



IFAC Newsletter Issue 5, 2001

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IFAC Technical Committees and their Scopes

In our introduction of TCs and their scopes, we present the Coordinating Committee on Systems Engineering and Management

Coordinating Committee on Industrial Applications

Chair:



**T. McAvoy
USA**

mcavoy@eng.umd.edu

Technical Committee on Chemical Process Control

Chair :



C. Georgakis (USA)

c.georgakis@pmc.lehigh.edu

Scope:

Focuses on development of new chemical control techniques and algorithms for application in pilot and industrial sized plants. Processes of interest include all techniques used in petroleum, chemical, petrochemical, speciality chemical, pharmaceutical, food, cement, and paper & pulp industries. Considers system descriptions, component selection, sensors, and actuators as well as tuning, local control, plant-wide control, and technology transfer.

Technical Committee on Mining, Mineral and Metal Processing

Chair :



S.L. Jämsä-Jounela (Finland)

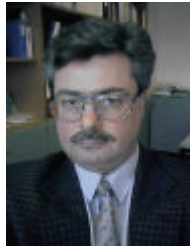
sirkka-1@hut.fi

Scope:

Fosters all aspects of process control in the fields of mining, mineral processing and metal processing. Includes control theory, measurements, automation, and optimization. Includes process goals, loop design, multiple control objectives, variability minimization, uniformity control, and process design. Also addresses exploration for fossil materials, but excludes petroleum refining.

Technical Committee on Power Plants and Power Systems

Chair :



H.W. Weber (Germany)

hw@e-technik.uni-rostock.de

Scope:

Addresses all aspects of modelling, operation, and control of power plants and power systems. Includes load forecast and flow calculation, dynamic interactions of power plants and power systems, constraint and security control concepts, tools for control system design, test and documentation, real time simulation & dispatching, technical impact of deregulation on power system control, and security monitoring as well as analysis and control in deregulated power systems.

Technical Committee on Control of Biotechnological Processes

Chair :



M. Perrier (Canada)

Michel.Perrier@urcpc.polymtl.ca

Scope:

Promotes control engineering research and applications in biotechnology. Includes cell internal metabolic conversion modelling, process supervision, diagnosis, operation, optimisation, and control of biotechnological production plants. Micro-organisms, animal and plant cells, tissue culture, up- and down-stream processing. Also considers wastewater treatment plants and other processes related to environmental engineering, sanitation control, and hygiene control.

Technical Committee on Fault Detection, Supervision and Safety of Technical Processes - SAFEPROCESS

Chair :



R.J. Patton, UK
r.j.patton@eng.hull.ac.uk

Scope:

Promotes on-line fault detection and isolation (FDI); fault diagnosis, predictive maintenance, supervision and fault-tolerant control using redundancy methods. FDI using observers, Kalman and fault detection filters, parity space, parameter estimation, statistical process monitoring; robustness issues. Qualitative modelling/reasoning. Soft computing and evolutionary programming/genetic algorithm designs for FDI. Fault-tolerance planning; FMEA and severity analysis. Joint estimation/control, reconfiguration issues; fault tolerance.

IFAC Professional Briefs

Late 2000, IFAC TC Chairs were invited by Peter Fleming, Chair of IFAC Publication Committee, to suggest a list of topics and associated contributors for IFAC Professional Briefs. These Professional Briefs would aim at a readership of general professional control engineers (industrial and academic), rather than specialist researchers. Topics would, typically, provide an introduction and overview of a “hot topic”, illustrative results and sketch of the underlying theory, with special attention given to providing information sources such as useful internet sites, books, papers, etc. As a result, eight titles have been selected to launch the Professional Briefs series:

- Computer Controlled Systems
- PID Auto-Tuning
- Control of Biotechnological Processes
- Control Buses and Standards
- Physical-Based Modelling of Mechatronic Systems
- Genetic Algorithms in Control Systems Engineering
- Low Cost Automation in Manufacturing
- Engineering Dependable Industrial Real-Time Software

The development of the Professional Briefs series was discussed by IFAC Council at its meeting in Arlington, VA, USA, during the 2001 American Control Conference. The Council is planning for the first Briefs in the series to be produced for access via the IFAC Website and launched at the World Congress in Barcelona, July 2002. It was also decided to establish a Task Force acting as an Editorial Board for the Professional Briefs, with P. Albertos, J. Bokor, A. Crespo, P. Fleming, A. Haddad, R. Isermann, J. Park, and M. Zaremba as Chair. The purpose of the Task Force is to monitor the development of the project, evaluate and approve the first set of proposals to be included before the XVth IFAC Congress and review the content of the contributions to be posted on the IFAC Webpage.

