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Data Mining and Knowledge Discovery for Processing Monitoring and Control, X. Z. Wang, Springer Berlin, 1999 (G. Dodds)

Preface to the IFAC Milestone Reports 2002

During the last triennium several new activities were launched in IFAC. Examples are the milestone reports and professional briefs. Therefore a brief introduction for the milestone reports and a summary of some other activities are given.

SURVEYS ON SCIENTIFIC-TECHNICAL DEVELOPMENTS FOR AUTOMATIC CONTROL

Discussions within the Technical Board of IFAC have shown that more surveys for the different scientific and technical fields are desired, which summarize the state-of-the-art and future trends. Therefore the chairs of the Coordination Committees were asked in 2000 to compile milestone reports with the support of the Technical Committees. The milestone reports should be organized in two parts:
I. Current status (key problems in the field, recent accomplishments to theory and applications);
II. Forecasts (needs and challenges, anticipated developments, likely new applications), according to a proposal from Mike Masten.

A selection committee was established in the Technical Board (TB) consisting of the officials Mike Masten, Jozsef Bokor, Marek Zaremba and the TB chair. In 2001 11 Reports were received. Finally 6 milestone reports could be accepted for publication in 2002.

Design Methods:

A. Isidori, R. Bars, J.M. Dion, S.Engell, T. Glad

Computer Control:

H. Verbruggen, J. Park, W. Halang, G. Irwin, J. Zalewski

Manufacturing and Instrumentation:

A. Ollero, G. Morel, P. Bernus, S.Y. Nof, J. Sasiadek, S. Boverie, H. Erbe, R. Goodall

Industrial Applications:

T. McAvoy, SL. Jämsä-Jounela, R. Patton, M. Perrier, C. Georgakis

Bio-Ecological Systems:

Y. Hashimoto, I. Farkas, H. Murase, E.R. Carson, A.Sano

Social Impact of Automation:

L. Martensson, J. Cernetic

FURTHER ACTIVITIES OF THE TECHNICAL BOARD

The *Technical Board* coordinates the different Technical Committees through the Technical Board Members and approves their scopes, programs and activities. In addition, the TB is responsible for the final approval regarding Symposia, Conferences and Workshops.

The TB consists of the chair, two vice-chairs, two members with special liaison functions and nine Coordinating Committee Chairs. It is

currently divided in 9 Coordinating Committees (CC), with altogether 45 Technical Committees. The main tasks of the TB in the first year in the triennium 1999-2002 was to improve the organization with regard to the application and approval process of IFAC events and to finetune the scopes of the TCs. In the second year emphasis was on finding an *improved structure*. The TB will in the future be organized as follows:

THEORY

1. Systems and Signals
2. Design Methods

TECHNOLOGY

3. Computers, Cognition and Communication
4. Mechatronics, Robotics and Components

APPLICATIONS

5. Manufacturing Systems
6. Industrial Systems
7. Transportation Systems
8. Bio- and Ecological Systems
9. Social Systems

The number of TCs could be reduced to 38 by merging some TCs and adding two new TCs.

The third year was mainly dedicated to the *IFAC Congress in Barcelona*, for which about 2500 papers had to be reviewed, accepted and organized in technical sessions. This is a comprehensive activity, in which all the TCs, CCs, the Congress IPC and NOC are involved, and our appreciation goes to all who contributed actively to this event.

In addition to the milestone reports *Professional Briefs* were invited, based on a proposal by P. Albertos and P. Fleming. They aim at a readership of general professional control engineers, provide an introduction and overview, illustrative results and sketch of the underlying theory and are an activity of the *Publications Committee*.

Several professional briefs will be available from the IFAC homepage: www.ifac.control.org.

Between the Congress years IFAC organizes about 35 mainsponsored *Symposia, Conferences* and *Workshops* per year and about 5 cosponsored events with other organizations.

In the years 1999-2002 these IFAC events were attended by more than 9000 participants including the 14th IFAC-Congress in Beijing with 1466 participants. The minimum attendance was about 50 the maximum 335. The Symposia are on a Master Plan, representing long term commitments of IFAC and are held every 3 years. The IFAC events are sponsored by dedicated Technical Committees. The current 45 TCs have altogether over 1200 listed members.

Some *new titles* of IFAC events were Aerospace Applications of the Global Positioning System, Modelling and Control of Agriculture, Linear Time Delay Systems, Mechatronic Systems, Telematics Applications, Cost Oriented Automation, Advanced Fuzzy/Neural Controls, Fieldbus Systems, Internet Based Control Education.

