Emerging Technologies that will Change the World

In its February Issue MIT Technology Review presents ten researchers whose research in the area of new technologies will change the entire living and working world of people. Among the top ten we also find Professor Rolf Isermann from the Technical University of Darmstadt, former Vice-President and now Advisor and Council member of IFAC. Below find the article taken from “Technology Review”:

Engine control systems

David Talbot (IFAC Technical Committee Chair)

Mechatronics

To improve everything from fuel economy to performance, automotive researchers are turning to “mechatronics,” the integration of familiar mechanical systems with new electronic components and intelligent-software control. Take brakes. In the next five to 10 years, electromechanical actuators will replace hydraulic cylinders; wires will replace brake fluid lines; and software will mediate between the driver’s foot and the action that slows the car. And because lives depend on such mechatronic systems, Rolf Isermann, an engineer at Darmstadt University of Technology in Darmstadt, Germany, is using software that can identify and correct for flaws in real time to make sure the technology functions impeccably. “There is a German word for it: gründlich,” he says. “It means you do it right.”

In order to do mechatronic braking right, Isermann’s group is developing software that tracks data from three sensors: one detects the flow of electrical current to the brake actuator; a second tracks the actuator’s position; and the third measures its clamping force. Isermann’s software analyzes those numbers to detect faults – such as an increase in friction – and flashes a dashboard warning light, so the driver can get the car serviced before the fault leads to failure.

“Isermann is also working to make engines run cleaner. He is developing software that detects combustion misfires, which can damage catalytic converters and add to pollution. Because it’s not practical to have a sensor inside a combustion chamber, Isermann’s system relies on data from sensors that measure oxygen levels in exhaust and track the speed of the crankshaft (the mechanism that delivers the engine’s force to the wheels). Tiny fluctuations in crankshaft speed accompanied by changes in emissions reveal misfires. If a misfire is detected, the software can warn the driver or, in the future, might automatically fix the problem. Partnerships with manufacturing companies – including Daimler Chrysler and Continental Teves – merge the basic research from Isermann’s group with industry’s development of such technologies in actual cars. Isermann says that “80 to 90 percent of the innovations in the development of engines and cars these days are due to electronics and mechatronics.” Until recent years, mechatronic systems were found mainly in such big-ticket items as aircraft and industrial equipment or in small precision components for products such as cameras and photocopiers. But new applications in cars and trucks have helped prompt a surge in the number of groups working on mechatronics. The trend has been fueled by falling prices for microprocessors and sensors, more stringent vehicle-emissions regulations in Europe and California, and automakers’ wanting to enhance their vehicles with additional comfort and performance features.

Although the luxury market looms largest today – new high-end models from BMW contain more than 70 microprocessors that control more than 120 tiny motors – mechatronics will be moving into the wider car market within five years, says Lino Guzzella, codirector of the Institute of Measurement and Control at the Swiss Federal Institute of Technology. And with software like Isermann’s on board, the electronic guts of these new driving machines should be as sturdy and reliable as steel.

-- David Talbot

Others in MECHATRONICS

RESEARCHERS AND THEIR PROJECTS

Lino Guzzella (IFAC Treasurer)
Swiss Federal Institute of Technology
Engine modeling and control systems

Karl Hedrick and Masayoshi Tomizuka
U. California, Berkeley
Control systems and theory

Uwe Kiencke (IFAC Technical Board Member)
U. Karlsruhe
Digital signal processing

Philip Koopman
Carnegie Mellon U.
Fault tolerance in control software

Lars Nielsen (IFAC Technical Committee Chair)
Linköping U.
Engine control systems
Farewell at the IFAC World Congress in Barcelona

At the Closing Ceremony of the Barcelona Congress, the Congress participants gave a “huge” and warm “Thank You” to the Congress Chair Prof. Ferraté who had been instrumental in bringing the IFAC World Congress to Spain.