Since the Professional Briefs series will be an on-going IFAC effort to reach out to control professionals, prospective authors are strongly encouraged to submit their proposals for contributions on other potential Professional Brief titles. These proposals should be emailed to Prof. Marek Zaremba (zaremba@uqah.quebec.ca).

Peter Fleming and Marek Zaremba

In Memoriam – Harold Chestnut



It is with great sadness that we have learned of the passing of Harold Chestnut, one of the founding fathers of IFAC and its first President from 1964 – 1966. Much could and will be said about his life as a scientist, his participation in many IFAC activities and others throughout his lifetime. A full obituary will be published in the next IFAC Newsletter. At this point, we will hear the voice of Steve Kahne, former IFAC President, who spoke to the family and friends of Harold Chestnut as follows:

Hal's Second Family

There is a group of people present in spirit in this place today. They are all friends of Hal and most of them have known him for almost 50 years. Their name is IFAC, the people of the International Federation of Automatic Control. There is Boris in Tallinn, Tibor in Budapest, Yoshikazu in Kyoto, Gabriel in Barcelona, Bill in California, Jonas in Buenos Aires, Manfred in Hannover, Juri in Prague, John in Surry, Steve in Prescott, Antti in Helsinki, Mogens in Lyngby, Naude in Johannesburg, and hundreds more. They all know each other because Hal and his colleagues in 1956 had a vision – a vision for a world-wide community of like-minded people, devoted to their profession of control systems and dedicated to creating a network of leaders in that profession.

IFAC formed in 1957 and elected Hal as its first president. The IFAC family is Hal's second family. The current president is the 16th and only 7 others are still with us. Hal has now joined the first 8 in death. In a successful professional society the first President often holds a special place for its members. This was never more true than in IFAC. Even though Hal went on to be President of the IEEE (a professional society of electrical and computer engineers presently including 350,000 members) and to be elected to the National Academy of Engineering, IFAC and its network of colleagues always was his second family.

Much has been written about IFAC and much will be written in the future, but Hal's initiative in its creation and his decades-long influence in its activities represents a unique contribution to international scientific cooperation that has been so important for world stability in the last half of the twentieth century.

Now his work is done and we will miss him.

Stephen Kahne
14th President of IFAC
Prescott, AZ. September 2001.

Recipient of Giorgio Quazza Medal and Nathaniel B. Nichols Medal in 2002

Lennart Ljung



**Recipient of the
Giorgio Quazza Medal in 2002**

Carl Nett



**Recipient of the
Nathaniel B. Nichols Medal in 2002**

Every three years at each triennial IFAC Congress, the Giorgio Quazza Medal and the Nathaniel B. Nichols Medals are awarded.

The GIORGIO QUAZZA MEDAL was created in 1979. It is an IFAC award to a distinguished control engineer as a memorial to the late Giorgio Quazza, a leading Italian electrical and control engineer who served IFAC in many capacities in a most distinguished manner. The medal is presented by the President at each IFAC Triennial Congress at the Opening Ceremony. A prize is presented to the recipient together with the medal.

The NATHANIEL B. NICHOLS MEDAL was created in 1996. It is an IFAC award 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 medal is presented by the President at each IFAC Triennial Congress at the Opening Ceremony. A prize is presented to the recipient together with the medal.

At its recent meeting, held in June this year in Arlington, VA, USA, the IFAC Council voted on who would be the winners of the prestigious Quazza and Nichols Medals at the IFAC World Congress in Barcelona, Spain in 2002.

The Council decided to publish the Winners of the above Awards well in advance.

The IFAC Council voted for **Professor Lennart Ljung** to be the winner of the 2002 Quazza Medal with the following citation:

The Quazza Medal 2002 is awarded to Professor Lennart Ljung

**for fundamental contributions
to system identification.**

The IFAC Council voted for **Dr. Carl Nett** to be the winner of the 2002 Nichols Medal.

The Nichols Medal 2002 is awarded to Dr. Carl Nett

for contributions to combustion control and creative industrial leadership.

The awards will be presented to the winners in the framework of the opening ceremony of the 15th IFAC World Congress in Barcelona, Spain, Sunday, 21 July 2002.

It is our great pleasure to congratulate both winners most cordially here in the IFAC Newsletter.

Below follow the biographies of Professor Lennart Ljung and Dr. Carl Nett.

Professor Lennart Ljung – Recipient of the Giorgio Quazza Medal in 2002

Lennart Ljung was born in Malmo, Sweden in 1946. He received the B.A. degree in Russian and Mathematics, the M.S. degree in Engineering Physics, and the Ph.D. degree in Automatic Control in 1967, 1970 and 1970, respectively, from Lund University in Sweden. Since 1976, he has been a professor of Automatic Control at Linköping University in Sweden. He has spent the academic years 1980-81 at the Information Systems Laboratory at Stanford and the academic years 1985-86 at the Laboratory for Information and Decision Systems at MIT.