Special working meetings and panel discussions are organized to review *future developments* in the field of automatic control and related technology. The last working meeting in Arlington 2001 and the milestone reports have shown that within the three areas Theory, Technology and Applications the keywords in the Table seem to be dominating. Hence, the future directions of automatic control are mainly driven by new technological and application oriented aspects.

The IFAC-World Congress is which we have just experienced is the occasion to keep up with worldwide developments in the theory and applications of automatic control.

Technical Board Meeting

At the Working Meeting of the Technical Board and subsequently at the Council Meeting last year in Arlington, the following areas were identified to be of great significance for the future of automatic control and thus for the work of IFAC.

THEORY

- Nonlinear model based control
- Control of nonlinear complex systems with delays
- Hybrid control
- Intelligent Systems
- Cognitive Systems
- Learning Systems

TECHNOLOGY

- Embedded microcontrollers
- Distributed agents (Ubiquitous-computing)
- Large communication networks control
- Large computer grids
- Wireless mobile systems
- New sensors & actuators
- Sensorfusion
- Implementation issues
- Autonomous Systems
- Fault management & safety
- Diagnosis, fault tolerance
- Teleoperation
- Virtual reality
- Certification

APPLICATIONS

- Large Scale Systems
- Complex Processes
- Multidisciplinary Fields
- Mechatronics
- Microelectromechanical Systems (MEMS)
- Nanotechnologies
- Unmanned vehicles
- Mobile robots
- Global navigation satellites
- Quality control
- Precision agriculture
- Biotechnical processes
- Bio-medical engineering
- Genomics
- Environment control
- Profitability optimization
- Humancentered automation
- Socio-technical design

Rolf Isermann
IFAC-Vicepresident, Chair of the
Technical Board 1999 - 2002

About the New IFAC Journals

Last year the IFAC Council approved the adoption of the *Journal of Process Control* and *Engineering Applications of Artificial Intelligence* as new IFAC Journals. We are pleased to introduce these two journals and provide some information about their scopes. More details may be found by following the links shown below.

In common with all other Elsevier journals, the IFAC Journals are available on-line through Science Direct (www.sciencedirect.com). Science Direct is the world's largest collection of online journals, and has a community of over 9 million users. Authors in IFAC Journals are thus assured of maximum exposure for their papers, helping to increase readership and improve the dissemination of IFAC's publications.

Journal of Process Control

<http://www.elsevier.com/locate/jprocont>

Journal of Process Control (JPC) covers the application of control theory, process operation including process monitoring, the integration of process design and control, process modelling and simulation, applied statistics and optimization, hardware and soft sensors, and computer science to the solution of process control problems. Papers on theory in these areas are also strongly encouraged, provided that the theoretical contribution is aimed at process control applications. The main point of intersection of the Journal with IFAC involves the activities of the Technical Committee on Chemical Process Control (7a). In addition the Journal publishes papers within the scopes of the Technical Committees on Metals, Mining and Minerals (7b), Biotechnological Processes (7e), and SAFEPROCESS (7e). In recent years the Journal has published special issues with papers from Area 7a presented at its ADCHEM and DYCOPS Symposia, and the sessions it has developed for the IFAC World Congress. The ADCHEM and DYCOPS Symposia are held on a regular three-year rotating basis.

In today's economic environment process control has been embraced by industry in order to achieve its objectives. The use of techniques such as model based control, multivariate statistical control, process simulation, etc. is increasing with time. Since JPC covers these subjects their growing importance provides a sound foundation for the growth of the Journal as well. Over the years the quality of the papers published by the Journal has increased, as evidenced by its high impact factor and its recognition within both academia and industry. Thus, the Journal is on an excellent trajectory for future development and recognition. The formal adoption as an IFAC Journal will certainly contribute to this process.

Based on their region, authors are requested to submit their original manuscript to one of the following Editors: P.L. Lee, Curtin University of Technology, GPO Box U1987, Perth, WA 6845, Australia (Asia/Australasia); N.L. Ricker, University of Washington, Box 351750, Seattle, WA 98195-1750, USA (the Americas); W. Marquardt, Lehrstuhl für Prozesstechnik, RWTH Aachen, Turmstrasse 46, 52054 Aachen, Germany (Europe/Africa/Middle East). All contributions are read by two or more referees to ensure both accuracy and relevance, and revisions to the script may be required. When a manuscript is returned for revision prior to final acceptance, it must be returned within four months. Otherwise it will be considered as a new submission.