Mechatronic Systems
2nd IFAC Conference
Berkeley, CA, USA, December 9 – 11, 2002

The 2nd IFAC Conference on Mechatronic Systems was held from December 9 – 11, 2002 at the University of California, Berkeley. Industrial products are increasingly sophisticated and complex. Market demands and societal needs have necessitated that industry respond with high-quality products in a timely manner. Mechatronics is recognized as the key element in such responses. This conference brought together more than 170 experts from 26 countries to share the state-of-the-art of mechatronics and to present new research results and perspectives regarding the future development in the multidisciplinary field of mechatronic systems.

In the first plenary talk, “Automotive Mechatronics,” Dr. P. Schöner presented the motivation, technical challenges and future of mechatronics along with representative mechatronic solutions in the automotive industry. Professor H. Asada gave the second plenary talk, “Wet Mechatronics.” He presented a new direction of mechatronics in wet environments such as thermo-fluid and biochemical environments. The third plenary talk by Professor S. Sastry, “Millirobots for Minimally Invasive Telesurgery,” was on the mechatronic developments in an important area of biomedical systems. These plenary talks were collectively an excellent summary of how mechatronic approaches have been and will continue to play key roles at the forefront of modern technologies. Mechatronic approaches pursue the synergy achieved through the integration of mechanical, electrical, and information technologies in the design, manufacture and operation of industrial products and processes. Synergies may be in terms of performance, physical dimension, cost, power efficiency, time for development, dealing with complexity, and so on. In addition to the three plenary talks, 146 technical papers were presented in 28 technical sessions. They covered a wide range of topics relevant to mechatronics: automation/robotics, micro-electromechanical systems (MEMS), mechatronic devices/machines, control of mechatronic systems, human-machine interfaces, embedded computing and software engineering and design/integration methodologies for mechatronic systems. Technical sessions were also organized on specific engineering systems to report on mechatronic approaches and solutions: automotive systems, biomedical systems, robots, hard disk drives, and motion/vibration control systems. Post conference tours were organized for visiting research laboratories at the University of California, Berkeley and Stanford University.

The main social activity was the banquet at the Chabot Space and Science Center. The museum was rented exclusively for the conference participants, and a special planetarium show and viewing of the moon surface and Saturn (with rings!) accompanied fine foods and wine.

The IFAC Technical Committee on Mechatronic Systems (MIS) sponsored this conference. The Committee was established recently in response to the ever growing importance of mechatronics. Mechatronics is not new to the IFAC community and it has naturally been a part of activities covered by other technical committees such as Automotive Control (TVC), Robotics (MIR) and Component and Instrumentation (MIC). MIS and this biennial Conference on Mechatronic Systems provide a cross-cutting forum to various application fields and industrial segments. Mechatronics is growing in other technical communities such as general electrical engineering and mechanical engineering. MIS and this conference serve as interfaces and coordinate activities with other technical societies where mechatronics-in-action is taking place. For example, IFAC and IEEE/ASME (Institute of Electrical and Electronics Engineering/American Society of Mechanical Engineering) coordinate their conference activities so that the IFAC Conference on Mechatronic Systems takes place every even year and the IEEE/ASME International Conference on Advanced Intelligent Mechatronics every odd year.

In general, sessions were well attended, and there were only a few no shows. Although we did not conduct a formal evaluation, comments we received from participants were all positive. The conference was a success!

Masayoshi Tomizuka
Chairman of International Program Committee

Programmable Devices and Systems – PDS 2003
IFAC Workshop
Ostrava, Czech Republic
February 11th – 13th, 2003

The IFAC Workshop on Programmable Devices and Systems – PDS 2003, organised by the Department of Measurement and Control, Technical University of Ostrava, Czech Republic in co-operation with the Institute of Electronics, Silesian University of Technology, Gliwice, Poland was held in Ostrava, Czech Republic in February 11 – 13, 2003. The Workshop is a continuation of the PDS conferences, which were held in Ostrava and in Gliwice in 1995 – 2001.