His main research interests are in system identification and related areas. His scientific work includes consistency analysis, identification in closed loop, convergence of recursive identification methods, tracking of time-varying systems, a unified view of many identification concepts, frequency domain interpretations, validation and many other topics. He is the author of 10 books, more than 100 journal publications and more than 200 papers on conference proceedings. An important aspect of the work is that it has clarified many of the basic issues of identification and in that way contributed to the understanding of the subject.

Lennart Ljung has worked actively to promote the practical use of system identification. This work involves several widely used text books. His “System Identification: Theory for the user” has around 1000 citations in the Science Citation Index. His work also includes the System Identification Toolbox for Matlab. The existence of the toolbox has had a deep impact on the use of identification in practical industrial work. Lennart Ljung has promoted the use of identification through many courses for industrial users and many cooperation projects with industry. Another important contribution is his promotion of identification (and control theory in general) in the basic courses in the engineering curriculum.

He has served IFAC in many capacities and was chairman of IFAC’s Technical Board and Vice-President of IFAC during 1987 -1993. He is and has been on the editorial board of several journals. He is a member of the Royal Swedish Academy of Sciences. He received honorary doctor degrees from the Baltic State Technical University, St. Petersburg, Russia, in 1996 and from Uppsala University, Uppsala, Sweden, in 1998. He received the IEEE Control System Society Outstanding Paper Award in 1979, the Automatica Prize Paper twice in 1981 and 1993, the College of Electrical Engineers’ Gold Plaque from The Institute of Engineers of Australia in 1993 and the Chester Carlson Research Prize, awarded by the Royal Swedish Academy of Engineering Sciences, in 1996.

Dr. Carl Nett – Recipient of the Nathaniel B. Nichols Medal in 2002

Carl N. Nett was born in Syracuse, New York, on January 24, 1960. He received the B.S. degree in Physics, magna cum laude, in 1982, and the M.S. and Ph.D. degrees in Electrical Engineering, in 1984 and 1985, respectively, from Rensselaer Polytechnic Institute, Troy, New York.

From 1985-89, Dr. Nett was a member of the technical staff in the Control Systems Laboratory of the GE Corporate Research and Development Center, Schenectady, New York. From 1986-89, he also held an appointment as an Adjunct Assistant Professor in the Department of Electrical, Computer, and Systems Engineering at Rensselaer Polytechnic Institute. From 1989-1993, he was a member of the faculty in the School of Aerospace Engineering at the Georgia Institute of Technology, Atlanta, Georgia, where he held the rank of Associate Professor, and additionally served as the director of the Laboratory for Identification and Control of Complex Highly Uncertain Systems, which he founded in 1989. In 1993, he joined the United Technologies Research Center (UTRC), in East Hartford, Connecticut, where he held the positions of Director, Dynamic Systems and Controls, and UTRC / Pratt & Whitney Joint Program Manager, Compression Systems. In these positions he was responsible for UTRC programs in reduced-order modeling, nonlinear dynamic analysis, and active / passive control of complex dynamical processes. These programs were primarily focused on applications in unsteady flows, combustion, and structures, in support of United Technologies gas turbine engine (Pratt & Whitney), helicopter (Sikorsky), HVAC (Carrier), elevator (Otis), and automotive (UTC) businesses. In 1996, Dr. Nett joined United Technologies / Pratt & Whitney as Director, Compression Systems Component Center. In this position he was responsible for all technical aspects (design, manufacturing, aftermarket) of compression systems (fans, low pressure compressors, high pressure compressors) across all product lines (commercial aircraft, military aircraft, industrial turbines). In 1999, Dr. Nett assumed the role of General Manager, Compression Systems Module Center at Pratt & Whitney. In this role he was responsible for all engineering and manufacturing aspects of Pratt & Whitney compression systems across all product lines. In 2000, Dr. Nett assumed the role of Director, United Technologies Research Center. In this role he is responsible for all operational aspects of the Research Center, spanning Components, Systems, and Networks.

In 1988 he was awarded the Allen B. Dumont Prize from Rensselaer Polytechnic Institute. In 1987 he was awarded a GE Managerial Award for his work on jet engine control system design. In 1990 he was selected as a Presidential Young Investigator by the National Science Foundation, and also delivered a keynote address at the 1990 Applications of Multivariable Systems Techniques (AMST) conference. In 1991 he was the recipient of the Donald P. Eckman Award conferred by the American Automatic Control Council. In 1993 he was presented the

Best Paper Award by the Aircraft Engine Committee of the ASME International Gas Turbine Institute. In 1994 he received an Outstanding Technical Achievement Award from UTRC for his work on active stall control in jet engines. In 1996 he was awarded Outstanding Technical Achievement Award from both Pratt & Whitney and UTRC for his ongoing work on active stall control in jet engines. In 1996 he was also awarded the George Mead Medal, the highest technical award annually conferred by United Technologies Corporation, again for his work on active stall control in jet engines.

