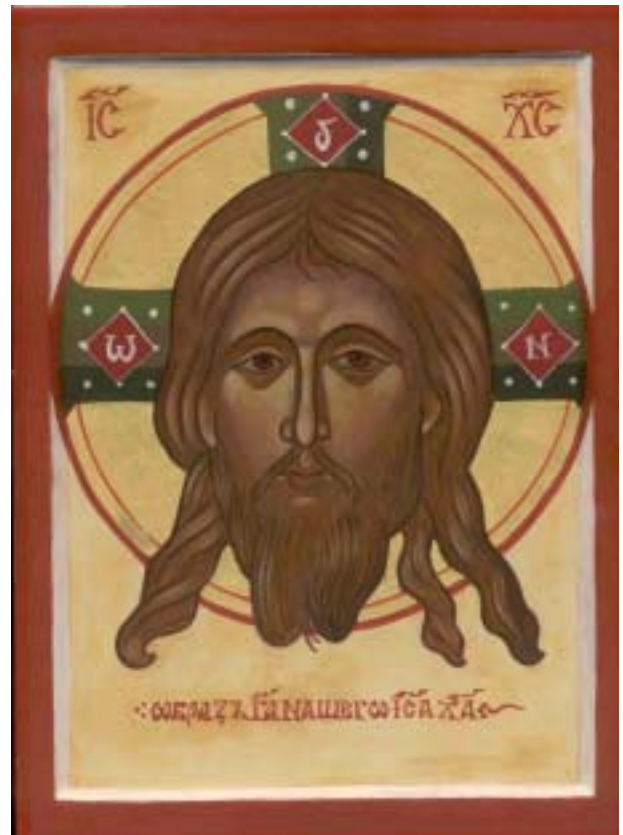
Professor Castro Simas graduated in Electrical Engineering from IST, Technical University of Lisboa, Portugal in 1975. Since then, she was a member of the teaching staff. Firstly, as research assistant, and after her PhD on “MOS Power Devices Modeling,” also at IST, as Assistant Professor (1988-1993) and Associate Professor (1993-2002.) She was the founder and leader of the Smart Power Devices and Circuits Group of the “Instituto de Telecomunicações.” She was also the founder of the IEEE Portugal Section Joint Chapter on PELS/PES/IAS in 1991 and was the chairwoman until her departure.

Professor Castro Simas’s conferences activities included presentation of more than 40 papers, especially in the IEEE PESC and IAS annual meeting. She participated in review boards of several international conferences and in organization committees such as the “Steering Committee” of Power Electronics and Motion Control, PEMC’90 and IEEE International Symposium on Industrial Electronics, ISIE’97. She was also co-responsible together with Professor Bose for the review process of the Power Electronics sessions of IEEE Industrial Applications Society Annual Meeting, IAS’2001. As a member of the IEEE IAS Power Electronics European Working Group she has organize its annual meeting in Aveiro, Portugal, in May 2000. That was a very important event from both technical/scientific and social points of view. She was always putting a lot of her energy in the success of her commitments. She had published seven papers in Transactions. She also had been a reviewer of IEEE Transactions on Power Electronics, on Industry Applications, on Industrial Electronics and on Electron Devices.

Besides Electronics and family, her interests were also on painting watercolors, pastel, oil and more recently orthodox icons. (Art by professor Castro Simas is shown below)



We will miss the dynamic, elegant and optimistic colleague and friend.



Inês is survived by her husband João Costa Freire, he also an IEEE volunteer since 1985, daughter Sofia (24) and son Tiago (21).

AROUND THE WORLD

Report from ISIE 2002 in L'Aquila, Italy

James C. Hung and Carlo Cecati
General Co-Chairmen of ISIE 2002

The 2002 International Symposium on Industrial Electronics took place in L'Aquila, and old town not far from Rome and the base of the Gran Sasso mountain, the highest in the Italian Peninsula on July 8-11, 2002. The general chairmen for this edition were Prof. James C. Hung, past IES President and Prof. Carlo Cecati, from the University of L'Aquila, Italy.