On the basis of its organisers’ experiences and participants’ opinions it has been decided to continue the scope for the PDS 2003 IFAC Workshop. The organisers believe that in the area of programmable devices and systems there are some problems sufficiently specific to them to justify the decision to organise the PDS 2003 IFAC Workshop.

The main objective is to provide a forum to present the latest research results and experiences in the area of the design and application of programmable devices and systems. PDS is a forum to discuss the current status and future trends of this particular branch of the programmable devices in measurement, control, and computer science.

The topics of the workshop were
i) Industrial Programmable Controllers & PLC’s
ii) Embedded systems, Microprocessor and Micro-controlers
iii) Field Programmable Logic (PLD, CPLD, FPGA) and High End Design Means
iv) Signal Processing, and
v) Reliability and Safety of Circuits and Systems.

The IFAC Technical Committee on Components and Instruments and Safety of Computer Control Systems sponsored the Workshop.

During the three days of the PDS 2003 Workshop, 87 papers presented both theoretical and practice-oriented viewpoints from 13 countries. All papers accepted for presentation appeared in the Preprints of the meeting which were distributed to participants. Presented papers will be printed in Proceedings by Elsevier Science Ltd., Oxford, U.K.

Selected papers are offered for possible publication in the IFAC Journals Automatica, Control Engineering Practice and Affiliated Journals. Copyright of materials at an IFAC meeting is held by IFAC.

The technical programme of the Workshop included technical visits to enterprises ON SEMICONDUCTOR – TESLA SEZAM and SIEMENS Automotive in Fremitat pod Radholzím.

Karel Vlek, IPC Vice-Chair,
VSÚ Technical University of Ostrava, CZ.

Vížen Stovnál, NOC Chair,
VSÚ Technical University of Ostrava, CZ.
A Journal of IFAC the International Federation of Automatic Control

Papers from the November 2002 Issue

Wait-free Data Sharing between Periodic Tasks in Multiprocessor Control Systems (O. Song, C.-H. Choi)
A Practical Multiple Model Adaptive Strategy for Multivariable Model Predictive Control (D. Dougherty, D. Cooper)
Initial Condition-adaptive Robust Control for a High-speed Magnetic Actuator (T. Kawabe)

Informal Meeting of IFAC Officers
Laxenburg, Austria
21 – 22 March, 2003

As has been a tradition for more than 20 years, the IFAC President, Vice-Presidents, Past President, President-Elect and the IFAC Treasurer came together in Laxenburg at the Seat of the IFAC Secretariat to meet with the Secretary and the Secretariat staff. These meetings are used to informally discuss administrative matters and to strengthen the traditionally good links to the Austrian Academy of Science, the Austrian Ministry of Science and Innovation. They were introduced during the Presidency of Professor Sawaragi during his term of office from 1978 - 81. In this context it is also noteworthy that the IFAC Secretariat has been located in Laxenburg for 25 years now, most of the time with the same staff, which has lent additional stability and continuity to the activities of a Federation which elects its officials every three years.

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Papers from the January 2003 Issue

Papers

On Linear Models for Nonlinear Systems (P.M. Mäkilä, J.R. Parvington)
Lyapunov-Krasovskii Approach to the Robust Stability Analysis of Time-delay Systems (V.L. Kharitonov, A.P. Zhakko)
Stability Issues for Dynamic Traffic Assignment (S. Peeta, T.-H. Yang)
Run-to-run Control Methods Based on the DHOBE Algorithm (C. Zhang, H. Deng, J.S. Baras)