Tom McAvoy
Editor-in-Chief

Engineering Applications of Artificial Intelligence

<http://www.elsevier.com/locate/engappai>

The international scientific journal *Engineering Applications of Artificial Intelligence* (EAAI) was launched in 1988, and is at the moment in its 15th volume. The journal was initially directed from the University of Wales Swansea, with Mike Rodd as Editor-in-Chief. Mike was succeeded in 1992 by Leo Mötus, who was Editor-in-Chief from 1992–1999, in which period the Journal became an IFAC Affiliated Journal, linked to the TC on Artificial Intelligence in Real-Time Control (AIRTC). Since this time, a lot of papers first presented at IFAC events, reworked into full journal papers, have appeared in EAAI. The Journal joined Elsevier Science in 1993. Rob Vingerhoeds took over as Editor-in-Chief in 1999, being at the time also Chairman of the IFAC TC AIRTC. The link with IFAC has been very successful and in 2001, IFAC and Elsevier decided to move EAAI from the affiliated status to a full IFAC Journal.

Engineering Applications of Artificial Intelligence aims at addressing the application of artificial intelligence (AI) techniques by the practising engineer to solve a whole range of hitherto intractable problems. It should be noted that the application domain does not restrict itself to control engineering. Indeed, the journal provides an international forum for the rapid publication of work describing the practical application of AI methods in all branches of engineering, as well as some more theoretical aspects that contribute to practical applications of AI. Examples of "non-control" oriented publications in EAAI are numerous, including such areas as design, planning, medical applications, and so on.

Focal points of *Engineering Applications of Artificial Intelligence* are:

- Applications of real-time intelligent automation, and associated supporting methodologies and techniques.
- Architectures, algorithms and techniques for distributed AI systems.
- Decision-support systems.
- Aspects of reasoning techniques.
- Chaos theory and fractals.
- Aspects of knowledge elicitation and processing
- Aspects of perception
- Aspects of software engineering for software and hardware architectures for the real-time use of AI techniques, safety and reliability.
- Fault detection, analysis and diagnostics.
- Industrial experiences in the application of the above techniques.

EAAI's new status within IFAC is not intended to bring major changes to the Journal and its Aims and Scope. It merely brings even stronger support from IFAC for what the Journal has been after since its launch; detailed expositions of new research or applications, discussions of new technical concepts or developments, or new applications of existing techniques, case studies, discussions on the experience gained and lessons learnt from using or developing AI systems for engineering applications.

Volume 15, the first as a full IFAC Journal, promises to be an exciting one. The Journal has recently introduced electronic submission of papers (reducing the time taken for communication between editors and authors), and is available online via ScienceDirect. We are confident that these changes will add to the success of the Journal.

Rob Vingerhoeds
Editor-in-Chief

IFAC Awards Program



PRESENTATION OF AWARDS

XVth IFAC WORLD CONGRESS

BARCELONA, SPAIN

21 – 26 July, 2002

OPENING CEREMONY

LICEU DE BARCELONA

IFAC Awards

Presented every three years at the IFAC World Congress

- Giorgio Quazza Medal

This is an IFAC award, established in 1979, to a distinguished control engineer. The spirit is captured by Giorgio Quazza, a leading Italian electrical and control engineer who served IFAC in many capacities in a most distinguished manner.

- Nathaniel B. Nichols Medal

This is an IFAC award, established in 1996, that recognizes industrial leadership, outstanding contributions of an individual to design methods, software tools and instrumentation, or significant projects in major applications and advancement of control engineering. The spirit is captured by the name of Nathaniel B. Nichols, one of the pioneers of control engineering.

- Industrial Achievement Award

This is a new IFAC award, established in 2001, to an individual, or a team of individuals, who has made a significant contribution to industrial applications of control.

- Control Engineering Textbook Prize, Awarded in Honour of Harold Chestnut, First President of IFAC

The Prize goes to author(s) of that control engineering textbook judged to have most contributed to the education of control engineers.

- Automatica Paper Prizes

Given to authors of excellent papers on Surveys, Theory and Applications published in Automatica, funded by Elsevier.

- Control Engineering Practice Paper Prizes

Given to authors of excellent papers published in CEP, funded by Elsevier.

- IFAC Congress Applications Paper Prize

Awarded to the best application paper presented at each IFAC World Congress. Presented at the Congress Closing Session.

- IFAC Congress Young Author Prize.

Awarded to the best paper of an author(s) younger than 35 years, presented at each IFAC World Congress. Presented at the Congress Closing Session.

- IFAC Congress Poster Paper Prize.