The high quality technical program was assembled by the excellent Technical Program Committee chaired by Prof. Ren C. Luo from the National Chung Cheng University, Taiwan and Prof. Enrico Pagano, from the University of Naples, Italy. It included 251 papers from more than 40 different countries and prepared by about 700 authors. The papers cover a broad spectrum of topics in industrial electronics, including power electronics (about half of papers), signal processing and

control (about a quarter of papers), intelligent systems, factory automation and emerging technologies.

The open ceremony, on Monday morning, was housed in the Civic Theater, in the hearth of the City of L'Aquila. After the opening ceremony Prof. Fumio Harashima from Tokyo Denki University and Prof. Enrico Pagano chaired the plenary speeches session. The plenary session included three speakers: Prof. Francesco Profumo from the Politechnic of Turin, Prof. Hideki Hashimoto from University of Tokyo, and Dr. Thomas La Porta from the Bell Labs, USA. Prof. Francesco Profumo introduced the main concepts on the new "Plastic" electric motors. Prof. Hideki Hashimoto made a commentary on the research trends in the field of the intelligent space. Dr. Thomas La Porta addressed his speech on the research challenges in mobile networking and computing.



Since the afternoon the conference took place in the Convento della Basilica di Collemaggio, an old monastery, at a walking distance from downtown. The technical program was arranged in three or four parallel oral sessions and one poster session for each day. In addition to these sessions, one tutorial took place every day, after the morning sessions and before the lunch. The topics of tutorials were:

- "System on Chip" by Dr. Santanu Dutta, Philips USA.
- "Recent advances in power electronics and motor drives" by Prof. Bimal K. Bose, from the University of Tennessee, USA.

- "Effects on power quality of harmonic and interharmonic caused by non linear loads" by Prof. Alfredo Testa from the Second University of Naples, Italy.

Three invited papers, one for each day were presented:

- "The application of a MRAC with signal adaptation to PM brushless DC motor drives" by Prof. Krishan Ramu from Virginia Tech. USA.
- "Ethernet networks for factory automation" by Prof. Richard Kanavagh from the University College, Cork, Ireland.

- “Signal processing techniques for improved digital tachometry” by Prof. Giuseppe Buja, from the University

of Padova, Italy.



The very successful technical program was completed by three special sessions and a very exciting Student Forum, chaired by Prof. Okyay Kaynak, IES President, and Dr. Marco Liserre, from Politechnic of Bari, Italy. Among the sixteen Student Forum papers, the best papers received travel grants and awards. The Best Student Forum Paper and the Best Student Forum Poster were awarded by the Engineers Association of the Province of L'Aquila.

An outstanding social program consisting of four distinct tours in L'Aquila and its outskirts, and tasting of excellent wines and foods, made this edition of the International Symposium on Industrial Electronics a pleasant memory to all attendees.

*James C. Hung and Carlo Cecati
ISIE2002 General Co-Chairs*

Invitation to Attend ISIE 2003 in Rio de Janeiro, Brazil

Walter. I. Suemitsu and Carlos Couto
General Co-chairs of ISIE 2003

ISIE'2003, the International Symposium on Industrial Electronics, will take place in Rio de Janeiro, Brazil, from June 9 to 12, 2003.

The ISIE is one of the major annual conferences organized by the IEEE Industrial Electronics Society attracting a large number of experts in the field.

- The topics for the Conference are:
- Computer and Control Systems
- Power Electronics
- Sensors and Actuators
- Industrial Information Technology.

Under these topics, we invite you to submit a paper or to propose either a Special Session or a Tutorial.



The conference paper submission deadlines are:

- Reception of 2000 words abstracts: November 15, 2002
- Paper acceptance notification: January 17, 2003
- Full Paper reception: March 17, 2003

The submission process will be electronic and more details about the conference are available in the site <http://isie2003.coe.ufrj.br/>.

Rio de Janeiro is one of the major economic and cultural centers in South America. It combines the characteristics of a cosmopolitan metropolis with the natural beauties of beaches and forests, which have made it known worldwide as the

"wonderful city". More information about Rio can be found in the links provided in the ISIE'2003 site.