Brief Papers

Numerical Treatment of Multobjective Optimal Control Problems (M. El-Kady, M.S. Salim, A.M. El-Sagheer)
Robot Control and Parameter Estimation with Only Joint Position Measurements (M.A. Artaoga)
Damping of Harmonic Disturbances in Sampled-data Systems – Parameterization of All Optimal Controllers (T.H. Tolvenon, A. Medvedev)
Reduced-order Control for a Class of Nonlinear Similar Interconnected Systems with Mismatched Uncertainty (X.-G. Yan, L. Xie)
An Energy-shaping Approach to the Design of Excitation Control of Synchronous Generators (M. Galaz, R. Ortega, A.S. Bazanella, A.M. Stankovic)
Fast Calculation of Stabilizing PID Controllers (M. T. Sölyomyn, N. Munro, H. Baki)
Integral Control by Variable Sampling Based on Steady-state Data (N. Ozdemir, S. Townley)
Universal Stabilization of Feedback Nonlinear Systems (Y. Xudong)
Relay Auto-tuning of PID Controllers Using Iterative Feedback Tuning (W.K. Ho, Y. Hong, A. Hanson, H. Hjalmarsson, J.W. Deng)
On the Synthesis of Controllers for Continuous Time LTI Systems that Achieve a Non-negative Impulse Response (S. Darbha)
On the Stability of Nonautonomous Systems (A. Iggidir, G. Sallet)

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Optimal Control of the Thrustel Skate (K. Lynch)

Book Review

Nonlinear Identification and Control – A Neural Network Approach, by G.P. Liu (S.S. Ge)

Papers from the February 2003 Issue

Papers

Optimal Output-transitions for Linear Systems (H. Perez, S. Devasia)
Designing Robustly Stabilising Controllers for LTI Spatially Distributed Systems Using Conic Factor Synthesis (J. Reinschke, M.C. Smith)
A Clustering Technique for the Identification of Piecewise Affine Systems (G. Ferrari-Trecate, M. Muselli, D. Liberati, M. Morari)
Control of Combustion Oscillators via H-infinite Loop-shaping µ-analysis and Integral Quadratic Constraints (Y.-C. Chu, K. Glover, A.P. Dowling)

Brief Papers

On the Problem of General Structural Assignments of Linear Systems Through Sensor/Actuator Selection (X. Liu, B.M. Chen, Z. Lin)
Hysteresis-based Switching Algorithms for Supervisory Control of Uncertain Systems (J.P. Hespamah, D. Liberon, A.S. Morse)
Sliding Mode Control for Two-time Scale Systems: Stability Issues (M. Innocenti, L. Greco, L. Polinari)
Optimal Errors-in-variables Filtering (R. Guidorzi, R. Diversi, U. Soverini)
Nonlinear Control of a 3-pole Active Magnetic Bearing System (C.-T. Hsu, S.-L. Chen)
Relay-based Closed Loop Transfer Function Frequency Points Estimation (G.H.M. de Adda, P.R. Barros)
Pseudo Decentralized Switching Control (A.G. Aghdam, E.J. Davison)
Coordinated Passivation Designs (M. Larsen, J. Jankovic, P.V. Kokotovic)
Discontinuous Exponential Stabilization of Chained Form Systems (N. Marchand, M. Alami)
Strict Lyapunov Functions for Time-varying Systems (F. Mazenc)

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An Equivalence Result in Linear-quadratic Theory (W.A. van den Broek, J.C. Engwerda, J.M. Schumacher)
H-infinite Control of Dead-time Systems Based on a Transformation (Q.-C. Zhong)

Book Reviews

Qualitative Theory of Hybrid Dynamical Systems, by A.S. Matveev and A.V. Savkin (D. Liberzon)
Optimal Control of Singularly Perturbed Linear Systems and Applications, by Z. Gajic and M.-T. Lim (J.M. Berg)
Self-learning Control of Finite Markov Chains, by A.S. Poznyak, K. Najjim and E. Gomez-Ramirez (B. Van Roy)
Papers from the March 2003 Issue

Papers

Optimal Stochastic Fault Detection Filter

The Full Information and State Feedback H2 Optimal Controllers for Descriptor Systems
(J.Y. Ishihara, M.H. Terra, R.M. Sales)