Awarded to the best poster paper and its presentation at each IFAC World Congress. Funded by the Congress NOC and presented at the Congress Closing Session.

- IFAC Outstanding Service Award

This award is presented to IFAC officials who have served and contributed substantially to IFAC in various capacities. Presented at a Pre-Congress IFAC meeting.

Automatica Paper Prizes

Set Invariance in Control by F. Blanchini

This paper successfully surveys the positive invariant set and its applications to wide variety of control problems including Lyapunov function and constrained control.

Randomized Algorithms for Robust Controller Synthesis Using Statistical Learning Theory by M. Vidyasagar

This paper presents the statistical learning theory and new results of its use for randomized controller design.

Nonlinear Passive Weather Optimal Positioning Control (WOPC) System for Ships and Rigs: Experimental Results by T.I. Fossen

A new concept for marine vessels control is developed, and its use on a ship model is presented

Control Engineering Practice Paper Prizes

Industrial Application of a Nonlinear Model Predictive Control to Polymerization Reactors by H. Seki, M. Ogawa, S. Ooyama, K. Akamatsu, M. Ohshima and W. Yang

Successful use of linear quadratic inequalities to determine setpoint. For trajectories and feedback control in nonlinear predictive control of polymerization reactors

Evaluation H-infinite Controllers on the NRC by A.J. Smerlas, D.J. Walker, I. Postlethwaite, M.E. Strange, J. Howitt, A.W. Gubbles

For Development of a nine degree-of-freedom helicopter model and design of a H-infinity controller resulting in improved results in fly-by-wire experiments

Intelligent Control System of an Industrial Lime Kiln Process by M. Järvensivu, K. Saari, S.-L. Jämsä- Jounela

For reduced energy consumption and decreased emission of an industrial lime kiln process by closed loop control based on a combination of neural networks and fuzzy control

Control Engineering Textbook Prize

Hassan K. Khalil

Nonlinear Systems, 2nd Ed., Prentice Hall 1996

Previous winners were:

1987: G. Goodwin, K.H. Sin
1990: G.F. Franklin, J.D. Powell,
A. Emami-Naeini
1993: K.J. Aström, B. Wittenmark
1996: J.M. Maciejowski
1999: Ch.C. Chandras

Industrial Achievement Award

Development and Establishment Team for Hot Rolling Technology

from

Kawasaki Steel Corporation

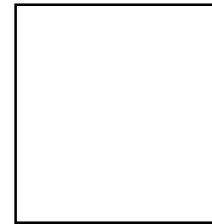
headed by

Yasuo Ichii, Shoji Murayama and Takahiro Yamasaki

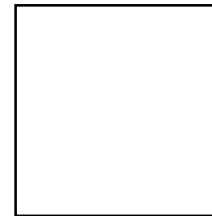
for the project

Application of Advanced Process

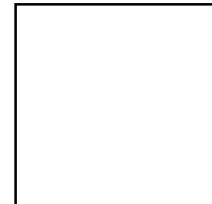
Control Technologies to Endless Hot
Strip Rolling



Yasuo Ichii



Shoji Murayama



Takahiro Yamasaki

Nathaniel B. Nichols Medal

Carl Nett

for contributions to compressor control and creative industrial leadership

Previous winners were:

1996: Jürgen Ackermann
1999: Gunter Stein

Giorgio Quazza Medal

Lennart Ljung

for fundamental contributions to system identification

Previous winners were:

1981: John F. Coales
1984: Yakov Z. Tsyppkin
1987: Karl J. Aström
1990: Petar Kokotovi
1993: Edward J. Davison
1996: Alberto Isidori
1999: Brian D.O. Anderson

PRESENTATION OF AWARDS

XVth IFAC WORLD CONGRESS

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CLOSING CEREMONY

While the winners of the awards presented at the Opening Ceremony are already known at the time when this issue of the Newsletter is printed, the winners of the Congress Awards - the Applications Paper Prize, the Young Author Prize and the Poster Prize will not be known before the Closing Ceremony of the Congress - too late to be published here. The reason is that the winner of the award is determined from among a number of finalists, evaluating the paper in the reviewing process before the Congress plus judging the presentation of the paper at the Congress. Thus we can, at this point present, to you the finalists for the Applications Paper Prize and the Young Author Prize. The winners will be announced in the next issue of the IFAC Newsletter. The finalists for the Poster Prize are naturally not yet known - the finalists and winner will be published in the next issue of the Newsletter as well.