We are putting our best efforts preparing the event to be memorable one from social and cultural point of view. We hope you will help us making it technically a successful event by submitting a paper and by attending the conference!

See you all in Rio in June 2003!

Walter Suemitsu & Carlos Couto
ISIE2003 General Co-Chairs



BOOK REVIEW



Modern Power Electronics and AC Drives

Book by Bimal K. Bose, Prentice Hall, 2002
Hardcover, 720 pages, ISBN 0-13-016743-6

This new excellent text/reference book presents the latest concepts of electrical drives and power electronics technology including Matrix and Resonant Converters as well as Vector and Direct

Torque Control of AC motors. The book has 12 chapters altogether, covering the topics of power semiconductor devices, AC machines for drives, diodes and phase-controlled converters, cycloconverters, voltage-fed converters, current-fed converters, induction motor slip-power recovery drives, control and estimation of induction motor drives, control and estimation of synchronous motor drives (wound field, permanent magnet, synchronous- and switched-reluctance), expert system principles and applications, fuzzy logic principles and applications, neural network principles and applications.

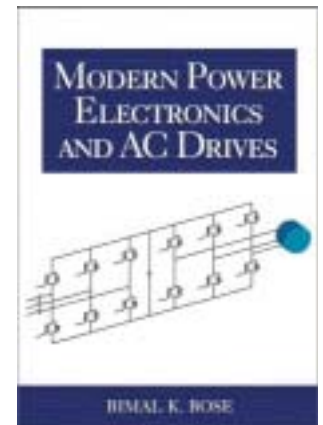
The description of technical material is clear and simple with the right amount of mathematics for undergraduate and graduate students. Each chapter begins with an Introduction and is supplemented with a summary and well-selected comprehensive list of References at the end. On the request, a

set of questions and problems (69 pages) can be forwarded by the author. (bbose@utk.edu)

The unique advantage of the book is that besides well-balanced conventional technology, it includes crucial innovations such as artificial intelligence (expert systems, fuzzy and neural network systems), advanced estimation, and sensorless control which can not be found in any other book.

I do not hesitate to recommend this new attractive text/reference book as a basic text to wide audience of engineering educators, students and engineers in industry. I strongly believe that this new book by Bimal K. Bose, well-recognized expert in the field of power electronics, will certainly be at least as successful as that authored by him - "Power Electronics and AC Drives" published by Prentice Hall in 1986.

Marian P. Kazmierkowski, IEEE Fellow
Warsaw University of Technology, Poland



NEW TECHNOLOGY

Overview of Tutorials to be Presented at IECON 2002 in November

Mo-Yuen Chow, Tutorial Co-chairmen at IECON'02

Time Sensitive Network-Based Control Systems,

Dr. Mo-Yuen Chow and Dr. Yodyium Tipsuwan, North Carolina State University

For many years now, data networking technologies have been widely applied in the control of industrial and military applications. These applications include manufacturing plants, automobiles, and aircrafts. Connecting the control system components in these applications, such as sensors, controllers, and actuators, via a network can effectively reduce the complexity of the systems with nominal economical investments. Furthermore, the applications connected through a network can be remotely controlled from a long-distance source. Traditionally, the networks used in the aforementioned applications are specific industrial networks, such as CAN (Controller Area Networks), and PROFIBUS. However, general data networks such as Ethernet and Internet are rapidly advancing to be the networks of choices for many applications due to their flexibility and lower costs.

A challenging problem in control of networked-based system is network delay effects. The time to read a sensor measurement and to send a control signal to an actuator

through the network depends on network characteristics such as their topologies, routing schemes, etc. Therefore, the overall performance of a network-based control system can be significantly affected by network delays. The severity of the delay problem is aggravated when data loss occurs during a transmission. Moreover, the delays do not only degrade the performance of a network-based control system, but also can destabilize the system.

This tutorial presents fundamental details of network-based control and recent network-based control techniques for handling the network delays. The techniques are based on various concepts such as state augmentation, queuing and probability theory, nonlinear control and perturbation theory, and scheduling. A general structure of a network-based control system, delay types, and delay behaviors are also described in this tutorial. In addition, advantages and disadvantages of these techniques are discussed.

