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DSC Division Newsletter

Editor: Hemant Sardar; Assoc. Editors: Steve Hann, May-Win Thein

Summer 2000

Message From Past Editor

Dear Colleague,

It has been a pleasure serving as a DSCD Newsletter co-editor and editor during the last 0.5% of the previous millennium (May we not see that word again until Y3K). I've enjoyed meeting professional colleagues and making friends through newsletter activities. On a final note, I strongly recommend volunteering for the newsletter; the benefit-to-effort ratio is quite high.

Sincerely,
Bruce Wilson

New Associate Editor

Dr. May-Win Thein is the new Associate Editor of the Newsletter. Since receiving her Ph.D. from Oklahoma State University, Dr. Thein has been an Assistant Professor of Mechanical Engineering at the University of New Hampshire. Her research interests are in the areas of general stability of nonlinear systems, continuous and discrete time nonlinear state estimation, and multi-rate state and parameter estimation with particular application to disk drive control. Dr. Thein is also a member of IEEE, AIAA, and several honor societies such as Sigma Xi and Pi Tau Sigma. Welcome aboard May-Win!

In the Trenches: Interview with Davor Hrovat (Part II)

In November, 1996 Dr. Hrovat of Ford Motor Company was awarded the first DSCD Award for Innovative Industrial Practice. Over the course of several months, which included a move from Europe to the United States, Davor managed to provide a broad and thoughtful response to a series of interview questions from Bruce Wilson, former Editor of the DSCD Newsletter. This is the second part of this interview, Part I was published in the Spring '98 DSCD Newsletter.

What are some of the big challenges and opportunities for control in the automotive industry?

Most of current automotive control strategies are very complex and often ad-hoc. They are evolved through years of empirical developments and reflect a substantial knowledge-base and talents of hundreds if not thousands of experienced engineers. Although not always elegant, these products should not be underestimated, alter all, during the past two decades, they achieved remarkable gains in fuel economy performance and vehicle safety, while at the same time satisfying increasingly stringent emission constraint.

The big challenge - and at the same time big opportunity for control will be to achieve similar and better overall performance with a simpler and more robust strategy, based on more systematic control techniques. This is a a very challenging task and brute-force or "blind" application of modern control techniques alone won't suffice. Indeed, there is a lack of comprehensive control theory that would exactly fit the above complex setting characterized by a large number of contingencies, although, ongoing progress in adaptive, robust, nonlinear, fuzzy, neural net, model-predictive, and gain scheduling controls (to name a few) seems promising. In addition, what is still needed is a well-balanced blend of a good understanding of the underlying physical fundamentals complemented by a good "feel" - in other words - the good ol' intuition.

The payoff will come not only in the form of functional improvements, but also in a substantial reduction in code size and complexity, with a corresponding increase in overall system robustness. The latter is very important in an industry with products subject to large variability due to: large volumes produced under tight regulatory and cost constraints; vastly different conditions of operation (climate; spectrum of drivers); and aging through thousands of miles, often without regular maintenance.

Given the broad offerings in control courses, what sort of background do you suggest for graduate engineering students who wish to practice controls in the auto industry?

I would suggest the following well-rounded and well-balanced, system-oriented background. First, since most of our work still involves developing appropriate control-oriented models which form the basis for subsequent control design, I would recommend a good background in modeling and simulation of dynamics (mechatronic) systems and related CAE tools and methods. Here I found the bond graph modeling technique especially effective for automotive mechatronic systems, which - as I said earlier - are often characterized by a network-like structure and different energy domains (mechanical, electrical, hydraulic….). Although by definition, this is an interdisciplinary area, it seems that at present the mechanical engineering curricula may have a slight advantage here, due to their traditional emphasis on first principle physics and physical systems modeling.

Then comes a solid knowledge of different control techniques, of course within the previously mentioned provisos. Closely related re the important fields of control S/W and H/W implementation. This include a solid working-level knowledge of C/C++ programming languages, and familiarity with different micro-processor systems, their interfacing and related electronics. Finally , depending on one's further specialization, one may want to focus on different basic areas, such as combustion - thermodynamics, vehicle dynamics - general dynamics, chemistry, environmental engineering, etc.