Model Validation for Control and Controller Validation in a Prediction Error Identiﬁcations Framework – Part I: Theory
(M. Gevers, X. Bombois, B. Codrons, G. Scorletti, B.D.O. Anderson)

Model Validation for Control and Controller Validation in a Prediction Error Identiﬁcations Framework – Part II: Illustrations
(M. Gevers, X. Bombois, B. Codrons, G. Scorletti, B.D.O. Anderson)

Linear Control of Live Marked Graphs
(Ph. Daranadeu, X. Xie)

Asymptotic Controllability and Observability Imply Semiglobal Practical Asymptotic Stabilizability by Sampled-data Output Feedback
(H. Shim, A.R. Teel)

Low-gain Integral Control of Continuous-time Linear Systems Subject to Input and Nonlinearities
(T. Flienger, H. Logemann, E.P. Ryan)

Brief Papers

Control of Discrete-time Nonlinear Systems with a Time-varying Structure
(R. Ordonez, K.M. Passino)

Global Stability and Disturbance Suppression of a Class of Nonlinear Systems with Uncertain Internal Model
(Z. Ding)

Friction Compensation for a Sandwich Dynamic System
(A. Taware, G. Tao, N. Pradhan, C. Teolis)

An Algorithm for Multi Parametric Quadratic Programming and Explicit MPC Solutions
(P. Tondel, T.A. Johansen, A. Bemporad)

Frequency Domain Solution to Delay-type Nehari Problem
(Q.-C. Zhong)

Robust H Filtering for Uncertain Impulsive Stochastic Systems Under Sampled Measurements
(S. Xu, T. Chen)

Observer-based Stabilization of Switching Linear Systems
(Z.-G. Li, C.Y. Wen, Y.C. Soh)

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Robust Pole Clustering in a Good Ride Quality Region of Aircraft for Matrices with Structured Uncertainties
(S.-G. Wang)

Multiple-objective Risk Sensitive Control and its Small Noise Limit
(A.E.B. Lim, X.Y. Zhou, J.B. Moore)

An LMI Approach to Design Robust Fault Detection Filter for Uncertain LTIs
(M. Zhong, X.S. Ding, J. Lam, H. Wang)

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Robust Adaptive Control for Nonlinear Uncertain Systems
(W.M. Haddad, T. Hayakawa, V. Chellbina)

Arbitrary Fuel-optimal Attitude Maneuvering of a Non-symmetric Space Vehicle in a Vehicle-fixed Coordinate Frame
(I. Isoslovich)

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Electric Systems, Dynamics and Stability with Artificial Intelligence Applications, by J.A. Momoh and M.E. El-Hawary
(O.P. Malik)

Nonlinear System Identiﬁcation, by O. Nelles (E. Wailer)

Papers from the April 2003 Issue

Papers

MPC for Stable Linear Systems with Model Uncertainty
(M.A. Rodrigues, D. Odloak)

Optimal Control of Nonlinear Systems: A Predictive Control Approach
(W.-H. Chen, D.J. Balance, P.J. Gawthrop)

Robust Nonlinear Disturbance Suppression of a Class of Nonlinear Systems with Uncertain Internal Model
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WHO IS WHO IN IFAC

J.C. Geromel – IFAC Council Member

José C. Geromel was born in Itatiba, SP, Brazil in 1952. He received the B.Sc. and M.Sc. degrees in Electrical Engineering from the University of Campinas (UNICAMP-Brazil) in 1975 and 1976 respectively and the Doctorat d’Etat es Sciences Physiques degree from the University Paul Sabatier, France in 1979. In 1975 he joined the School of Electrical and Computer Engineering at UNICAMP where he is presently professor of Control Theory. In 1987 he held a visiting professor position at Milan Polytechnic Institute, Milan, Italy.