Design of Power Electronic Converters and Electrical Drives using MATLAB/Simulink Tools,

Dr. Hoang Le-Huy, Laval University, Quebec

This tutorial presents an effective approach to designing power electronic converters and electrical drives using MATLAB/Simulink and some specialized tools such as SimPowerSystems (SimPS), Fixed-Point Blockset (FPB), and Real-Time Workshop (RTW).

The design process of power electronic converters and electrical drives can be divided into two successive phases: simulation and prototyping. During the simulation phase, the complete system including the power circuit and the controller is modeled and simulated with the best accuracy possible to represent the system operation under different operating conditions. The power circuit is modeled using the SimPS blocks while the control system is modeled by Simulink and Fixed-Point Blockset blocks. Fixed-point format is used because the controller is to be implemented on a fixed-point

processor (DSP controller). The performance of the power circuit and controller can be evaluated by simulation using realistic parameters. Some iteration is usually required to optimize the system performance. In the prototyping phase, the simulated system has to be implemented on a prototyping hardware to evaluate its real-time performance. The controller model is separated from the system model and converted into C code by the Real-Time Workshop using a processor specific target. The C code is then compiled and the resulted code can be downloaded to the hardware (DSP controller evaluation board) for execution and debugging.

The design process is illustrated by two examples including a unit power factor AC-DC converter and a field-oriented induction motor drive. The examples are explained in detail from modeling and simulation to code generation.

Data Monitoring and Control Over the Internet and World Wide Web,

Dr. Alfred C. Weaver, Founding Director, Internet Technology Innovation Center, Commonwealth of Virginia

In this three-hour tutorial we discuss the ways and means by which monitoring and control can be accomplished over the Internet. My premise is that the development of electronic commerce for the World Wide Web has fostered the development of many capabilities (e.g., data logging, high resolution pictures, streaming multimedia, live audio/video, secure data retrieval, secure payments) that can be reused in the context of remote process monitoring and control. We discuss:

- What solution already exist? - What tools and solutions does electronic commerce already provide?
- HTML and web programming - coding examples of using HTML and web forms to retrieve process data from web

servers (monitoring) and sending commands and data to the process (control)

- JavaScript and PERL programming - coding examples of how to write control loops, transmit and receive parameter data, and interface with databases
- Java programming - examples of Java applets with sophisticated user interfaces, including one for the "virtual factory"
- Jini architecture - how software processes discover available services
- Wired and wireless access - technology and data rates for copper, fiber optic, satellite, and wireless channels, including Bluetooth and IEEE 802.11b

- Privacy and security - how encryption services that protect your money on the Internet can protect your process data
- Reliability - hacker attacks, and approaches to preventing them
- Network edge services - moving services from the data origin to the edge of the network reduces bandwidth demands and expands the range of available data services
- Putting it all together

**PLD architectures and PLD based digital system design method,
Dr. Enrique Mandado and Dr. María Dolores Valdés**

PLD became standard integrated circuits and are very useful for digital systems implementation. However, PLD constitute by themselves complex digital systems characterized by a set of basic non-excluding concepts that are themselves divided into a great number of sub-concepts. Due to this, learning PLD architectures and PLD-based digital system design are difficult tasks.

The tutorial is divided into three parts as briefly described next.

- PLD Architecture Analysis - Through a set of forty-three figures all these concepts are analyzed, first separately, and then combined. The analysis starts with the simplest PLD circuits (Basic PLD), that have just one Programmable Interconnect Matrix (Figure 1). Once the most important types of BPLD being analyzed, the different ways to share logic products or sums of logic products are studied. Sharing circuits are one of the elements of Advanced PLD (APLD). Then, segmented Advanced PLD, with multiple Programmable Interconnect Matrices, are analyzed (Figure 2). Finally, the different ways to increase the complexity of Advanced

**Integration of Advanced Motion Control Devices in Automotive Products: Design in the Context of the Application,
Dr. Hamid Toliyat, Texas A&M University and Dr. Babak Fahimi, University of Missouri- Rolla**