Do you notice any difference in the background and approached to control problems in the US-trained engineers and European-trained engineers?

This is an interesting question. During the past 10 years I have spent a year in England in the 80's, and recently a year in Germany - both on Company assignments. While it is always a bit too tempting and too simplistic to generalize these matters, my perception is that the European engineers, especially the German Dipl. Ings, tend to have strong background in fundamental-traditional engineering disciplines, and a healthy dose of respect for the underlying physics. On the other hand, it seems that the US-trained engineers are more receptive to adapting and utilizing modern control and computer techniques and tools. It is interesting that, reflecting their geographical position, the British engineers seem to fit somewhere in-between the two; in some aspects I found them even more flexible than their US counterparts in adapting the new techniques.

(Bruce Wilson is an Assistant Professor of Mechanical, Industrial and Manufacturing Engineering at Northeastern University and former Editor of this Newsletter.)

NSF Workshop on the Integration of Modeling and Control for Automotive Systems

The Transportation Panel of the DSCD organized and led a workshop on June 5-6, 1999 at the University of California, Santa Barbara. Over 80 participants spent two days examining the questions associated with trying to formally integrate the Modeling process and Control process. The focus was kept to Automotive Systems to allow the use of case study examples for determining underlying fundamental issues. The workshop focused on the following main points:

- How to derive and manage models for control analysis, design, optimization, and verification?
- How to choose the appropriate analysis/control tool for a particular system given an existing modeling approach?
- How to combine the previous two points to perform both actions simultaneously?

Along with some excellent lecture style presentation, several hours were devoted to focus group discussions on many specific topics. One example was the session on Insight Gained from Specific Examples. Three automotive examples (A/F ratio, ABS, ACC/AHS) were used to determine commonalties to successes and failures. The commonalties to success were

- Highly perceived pay-off
- Simple physics captures 80% of the relevant phenomena
- Current sensor technology allows the measurement of the performance variables
- The actuators allow for sufficient control authority to perform desired task
- The actuators and sensors are roughly co-located
- The final controller structure can be specified to the point that there are few 'tweakable' parameters.

The commonalties to failure were quite varied and it was much more difficult to find the same set of indicators over different case studies that would predict modeling/control integration breakdown. It is more than likely that this would hold true for several other examples from Automotive Systems and will probably hold true for most, if not all, other fields of engineering. In essence, those approaches that succeed do so for the same reasons. Those approaches that fail do so for many different reasons. The workshop findings examined several other interesting topics including Education of students to consider modeling and control integration. The interested reader is encouraged to view the final report to NSF and any additional workshop information at: www.engineering.ucsb.edu/~anna/workshop.html

Call For DSCD Awards Nominations

The Dynamic Systems and Control Division of ASME International is seeking nominations for the following awards, to be awarded at the 2000 ASME International Mechanical Engineering Congress and Exposition, November 5 - 10, 2000, Orlando, FL:

DSCD Outstanding Investigator Award

The DSCD Outstanding Investigator Award is given biannually by the Dynamic Systems and Control Division of ASME to a DSCD member who has demonstrated sustained outstanding research contributions, either basic or applied, as a mechanical engineering professional to fields of interest to the DSCD.

Previous Winners:
1996 Masayoshi Tomizuka
1998 Haruhiko Asada

DSCD Leadership Award

The DSCD Leadership Award is given biannually by the Dynamic Systems and Control Division of ASME to a DSCD member who has demonstrated sustained outstanding leadership contributions to the DSCD, to ASME, and to fields of interest to the DSCD.

Previous Winners:
1996 Michael J. Rabins
1998 Devendra P. Garg

DSCD Innovative Practice Award

The DSCD Innovative Practice Award is given biannually by the Dynamic Systems and Control Division of ASME to a DSCD member for either excellent sustained contributions or for an outstanding major, singular contribution in innovative applications of dynamic systems, measurement, or control in engineering practice.

Previous Winners:
1996 Davor D. Hrovat
1998 Daniel E. Whitney

Nominees selected for the Awards must have been primary members of the DSCD for at least 5 consecutive years prior to receiving the Award and have been an active contributor to the DSCD. Each Award may not be given to the same individual more than once Any member of the DSCD Honors Committee whose term on the nominating committee includes a portion of the period in any selection cycle between the first call for nominations for an award and the final selection of the awardee is ineligible for nomination for these awards. NOMINATIONS MUST BE RECEIVED NO LATER THAN 5:00 PM, AUGUST 31,2000.