IFAC Congress Applications Paper Prize

Finalists

Estimation of Automotive Tire Force Characteristics Using Wheel Velocity by E. Ono, K. Asano, M. Sugai, S. Ito, A. Tanaka, M. Sawada, Y. Yasui

Flatness-based Clutch Control for Automated Manual Transmissions, by J. Horn, J. Bamberger, P. Michau, S. Pindl

Modeling and Control of Keyhole Arc Welding Process, by Y.M. Zhang, Y.C. Liu

Performance Evaluation of an Industrial MPC Controller, by J.P. Gao, K. Akamatsu, Y. Hashimoto, S.L. Shah, B. Huang

A Flight Control System for Aerial Robots: Algorithms and Experiments, by D.H. Shim, H. Jin Kim, S. Sastry

IFAC Congress Young Author Prize Finalists

Stabilization by Quantized State or Output Feedback: A Hybrid Control Approach, by D. Liberzon

Variance Aspects of L₂-model Reduction when Undermodeling - the Output Error Case, by F. Tjarnström

Partial Stabilization of a Rigid Body with Several Elastic Beams, by Alexander Zuyev

IFAC Advisors

At the time of the Congress, the IFAC President has the privilege to appoint Advisors of IFAC. The list of IFAC Advisors reads like a "Who is Who" in IFAC and the Advisors' opinion is frequently sought.

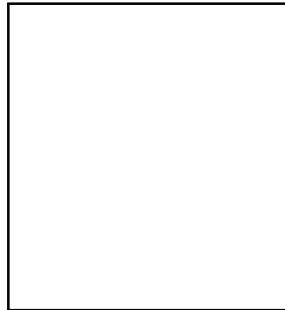
At the Closing Ceremony of the Congress, Prof. Pedro Albertos, the Outgoing President appointed the following two persons Advisors of IFAC

Rolf Isermann



for outstanding contributions in leading IFAC's technical activities into the new millennium

Walter Schaufelberger

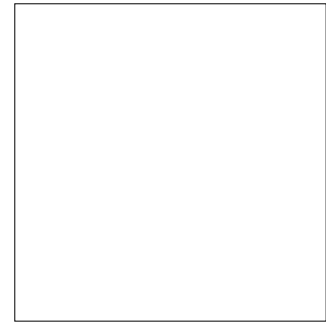


for outstanding contributions in keeping IFAC's finances in excellent shape

Previously appointed Advisors are:

Brian D.O. Anderson
Jiri Benes
Janos Gertler
Stephen Kahne
Lennart Ljung
Mohamed Mansour
William E. Miller
Yoshikazu Sawaragi
Manfred Thoma
Tibor Vámos

Hassan K. Khalil
Winner of the
Control Engineering Textbook Prize
in Honor of Harold Chestnut
First President of IFAC



Hassan K. Khalil received the B.S. and M.S. degrees from Cairo University, Cairo, Egypt, and the Ph.D. degree from the University of Illinois, Urbana-Champaign, in 1973, 1975, and 1978, respectively, all in Electrical Engineering.

Since 1978, he has been with Michigan State University, East Lansing, where he is currently Professor of Electrical and Computer Engineering. He has consulted for General Motors and Delco Products.

He has published several papers on singular perturbation methods, decentralized control, robustness, nonlinear control, and adaptive control. He is author of the book *Nonlinear Systems* (Macmillan, 1992; Prentice Hall, 1996 and 2002), coauthor, with P. Kokotovic and J. O'Reilly, of the book *Singular Perturbation Methods in Control: Analysis and Design* (Academic Press, 1986; SIAM 1999), and coeditor, with P. Kokotovic, of the book *Singular Perturbation in Systems and Control* (IEEE Press, 1986). He was the recipient of the 1983 Michigan State University Teacher Scholar Award, the 1989 George S. Axelby Outstanding Paper Award of the IEEE Transactions on Automatic Control, the 1994 Michigan State University Withrow Distinguished Scholar Award, the 1995 Michigan State University Distinguished Faculty Award, the 2000 American Automatic Control Council Ragazzini Education Award, and the 2002 IFAC Control Engineering Textbook Prize. He has been an IEEE Fellow since 1989.

Dr. Khalil served as Associate Editor of IEEE Transactions on Automatic Control, 1984 - 1985; Registration Chairman of the IEEE-CDC Conference, 1984; Finance Chairman of the 1987 American Control Conference (ACC); Program Chairman of the 1988 ACC; General Chair of the 1994 ACC; Associate Editor of Automatica, 1992-1999, and Action Editor of Neural Networks, 1998-1999. He is currently serving as Editor of Automatica for nonlinear systems and control, and member of the IEEE-CSS Board of Governors

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