Substitution of inefficient mechanical components in automobiles by electromechanical devices has turned automotive industry into an attractive market for advanced power electronics and motion control technologies. In addition to significant enhancement in fuel economy, the capability to communicate and optimally manage the power system of the car has fulfilled the promise of a superior fault tolerance, better maintenance and improved reliability. Today, wide ranges of automotive products are equipped with the state of the art motor drive technologies. Integrated Starter Alternator, electrically assisted power steering, electric pumps are among applications in which advanced motor technologies such as vector current control, position sensorless and adaptive control are being used. Finally, electrification of automobiles opens new horizons on smart control and communication as

**New Ways of Teaching Power Electronics and Electric Drives,
Dr. Ned Mohan, University of Minnesota**

Intended for educators of Power Electronics and Electric Machines/Drives courses, this tutorial will describe course restructuring at the University of Minnesota that has tripled student enrollments. The following new pedagogical developments will be presented which have been discussed at several NSF-sponsored Faculty Workshops:

A Building-Block Approach to Switch-Mode Power Electronics. All practical switch-mode converter topologies are derived from a switching power-pole, showing their commonality. As a two-port, with a voltage-port on one side and the current-port on the other, representing this power pole

PLD are studied. These new concepts are present in Complex PLD (CPLD).

- PLD-Based Digital Systems Design Process - The authors from their experience in PLD-based digital system design developed the design process explained in the tutorial. Each stage of the design process is analyzed with the help of an adequate example. Special emphasis is made in the description phase through the use of Hardware Description Languages (HDL), as well as in the verification stages through the whole design process including static timing analysis and timing simulation. PLD configuration through Boundary Scan standard is also described.
- PLD-Based Real Digital Systems Design - To consolidate the learning process of the previous concepts several real digital systems are chosen and their complete design is developed. Previously, the PLD selection criteria are analyzed to choose the right PLD for a specific digital system design. A set of general rules developed by the authors is also described to obtain an optimal implementation of the digital system.

practiced in X-by wire and unmanned vehicles. In the light of fascinating opportunities in more electrification of automobiles, selection, sizing and control of power electronics circuitry and motor drives "in the context of specific applications" deserves due attention. Design of automotive pumps and assist motor drive for electrically assisted power steering is chosen to explain the details of the design philosophy. These examples depict a collection of important characteristics ranging from ultra high-speed motion to near zero speed requirements for control of the drive. In order to give an insightful physical understanding of each step, we will provide theoretical proof as evidenced by measurement data. This seminar is prepared such that practicing engineers and graduate students can absorb it entirely.

on an average basis as a controllable turns-ratio ideal transformer gives clear insight into synthesis by PWM.

An Integrative Approach to Teaching of Electric Drives as a First Course. It allows teaching in a single semester all subsystems that make up electric drives: electric machines, power electronics-based converters and feedback controllers. Using space-vector theory, made approachable to undergraduates, reveals the physical basis on which ac machines operate thus allowing a clear understanding of how they ought to be controlled in the next advanced course.

Integration of Simulations and Hardware. In power electronics courses, use of PSpice will be demonstrated for analysis and design of converters and their control. Use of MATLAB and Simulink will be demonstrated for simulating electric drives, and for integrating a DSP-based, 42-V hardware laboratory (in which nearly 70 US universities have shown interest in collaboration) for electric drives and power electronics.

**Fuzzy Logic Applications in Power Electronics and Industrial Systems,
Dr. Marcelo Godoy Simoes, Colorado School of Mines**

In the last few years the applications of artificial intelligence techniques have been used to convey advanced control for several industrial and power electronics applications. Power electronics and variable frequency drives are multidisciplinary fields in electrical engineering and need controllers that combine intelligent and conventional techniques, commonly used in the control of complex dynamic systems.

Intelligent systems are usually described by analogies with biological systems by, for example, looking at how human beings perform control tasks, recognize patterns, or make decisions. Fuzzy logic, proposed by Lotfy Zadeh in 1965, emerged as a tool to deal with uncertain, imprecise, or qualitative decision-making problems. Controllers that combine intelligent and conventional techniques are commonly used in the intelligent control of complex dynamic systems.