For more information on submitting a nomination, please contact:
Devendra P. Garg
P: (919) 660-5330 F: (919) 660-8963
E-mail: dpgarg@duke.edu

Tribute to Walter R. Evans

Walter Evans is best known for his invention of the Root Locus Method for designing automatic control systems. First published in 1948, it has since been used world-wide as the first step in creating good automatic control systems: It remains by far the most direct way of seeing exactly and very quickly what the cogent behavior of a controlled system will be, as a direct function of the control parameters at the designer's disposal.

While it is his Root Locus Method that has made his name widely known, and his contributions widely drawn upon, Evans also contributed deeply himself (1) to the advanced design of a range of automatic control systems for aircraft and spacecraft, including the unmanned supersonic Navaho, and for inertial guidance systems, including the one that navigated the submarines Nautilus and Skate under the North Pole, and (2) to the rapid frontier education of the engineers who worked with him to make them. The Navaho was the first supersonic aircraft, manned or unmanned. The Nautilus and Skate were the first two submarines to make a subpolar voyage, which they did with extremely small error.

Evans' landmark Root Locus Method played - and plays - a central role for rapid advances in the fast-growing field of auto-matic control. It provided, for the first time, a truly direct and quick way to look at a system's natural behavior and choose its control: by studying, in the "s plane," how the roots of its characteristic equation vary directly with the value of control "gain." And, because each (complex) root of the characteristic equation indicates the vibration frequency (imaginary part) and damping speed (real part) of one of its natural motions, one knows instantly and precisely, from a system's set of splane roots, what natural behavior that system will exhibit. The first rule is of course to be sure all closed-loop roots are well into the left half plane, i.e., are well stable.

With Evans' simple method, one can plot in seconds, and see at once the whole range of possible controlled behavior, and easily choose the best control.

Evans developed a set of very simple sketching rules by which the loci can always be quickly approximated "by eye" on the s plane. In 1948 there were no digital computers; but quite complex root loci could be quickly sketched anyway by Evans' rules - in seconds! Today there is enormous computing power at hand and programmed to sketch loci; but it is still much quicker to approximate first by eye, using Evans' rules.

To nail down specific points on the locus - to establish the gain to use and the exact natural frequency and damping that will result - Evans invented the Spirule, a simple plastic device with which the product of a set of s vectors can be quickly determined graphically. By 1950 the root locus method was already in wide use in the company, North American Aviation, where Evans was a highly respected engineering leader. (And the Spirule still gets a quick answer: Over the years, 100,000 have been shipped by Evans' wife, to engineers and engineering students in 65 countries.

Before Evans' Root Locus Method, these natural-behavior design decisions were most often made by the astute, but very indirect methods of Nyquist and Bode and Nichols, which inferred them from the system's response to sinusoidal inputs (a natural derivative of the EE community that designed early feedback controllers for electronic systems). Good design throughout the years since has used the two methods concurrently - the Root Locus Method and the range of "Frequency Response" methods. But it is the root locus that gives the first quick, direct insight. And it is the root locus structure that supports advanced optimal control design methods in a very fundamental way.

Formally, Evans taught courses at Washington University and at UCLA, and presented seminars that always surprised. His book, Control System Dynamics (McGraw Hill, 1954) and his seminal papers recorded succinctly his brilliant conception of automatic control. But the really fortunate students were the colleagues working beside Evans, and watching a wonderful, creative, agile and unfettered mind working with zest and very special wit (which was always brought directly to bear). His goal-oriented mind always approached any problem from a way no one else had ever thought of - and often the only way that would work. Every so often he would make a giant leap. He once solved a stymieing rocket engine control problem after only an hour's exposure to it. It typically took quite awhile for others to assimilate the power of what a flash of his mind had provided. (This showed up also in his approach to project management: "progress can be planned and reported only at the expense of being made.")