Prof. Geromel is a member of the Editorial Board of Studies in Informatics and Control and Subject Editor of International Journal of Robust and Nonlinear Control. In 1994 he was awarded the Zeferino Vaz Award for his teaching and researches activities at UNICAMP. Since 1981 he has been a Fellow and in 1997 he was elected member of the Electrical Engineering Committee of the CNPq (Brazilian Council for Research Development). Since 1998 he has been the Dean for Graduate Studies at UNICAMP and member of the Brazilian Academy of Science. In 1999 he was named for Chevalier dans l’ Ordre des Palmes Académiques by the Minister of National Education of France.

He has supervised twelve M.Sc. and eight Ph.D students. He has published more than 120 technical papers, 50 of them in international journals. He is co-author of the book Control Design (with P. Colaneri and A. Locatelli, Academic Press, 1997). His current research interests include convex programming theory, robust control systems design, robust filtering and joint location and control systems design. At the General Assembly of IFAC in Barcelona 2002 he was elected member of the IFAC Council.

The IFAC Information Brochure 2002 is now available and can be obtained from the IFAC Secretariat by mail or e-mail.

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<th>2003</th>
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<td>IFAC Workshop Real Time Programming</td>
<td>May</td>
<td>Lagow, Poland</td>
<td><a href="http://www.iee.uz.zgora.pl/wrtp03">http://www.iee.uz.zgora.pl/wrtp03</a></td>
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<td>American Control Conference – in co-operation with IFAC –</td>
<td>June</td>
<td>Denver, CO, USA</td>
<td><a href="http://acc2003.me.berkeley.edu">http://acc2003.me.berkeley.edu</a></td>
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<td>IFAC Symposium 5th Fault Detection, Supervision and Safety of Technical Processes – SAFEPROCESS</td>
<td>June</td>
<td>Washington, DC, USA</td>
<td><a href="http://safeproc.gmu.edu">http://safeproc.gmu.edu</a></td>
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<td>IFAC Symposium 6th Advances in Control Education – ACE 2003</td>
<td>June</td>
<td>Oulu, Finland</td>
<td><a href="http://ntsat.oulu.fi">http://ntsat.oulu.fi</a></td>
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<td>IFAC Conference Analysis and Design of Hybrid Systems – ADHS03</td>
<td>June</td>
<td>St. Malo, France</td>
<td><a href="http://www.supelec-rennes.fr/adhs03/">http://www.supelec-rennes.fr/adhs03/</a></td>
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<td>XVII IMEKO WORLD CONGRESS Metrology in the 3rd Millennium</td>
<td>June</td>
<td>Dubrovnik, Croatia</td>
<td><a href="http://www.imeko.org">http://www.imeko.org</a></td>
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<td>IFAC Workshop Automatic Systems for Building the Infrastructure in Developing Countries (Knowledge and Technology Transfer)</td>
<td>June</td>
<td>Istanbul, Turkey</td>
<td><a href="http://www.dogus.edu.tr/decom03">http://www.dogus.edu.tr/decom03</a></td>
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<tr>
<td>IFAC Workshop Technology and International Stability</td>
<td>July</td>
<td>Waterford, Rep. of Ireland</td>
<td><a href="http://www.iht.tuwien.ac.at/swiis03/">http://www.iht.tuwien.ac.at/swiis03/</a></td>
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<td>IFAC Workshop Modelling and Analysis of Logic Controlled Dynamic Systems</td>
<td>July</td>
<td>Irkutsk, Lake Baikal, Russia</td>
<td><a href="http://giscenter.irc.ru/ifacbaik/">http://giscenter.irc.ru/ifacbaik/</a></td>
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<td>European Control Conference (in co-operation with IFAC )</td>
<td>Sep.</td>
<td>Cambridge, UK</td>
<td><a href="http://conferences.ice.org/ECC03/">http://conferences.ice.org/ECC03/</a></td>
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<td>IFAC Workshop Time Delay Systems</td>
<td>Sep.</td>
<td>Recquencourt, France</td>
<td><a href="http://www.inria.fr/tds03.html">http://www.inria.fr/tds03.html</a></td>
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FORTHCOMING EVENTS