**Neuro-fuzzy systems and its electronic implementations,
Dr. Bogdan M. Wilamowski, University of Idaho**

Soft computing, known also as computational intelligence, combines neural networks, fuzzy systems, and evolutionary computing. All these approaches have already proved their usefulness and they have found many practical applications. The basic concepts of the neural networks and fuzzy systems will be presented, including its philosophies, architectures, and methods of design and training. The presentation will start with several examples demonstrating the usefulness of neuro-fuzzy systems, leading to the conclusion that we are at the beginning of the third technological revolution. Now systems of computational intelligence are capable of replacing highly skilled people with all their experience.

A review and comparison of various supervised and unsupervised learning algorithms will follow. A special emphasis will be given to fast learning algorithms such as Quickprop, Rprop, LM algorithm and its modifications.

**Real-Time Control System Scheduling for TDMA based real-time protocols,
Dr. Juan R. Pimentel, Kettering University**

Real-time protocols and networks with dependable features are becoming increasingly important for many distributed applications such as automotive control applications. An important problem in distributed real-time control systems involves scheduling of control system messages on the corresponding real-time network. The paper presents an overview of scheduling methodologies and techniques for the transmission of control messages of a distributed control system consisting of N multirate control loops. A control loop is modeled as an object with the

These new approaches are supported by textbooks, supplemented by instructor's CDs (with a large number of PowerPoint-based slides, each with audio clips) that will be demonstrated at this tutorial along with nearly 240 PowerPoint-based slides available as notes for the participants.

Fuzzy and neural control approaches are used in situations where knowledge needed to solve the problem might be incomplete, i.e., the source of the information maybe unknown at the current time the solution is devised. It is very common to have a changing environment and an analytical design might not be able to anticipate such changes. AI based control systems are designed under an open systems approach allowing continuous refinement and acquisition of new knowledge. Neural networks and fuzzy logic control have been successfully applied for power electronics applications. Neural networks have the capability of extracting knowledge out of numerical data while fuzzy logic systems have the capability of extracting knowledge out of heuristics. This tutorial on fuzzy logic will cover fundamental and practical topics in this exciting application area of power electronics and industrial systems.

Several special, easy to train, architectures will be shown such as functional link networks, counter-propagation networks, cascade correlation networks and others.

In the following part of the presentation the concept of fuzzy systems, including the conventional Zadeh approach and Takagi-Sugano architecture, will be presented. Comparisons of fuzzy and neural systems will be given and illustrated with several applications. Fuzzy controllers are the most popular choice for hardware implementation of complex control surfaces because they are easy to design. Neural controllers are more complex and hard to train, but provide an outstanding control surface with much less error than that of a fuzzy controller.

The presentation will be concluded with a demonstration of the fabricated VLSI fuzzy chip and neural chips, designed by the presenter.

following three entities: sensing, computing, and actuation that follow a precedence constraint. Entities from multiple loops interchange messages using TDMA based real-time protocols. Depending upon the performance criterion, a family of schedulers exist. An example is provided of a scheduler that minimizes the control delays (D_i) on all N control loops. A set of performance measures can be defined to evaluate the performance of the scheduler. Numerical examples of schedulers for typical control system loops found in engine control and monitoring systems are included.

2003 INTERNATIONAL ELECTRIC MACHINES AND DRIVES CONFERENCE

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Announcement and Call for Papers

IEMDC 2003

The IEEE International Electric Machines and Drives Conference provides an international forum for sharing of experience, new ideas, and developments in design, analysis, new materials utilization and optimization techniques for electrical machines, machine drive systems and drive components. The scope includes all varieties and sizes of electric machinery. Also included are practical applications, operations, maintenance, and the development and harmonization of standards for machines and drive systems. The IEMDC is a gathering for users, designers, and analysts of electric machines and drives, and related power electronics and controls.