Along with Evans unique mind and wit went a profound caring for others: for his family and for his coworkers and students. And his four children and wonderful wife Arline knew well and cherished much their unique blessing. (Son Greg noted that "while professionally plotting the roots of characteristic equations, he also was planting in us the roots of character." Greg described their family times as "life in the left half plane.")

Then, in 1980, tragedy struck. At age 60, at the peak of a superb career, Walter Evans suffered a massive stroke. Damage to the left part of his brain now denied him speech, reading, and the use of his right limbs. With his indomitable will and Saint Arline's unstinting support he continued to bring love and philosophic inspiration to us all to paint beautifully and to play chess well and swim often - until his death on July 10, 1999.

He was most appropriately awarded the Oldenburger medal from the ASME in 1987, the Richard Bellman Control Heritage Engineers Award from the American Automatic Control Council in 1988, and the Engineering Alumni Achievement Award from Washington University in 1990. And the highest distinction of all was the deep and warm respect of his colleagues: Walter Evans inspired us so much. And he gave us so much. We have been greatly blessed.

Robert H. Cannon, Jr.

(Dr. Robert H. Cannon Jr. is Charles Lee Powell Professor and past-Chairman of the Department of Aeronautics and Astronautics and Director of the Aerospace Robotics Laboratory at Stanford University.)

Eight Weeks at Boeing: Our experience as 1999 Boeing A.D. Welliver Fellows

The A.D. Welliver Faculty Summer Fellowship Program was established in 1994 by Boeing. The intent of this program has been to influence content of undergraduate engineering education in ways that will better prepare tomorrow's graduates for the practice of engineering in a world-class industrial environment. Since 1995, 44 faculty members from across the US, as well as Europe, Asia and Australia have participated in this program.

Unlike typical summer faculty fellowship programs which focus on a specific research activity, the Welliver Program attempts to provide the participants with a broad picture of the various activities that take place in a large company such as Boeing- from product definition to design, manufacturing and distribution. In particular, as part of the orientation process of the Welliver Program, we, along with 9 other faculty members from across the US and Australia were given the opportunity to closely observe the challenges facing Boeing as it moves towards implementing the emerging paradigms of concurrent engineering and lean manufacturing in its day to day operations.

One of us, Reza Langari, spent six weeks at the Puget Sounds facilities of Boeing Commercial Aircraft Group and the Southern California facilities of Boeing Space and Communications and Boeing Aircraft and Missiles Groups. These visits included attending design review meetings, meeting with design and manufacturing engineers and managers and touring the manufacturing facilities where products ranging from the C-17 aircraft to the new aerospace engine designed for the X-33 Vehicle are built and assembled. The other one of us, Krishna, Krishnamurthy spent six weeks at the Wichita Division of Boeing Commercial Airplane Group. This visit included attending design review meetings and meeting with design and manufacturing engineers and managers as well as touring the manufacturing facilities responsible for 737 NG fuselage, engine struts and nacelles, and nose sections for the 747, 757, 767 and 777. We both found the interaction with Boeing engineers and managers to be enlightening. In particular, we realized the increasing impact of cross functional and integrated product teams throughout the product design and development cycle and saw first hand the manner in which these new paradigms are changing the way engineering is done. We were also able to see the increasing challenges facing large manufacturing companies in balancing the scope of in-house product development versus out-sourcing as well as the role of engineers in addressing product design and development issues within the context of the supply chain management process. These and similar issues in modern engineering and manufacturing will certainly have impact in how we will teach the future generations of engineers at our respective institutions. To this end, the report prepared by our group of 11 faculty fellows is available by request from R. Langari at rlangari@tamu.edu or K. Krishnamurthy at kkrishna@umr.edu. A version of this report entitled "Visioning Transition: A Framework for Collaborative Change" has been accepted for presentation at the ASEE 2000 Annual Conference and Exposition to be held June 18 - 21, 2000 in St. Louis, MI.

(Dr. Reza Langari is Associate Professor of Mechanical Engineering at Texas A & M University. Dr. K. Krishnamurthy is Professor of Mechanical Engineering at University of Missouri-Rolla)

Reza Langari,
K. Krishnamurthy

New ASME Fellows

Dr. William Powers of Ford Motor Company, and Dr. David Powell from Stanford University were named as new ASME Fellows at the DSCD Awards Dinner.