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<tr>
<td>IFAC Symposium 8&lt;sup&gt;th&lt;/sup&gt; Automated Systems Based on Human Skill – joint design of technology and organization</td>
<td>September 22 – 24</td>
<td>Gothenburg, Sweden</td>
<td><a href="http://www.davinci.chalmers.se/Ifac_2003">http://www.davinci.chalmers.se/Ifac_2003</a></td>
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<td>EWICS/IFAC/IFIP Intl. Conference Computer Safety, Reliability and Security – SAFECOMP 2003</td>
<td>September 23 – 26</td>
<td>Edinburgh, UK</td>
<td><a href="http://www.safecomp.org">http://www.safecomp.org</a></td>
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<tr>
<td>IFAC Workshop Intelligent Assembly and Disassembly</td>
<td>October 9 – 11</td>
<td>Bucharest, Romania</td>
<td><a href="http://www.id2003.com">http://www.id2003.com</a></td>
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<td>IFAC Workshop New Technologies for Automation of the Metallurgical Industry</td>
<td>October 11 – 13</td>
<td>Shanghai, China</td>
<td><a href="http://www.baosight.com/ifac03">http://www.baosight.com/ifac03</a></td>
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<tr>
<td>Title</td>
<td>2004</td>
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<tr>
<td>IFAC Symposium Computer Applications in Biotechnology</td>
<td>March 28 – 31</td>
<td>Nancy, France</td>
<td><a href="http://www.ensic.inpl-nancy.fr/CAB9/">http://www.ensic.inpl-nancy.fr/CAB9/</a></td>
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<td>IFAC Symposium 11&lt;sup&gt;th&lt;/sup&gt; Information Control Problems in Manufacturing – INCOM 2004</td>
<td>April 5 – 7</td>
<td>Salvador, Brasil</td>
<td><a href="http://www.eletro.uf">http://www.eletro.uf</a> alleged.br/incom2004/</td>
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<td>IFAC Symposium Advances in Automotive Control</td>
<td>April 19 – 23</td>
<td>Salerno, Italy</td>
<td><a href="http://www.ifac04.unisa.it">http://www.ifac04.unisa.it</a></td>
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<td>IFAC Symposium Automatic Control in Aerospace</td>
<td>June 14 – 18</td>
<td>St. Petersburg, Russia</td>
<td><a href="http://aca2004.anet.ru">http://aca2004.anet.ru</a></td>
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<td>IFAC Symposium Telematics Applications in Automation and Robotics – TA 2004</td>
<td>June 21 – 23</td>
<td>Helsinki, Finland</td>
<td><a href="http://www.automatiqueura.fi/Ta04">http://www.automatiqueura.fi/Ta04</a></td>
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<tr>
<td>American Control Conference – in co-operation with IFAC</td>
<td>June 30 – July 2</td>
<td>Boston, MA, USA</td>
<td><a href="http://www.mie.uiuc.edu/acc2004/index.asp">http://www.mie.uiuc.edu/acc2004/index.asp</a></td>
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<tr>
<td>IFAC Symposium Intelligent Autonomous Vehicles – IAV 2004</td>
<td>July 5 – 7</td>
<td>Lisbon, Portugal</td>
<td><a href="http://iax04.isr.ist.ult.pt">http://iax04.isr.ist.ult.pt</a></td>
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<tr>
<td>IFAC Conference Control Applications in Marine Systems – CAMS 2004</td>
<td>July 7 – 9</td>
<td>Ancona, Italy</td>
<td><a href="http://cams04.unan.it">http://cams04.unan.it</a></td>
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<td>IFAC Workshop Fractional Differentiation and its Applications – FDA '04</td>
<td>July 19 – 20</td>
<td>Bordeaux, France</td>