In addition to papers of general applicability, IEMDC '03 will feature special sessions on four technical tracks:

- Automotive Applications of Electric Drives and Controls
- Large Turbogenerator Maintenance and Life Expectancy
- Aerospace Applications of Electric Drives and Controls
- Office Automation Applications of Electric Drives

These tracks will provide a separate focus on the technical subjects of this conference, as used and/or proposed for use in the target industry. Papers for each respective track will be reviewed by an industry-specific panel, and special sessions at the conference will be devoted to these papers.

Author Deadlines

Submission of Abstracts and Digests	October 21, 2002
Notification of Acceptance	January 31, 2003
Submission of Final Papers	March 31, 2003

To be considered for the conference program, authors should submit:

1. A one page abstract of 150 words or less with fully headed paper title, names of all authors, area of interest, and name and addresses of the corresponding author, including phone, fax, and e-mail address. All communication with the corresponding author will be conducted via e-mail and the conference web site. Papers will be presented in either lecture or poster format. If you have a preference for either format for presentation of your paper, please indicate that on this page. The final decision on presentation method however will be up to the program committee.
2. A digest of **up to five pages** on standard letter/A4 paper size, including key equations, figures, tables, and references headed by paper title only. The digest must state the purpose of the work, manner in which it advances previous work, and goals achieved and their significance in sufficient detail for undergoing a review process. The digest should not include the names and addresses of the authors.

Digests and abstracts will be submitted electronically in Adobe Acrobat Portable Document Format (.pdf). To facilitate the review process, please submit the abstract and digest as separate files. Instructions to submit abstracts and digests will be posted on the web site by July 30, 2002.

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Draft Call for Papers

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The purpose of this symposium is to provide a forum for presentation and discussion of the state-of-art of Industrial Electronics and related areas. Topics within the scope of the symposium will include:

COMPUTER AND CONTROL SYSTEMS: Advanced control and measurement, computer and microprocessor-based control, signal processing, estimation and identification techniques, application specific IC's, automotive electronics, non-linear control systems, industrial applications of neural networks, fuzzy algorithms, evolutionary computing, and intelligent systems, instrumentation for petroleum industry.

POWER ELECTRONICS: Power electronic devices and systems, high frequency power converters, digital control of power electronics, energy systems, electrical drives, static VAR and harmonic compensations, power management, and analytical and simulation methods.

SENSORS AND ACTUATORS: Intelligent sensors and actuators, multi-sensor fusion, micro/nano technology, microsensors and microactuators, instrumentation electronics, MEMS and system integration.

INDUSTRIAL INFORMATION TECHNOLOGY: Robotics, industrial vision, motion control, autonomous mobile robots, electrical vehicles, intelligent transportation, factory communications, flexible manufacturing system, industrial automation, process automation, automation systems for power distribution, CAD/CAM/CAT/CIM and LANs, industrial applications of internet technologies, multimedia, and wireless communications.

SPECIAL SESSIONS AND TUTORIALS: The conference will feature several special sessions, tutorials and invited sessions. If you are interested in organizing a special session, please contact one of the Special Session and Tutorial Co-chairmen.

Submission of papers: Prospective authors are invited to visit the conference web site at the following URL and submit digests according to instructions:

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Manuscripts must be submitted in PDF or (exceptionally) in PostScript. Conference web site contains much information on PDF file preparation. Those without Internet access can exceptionally submit four printed copies of their digest by post to:

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Summaries should include a clearly defined problem statement supported by the relevant references. It should state why the work was undertaken and what are its outcomes. The development description should clearly show the work's originality and contribution to the technical area. The summary must provide conclusions and recommendations for future work.