Acknowledgements

The Division would like to recognize Nejat Olgac for being the 1999 DSCD Representative to the IMECE and for the great job he did in organizing our participation.

News in Brief DSCD Awards Dinner

The DSCD Awards Dinner was held during the IMECE'99 in Nashville, Tennessee. Among the guests at the Dinner was Dr. John Parker who is the new president-elect of ASME International. The Rufus Oldenburger Award was given to Professor Yu-Chi Ho of Harvard University in recognition of his significant contributions and outstanding achievements in the field of automatic control. Such achievements may be, for example, in the areas of education, research, development, innovation, and service to the field and profession.

The other distinguished individuals who were honored at the dinner included:

Gary J. Balas, received the DSCD Outstanding Young Investigator Award for his significant contributions to the development of robust controller analysis and synthesis software tools, and for their innovative implementations in mechanical and aeronautical engineering.

Clarence W. deSilva, received the DSCD Education Award in recognition of his seminal contributions to instrumentation and control education, particularly in the areas of sensors and actuators, mechanical vibrations, microcomputers, robotics, and mechatronics; and for his intensive professional development courses on industrial automation offered at both national and international locations.

Kamal Youcef-Toumi and Ting-Jen Yeh received the Journal of Dynamic Systems, Measurement and Control's 1998 Best Paper Award for their paper "Adaptive Control of Nonlinear, Uncertain Systems using Local Function Estimation."

Michael Mosley from Rutgers University received the Student Best Paper Award for his paper on "Experimental Non-Linear Dynamics of Shape Memory Alloy Wire Bundle Actuator," that was co-authored with C. Mav-roidis. The other finalists were Martin Hosek from the University of Cincinnati and Andy Ottele from the Colorado School of Mines.

Rufus Oldenburger Award winnter Yu-Chi Ho at the Lectern.

Clarence W. deSilva, receiving the DSCD Education Award from ASME President-Elect John Parker.

Professor Yu-Chi Ho receiving the Rufus Oldenburger Award from ASME President-Elect Dr. John Parker under the watchful eyes of Clarence deSilva (left) and DSCD Chairman Glenn Masada.

Structures and Dynamics Program at the Army Research Office

As some of you already know, since my return to Duke University back from NSF, I have been regularly spending part of my time each week at the Army Research Office (ARO) located in Research Triangle Park here in North Carolina. I work with Dr. Gary L. Anderson (anderson@aro-emh1.army.mil), Manager for the Structures and Dynamics Program in the Mechanical and Environmental Sciences Division of the Engineering Sciences Directorate. Dr. Anderson is quite well known to the DSCD community. In fact, some of the researchers from the NSF's Dynamic Systems & Control Program have successfully received funding from Dr. Anderson's program at ARO as well. I am myself a former grantee in the robotics research area from Dr. Anderson's Structures and Dynamics program. Since my return from NSF, I have had the pleasure of meeting several of you in connection with my duties at ARO during my site visits to your research projects, workshop gatherings, and professional society meetings.

The major emphasis of the ARO's Structures and Dynamics Program has been on the theoretical, computational, and experimental analysis of smart structures and structural dynamics, damping, active control, and health monitoring as applied to rotorcraft, electromagnetic antenna structures, missiles, land vehicles, and weapon systems. The research projects supported by the program have been primarily directed towards improving the ability to predict, control, and optimize the dynamic response of complex, multibody deformable structures. Thus, there are excellent opportunities available for researchers from the dynamic systems and control community to pursue their research interests via ARO's sponsorship.

The Army Research Office provides funding for basic research projects that are of relevance to the mission of the U. S. Department of Defense. The relevance is established by an interest in the proposed project expressed by an Army Laboratory or a similar unit. The process starts with a submission to Dr. Anderson by October 15 a white paper of no more than 5 pages in length. This forms the basis of an invitation to submit a full-length proposal. After submission to ARO, each proposal is competitively evaluated by both the scientific peer group and the Army Laboratory researchers. Whereas various programs at ARO may choose to follow different procedures for proposal evaluation, the relevance of the proposed project to DoD mission is indeed a most paramount consideration.