<td><a href="http://www.lap.u-bordeaux.fr/ida04/home.html">http://www.lap.u-bordeaux.fr/ida04/home.html</a></td>
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<tr>
<td>Asian Control Conference (5th) – in co-operation with IFAC</td>
<td>July 20 – 23</td>
<td>Melbourne, Australia</td>
<td>e-mail: l. <a href="mailto:brindle@ecmu.oz.au">brindle@ecmu.oz.au</a></td>
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<tr>
<td>IFAC Symposium Large Scale Systems: Theory and Applications</td>
<td>July 26 – 28</td>
<td>Osaka, Japan</td>
<td><a href="http://not">http://not</a> yet available</td>
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<td>IFAC Workshops on – Adaptation and Learning in Control and Signal Processing – ALCOSP – Periodic Control Systems – PSYCO</td>
<td>August 30 – September 1</td>
<td>Yokohoma, Japan</td>
<td><a href="http://www.contr.sd.keio.ac.jp/ifacwos04/main.htm">http://www.contr.sd.keio.ac.jp/ifacwos04/main.htm</a></td>
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<td>IFAC Symposium 6&lt;sup&gt;th&lt;/sup&gt; Nonlinear Control Systems – NOLCOS’04</td>
<td>September 1 – 3</td>
<td>Stuttgart, Germany</td>
<td><a href="http://www.nolcos2004.uni-stuttgart.de">http://www.nolcos2004.uni-stuttgart.de</a></td>
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<tr>
<td>IFAC Multitrack Conference Advanced Control Strategies for Social and Economic Systems</td>
<td>September 2 – 4</td>
<td>Vienna, Austria</td>
<td>e-mail: <a href="mailto:kopacek@iit.tuwien.ac.at">kopacek@iit.tuwien.ac.at</a></td>
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<td>IFAC Symposium Mechatronic Systems</td>
<td>September 6 – 8</td>
<td>Sydney, Australia</td>
<td><a href="http://mechatronics2004.newcastle.edu.au/mech2004">http://mechatronics2004.newcastle.edu.au/mech2004</a></td>
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<td>IFAC Symposium 11&lt;sup&gt;th&lt;/sup&gt; Automation in Mining, Mineral and Metal Processing – M3MP 2004</td>
<td>September 8 – 10</td>
<td>Nancy, France</td>
<td><a href="http://www.cran.ulp-nancy.fr/ifac-mmm2004/">http://www.cran.ulp-nancy.fr/ifac-mmm2004/</a></td>
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<td>IFAC Workshop 2&lt;sup&gt;nd&lt;/sup&gt; Advanced Fuzzy/Neural Control</td>
<td>September 16 – 17</td>
<td>Oulu, Finland</td>
<td><a href="http://www.ntstat.oulu.fi/">http://www.ntstat.oulu.fi/</a></td>
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<td>IFAC Workshop Discrete Event Systems</td>
<td>September 22 – 24</td>
<td>Reims, France</td>
<td><a href="http://www.univ-reims.fr/wodes04">http://www.univ-reims.fr/wodes04</a></td>
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<td>IFAC Symposium System Structure and Control</td>
<td>December 8 – 10</td>
<td>Oaxaca, Mexico</td>
<td><a href="http://sssc04.cinvestav.mx">http://sssc04.cinvestav.mx</a></td>
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<td>Title</td>
<td>2005</td>
<td>Place</td>
<td>Further Information</td>
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<td>American Control Conference – in co-operation with IFAC</td>
<td>June 8 – 10</td>
<td>Portland, OR, USA</td>
<td><a href="http://not">http://not</a> yet available</td>
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<td>16&lt;sup&gt;th&lt;/sup&gt; IFAC WORLD CONGRESS</td>
<td>JULY 4 – 8</td>
<td>PRAGUE, CZECH REPUBLIC</td>
<td><a href="http://www.ifac.cz">http://www.ifac.cz</a></td>
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