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- Reception of 2000 words abstracts: November 15, 2002
- Paper acceptance notification: January 17, 2003
- Full Paper reception: March 17, 2003

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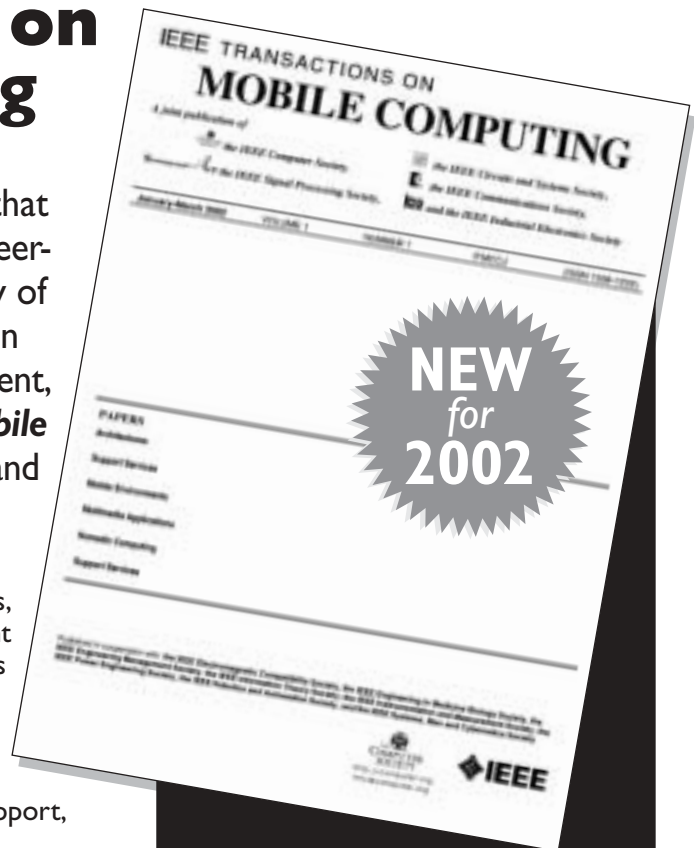
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2002 International Symposium, on Micro Mechatronics & Human Science (MHS 2002), Nagoya Municipal Industrial, Research Institute, Nagoya, Japan, October 20 - 23 2002; Contact: Prof. Fumihito Arai, Dept. of Micro System Engrg., Nagoya University, Furo-cho, Chikusa-ku, Nagoya 464 8603, Japan; Telephone: +81 52 789 3116; Fax: +81 52 789 3115; Email: arai@mein.nagoya-u.ac.jp

The 28th Annual Conference of the IEEE Industrial Electronics Society (IECON'2002), Meliá Lebreros Hotel, Sevilla, Spain, Nov. 5 to 8, 2002; Home-page: <http://iecon02.us.es/>; Contact: Leopoldo Garcia Franquelo, Escuela Superior de Ingenieros, Departamento de Ingenieria Electronica, Camino de los Descubrimientos s/n, 41092 Sevilla, Spain; Telephone: +34-95-4487365/72; FAX: +34-95-4487373/63153; Email: leopoldo@gte.esi.us.es

2002 IEEE International Conference on Industrial Technology "Productivity Reincarnation through Robotics & Automation" (IEEE-ICIT'02), Shangri-La Hotel, Bangkok, Thailand, December 11-14, 2002; Home-page: <http://www.ise.ait.ac.th/conferences/icit02.htm>; Contact: Dr. Manukid Parnichkun, Asian Institute of Technology, PO.Box 4, Klongluang, Pathumthani, 12120, Thailand; Telephone: +66 2524 5229; Fax: +66 2524 5697; E-mail: manukid@ait.ac.th

2003 International Electric Machines And Drives Conference (IEMDC'03), Monona Terrace Convention Center Madison, Wisconsin, USA, June 1-4, 2003; Home-page: <http://www.iemdc03.org>; Contact: Prof. Thomas A. Lipo, IEMDC, University of Wisconsin, 1415 Engineering Drive Room 2557, Madison, WI, 53706, USA; Telephone: +1 608 262 0287; Fax: +1 608 262 5559 ; E-mail: lipo@engr.wisc.edu

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The 11th International Conference on Advanced Robotics 2003 (ICAR 2003), University of Coimbra, Coimbra, Portugal, June 30-July 3, 2003; Home-page: <http://www.isr.uc.pt/icar03/>; Contact: ICAR03 Secretariat, ISR, DEEC, University of Coimbra, Polo II, 3030-290 Coimbra, Portugal; Fax: +351 239 406 672; E-mail: icar03@isr.uc.pt