The projects supported by the Structures and Dynamics Program have included multi-disciplinary research conducted by teams of several faculty members as well as research performed by individual investigators. The Multi-disciplinary University Research Initiative (MURI) program supports research teams whose efforts intersect more than one traditional science and engineering discipline. A major objective of engaging multidisciplinary teams in research is to hasten the progress of research in specific areas particularly suited for a joint effort, to channel creative energies in diverse disciplines to address major multi-disciplinary problems that arise in the design and realization of adaptive structures, and to accelerate the transfer of research results to practical applications.

At present, the Structures and Dynamics Program manages two MURI programs, one on innovative technologies for actively controlled jet-smooth quiet rotorcraft; and the other on multi-disciplinary research in smart composite structures. These programs have evolved from earlier research projects that were funded by ARO and ONR under the University Research Initiative (URI) Program that preceded the MURI program. The two MURI programs are "Innovative Technologies for Actively Controlled Jet-Smooth Quiet Rotorcraft" at the University of Maryland that is being carried out in collaboration with Pennsylvania State University and Cornell University, and the "Multi-Disciplinary Research in Smart Composite Structures" project at MIT. The Materials Science Division of ARO monitors two other MURI programs, in which emphasis is placed on the development of active materials. MURI projects concerned with MEMS sensors for gas turbine engines and design and control techniques for smart structures are monitored in ARO's Combustion and Propulsion Program and Control Theory Program, respectively. Dr. Linda Bushnell is the Program Manager for the Control Theory Program.

The research community in the area of dynamic systems and control possesses a huge potential of making substantial contributions in research directed toward enhancing performance, reliability, and agility of large, meso- and micro-size structures. Significant advances have been made in the fields of piezoelectric, electrostrictive, and magnetostrictive materials, reinforced composites, shape memory alloys, electro- and magneto-rheological fluids, intelligent sensor and actuator systems, and informulating techniques for modeling, simulation, and health monitoring and control of complex systems. All of these topics should provide sufficient interest and challenge to the researchers in the dynamics and control area.

A lot of progress has already been made over the past several years in the multi-disciplinary area of active materials, composite structures, and control. However, a number of challenges still remain. Specifically, these include the information and communication coordination and control of embedded devices in heterogeneous systems; structural identification and optimization; developing a thorough understanding of and designing active micro- and nano-scale active sensors and actuators, biologically inspired devices, and distributed transducers. Other areas that must receive attention should be directed towards developing active materials for high authority actuators; evolving knowledge-based systems for design using active materials; and optimizing sensor and actuator performance using the existing active materials. Similarly, research efforts are required for integrating concurrent design/control tools to include active materials in adaptive structures; and for devising accurate constitutive and hysteresis models for predicting behavior of active and passive materials under complex loading.

Several additional topics require immediate attention in this crucial area of research. For example, the reliability and durability of adaptive structural systems with embedded sensors and actuators must be ensured. Global and local control algorithms must be devised to assure robust system response under system uncertainties. Relatively cost-effective adaptive structural design concepts must be developed. Dependable and efficient power conditioning electronics and delivery systems must be formulated for distributed sensor and actuator arrays. Innovative computational methods must be conceived for designing active materials. Finally, reliable cost-effective manufacturing processes must be planned for producing small-sized sensors and actuators. These efforts would require multi-disciplinary teams of engineers and scientists working together to address adequately the research challenges presented. The researchers from the dynamic systems and control community can play a significant role by establishing collaboration with researchers in other areas to meet these challenges.

Additional information about this program is available at www.aro.army.mil.

Dev Garg

2001 IEEE/ASME International Conference on Advanced Intelligent Mechatronics

This biennial IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM) is intended to promote activities in various areas of mechatronics by providing a forum for exchange of ideas, presentation of technical achievements, and discussion of future directions. The next conference will be held in Como, Italy from July 8-11, 2001. The theme of the conference is Synergy in Mechatronics - The Next Step of Information Technology. The topics of interest are:

- System Integration
- Automotive Systems
- Actuators and Sensors
- Intelligent Systems
- Intelligent Control
- Industry Applications
- Robotics
- Intelligent Mechatronics
- Machine Vision
- Fusion of Mechanical Systems
- Manufacturing
- Communication Technology
- Motion Control
- Bio-Mechatronics
- Vibration and Noise Control
- Artificial Intelligence
- Micro Devices & Opto-Elect. Systems

The conference schedule is as follows:

March 1, 2000 - Call for papers, videos, workshops & tutorials

November 1, 2000 - Submission of invited sessions, workshops and tutorials

December 1, 2000 - Submission of papers and videos

January 1, 2001 - Notification of workshops and tutorials disposition

March 1, 2001 - Notification of papers and videos disposition

April 1, 2001 - Submission of final papers and videos

For more information, visit the conference website at http://www.AIM01.unina.it or contact the General Chair:

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Real-Time Experimental Control Workshop

The Mechanical, Aerospace, and Manufacturing (MAM) Engineering department at Polytechnic University announces a Real-Time Experimental Control Workshop to be held from May 29, 2000 to June 2, 2000. The workshop is directed at Ph.D. students, specializing in dynamic systems and control area, enrolled at U.S. universities. It will expose the participants to practical applications of dynamic systems and control, such as, servomotors, magnetic levitation, fluid level and flow control, nonlinear systems (e.g., 2 D.O.F. inverted pendulum, 3 D.O.F. helicopter, etc.), flexible structure systems, and open architecture robots. During the workshop, the participant will receive hands-on training in real-time implementation of the classical (P, PI, and PID), modern (LQR, Pole-placement, and LQG), and nonlinear controllers in a rapid control prototyping environment. This summer workshop opportunity is sponsored by the American Society of Mechanical Engineers-Dynamic Systems and Control Division, the NASA/NY Space Grant Consortium, and Quanser Consulting Inc. For further details visit: http://www.mechanical.poly.edu/faculty/vkapila/workshop.htm

FYI:

1. **Home Page of Year 2000** Parallel Kinematic Machines International Conference and Second European-American PKM Forum: http://www.personal.engin.umich.edu/~orlanik/2000-PKM-IC.htm. The 2000-PKM-IC will take place on 14-16 September, 2000 in Ann Arbor, Michigan USA.

2. **Registration for the 2000 Japan USA** (July 23-26, 2000) is available on the web at: http://www.engin.umich.edu/prog/pim/2000JUSFA.html

The Dynamic Systems and Control Division Newsletter is published twice annually (Spring & Fall). Please submit your items for publication, by e-mail; contact us for more details:

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AVEC 2000 Comes to North America

The 5th International Symposium on Advanced Vehicle Control (AVEC 2000) will be in Ann Arbor, Michigan, on August 22-24, 2000. Previously, AVEC was held in Japan (AVEC '92, '94, and '98) and Germany (AVEC '96). The sponsors for this meeting are the ASME DSCD, International Assn. for Vehicle System Dynamics (IAVSD), Japan Society of Automotive Engineers (JSAE), Society of Instrumentation and Control Engineers (SICE), Japan Society of Mechanical Engineers (JSME), and the Univ. of Michigan Automotive Research Center (ARC).

AVEC 2000 will bring researchers from across the globe to explore the advanced control of vehicles. This conference will include both rail and road vehicles used for either passenger or commercial purposes. This conference will examine in further detail the current and future combinations of Vehicle Dynamics with advanced control systems by gathering together experts in the field.

The following awards will be given at the AVEC2000 Symposium:

Innovation Award will be awarded to one individual whose research effort contributes to the advancement of the vehicle control field.

Best Paper Awards - (2) one emphasizing Theory and one emphasizing Practice will be given based on evaluation of both the manuscript and its presentation.

Post-symposium tour arrangements will include visits to Detroit area automotive manufacturing, research, and development facilities.

Further details can be found at:
http://www.engin.umich.edu/dept/meam/AVEC2000

LINKS...

ASME International...
http://www.asme.org

ASME International-Membership Area...
http://www.asme.org/memb

ASME International–International Mechanical Engineering Congress and Exposition for 2000 (IMECE 2000 or Congress 2000)...
http://www.asme.org/conf/congress00/index.html

Dynamic Systems & Control Division Home Page...
http://www.personal.engin.umich.edu/~ljefferty/asme_dscd/

Dynamic Systems & Control Division–Congress 2000 Home Page...
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