Dr. Nett has authored more than 125 technical articles in archive journals, conference proceedings, and books.

Control Engineering Practice Papers from the September 2001 Issue

Control of strip casting process: decentralization and optimal roll force control

K.-S. Hong, J.-G. Kim, M. Tomizuka

Adaptive fuzzy power control for WCDMA mobile radio systems

T. Frantti, P. Mähönen

Robust controller design for uncertain systems with variable time delay

M. Garcia-Sanz, J.C. Guiltén, J. Ibarrola

Review papers on Automation in Mineral and Metal Processing

Preface

D.G. Hulbert

Reviews

Current and future development in neural computation in steel processing

M. Schlang, B. Lang, T. Poppe, T. Runkler, K. Weinzierl

State of the art in hot rolling process control

R. Takahashi

State of the art and challenges in mineral processing control

D. Houdoin, S.L. Jämsä-Jounela, M.T. Carvalho, L. Bergh

State of the art in copper hydrometallurgic process control

L.G. Bergh, S.L. Jämsä-Jounela, D. Houdoin

A contemplative stance on the automation of continuous casting in steel processing

I.K. Craig, F.R. Camisani-Calzolari, P.C. Pistorius

Current status and future trends in the automation of mineral and metal processing

S.L. Jämsä-Jounela

Automatica Papers from the November 2001 Issue

Papers

Direct controller order reduction by identification in closed loop

I.D. Landau, A. Karimi, A. Constantinescu

Filtering, predictive, and smoothing Cramer-Rao bounds for discrete-time nonlinear dynamic systems

M. Simandl, J. Kralovec, P. Tichavsky

An integral constraint for single input two output feedback systems

A.R. Woodyatt, J.S. Freudenberg, R.H. Middleton

Least squares estimation techniques for position tracking of radioactive sources

J.W. Howse, L.O. Ticknor, K.R. Muske

Stabilization of distributed systems using irreversible thermodynamics

A.A. Alonso, B.E. Ydstie

Optimal control of a class of discrete-continuous non-linear systems-decomposition and hierarchical structure

P.D. Roberts, V.M. Becerra

Brief Papers

- Transfer equivalence and realization of nonlinear higher order input-output difference equations
U. Kotta, A.S.I. Zinober, P. Liu
- Monotonicity of the optimal cost in the discrete-time regulator problem and Schur complements
D.J. Clements, H.K. Wimmer
- Detecting period-doubling bifurcation: an approximate monodromy matrix approach
D.W. Berns, J.L. Moiola, G. Chen
- H ∞ controller reduction for nonlinear systems
C.-F. Yung, H.-S. Wang
- An iterative learning control algorithm within prescribed input-output subspace
K. Hamamoto, T. Sugie
- Robust tuning of the speed loop in indirect field oriented control of induction motors
A.S. Bazanella, R. Reginatto
- Nonregular feedback linearization for a class of second-order nonlinear systems
S.S. Ge, Z. Sun, T.H. Lee
- Nonlinear tip-position tracking control of a flexible-link manipulator: theory and experiments
M. Moallem, R.V. Patel, K. Khorasani
- Linear MPC with optimal prioritized infeasibility handling: application, computational issues and stability
J. Vada, O. Slupphaug, T.A. Johansen, B.A. Foss
- Nonlinear control of the Reaction Wheel Pendulum
M.W. Spong, P. Corke, R. Lozano
- A generalization of a standard inequality for Hardy space H^{∞}_1
H. Akcay

Technical Communiques

- Improvement of system order reduction via balancing using the method of singular perturbations
Z. Gajic, M. Lelic
- Impulse observability and impulse controllability of linear time-varying singular systems
C.-J. Wang, H.-E. Liao
- Controllability of singular systems with control delay
J. Wei, S. Wenzhong

Book Review

- Control system design, by G.C. Goodwin, S.F. Cura, M.E. Salgado
N.A. Kheir

Papers from the December 2001 Issue

Papers

- State-space analysis and identification for a class of hysteric systems
R. Banning, W.L. de Koning, H.J.M.T.A. Adriaens, R.K. Koops
- A parametrization for closed-loop identification of nonlinear systems based on differentially coprime Kernel representations
F. Kenji, B.D.O. Anderson, F. de Bruyne
- An LMI solution to the robust synthesis problem for multi-rate sampled-data systems
S. Lall, G. Dullerud
- Nonlinear observers: A circle criterion design and robustness analysis
M. Arcak, P. Kokotovic
- A hierarchical optimization neural network for large-scale dynamic systems
Zenbg-Guang Hou
- Hybrid control for global stabilization of the cart-pendulum system
Jun Zhao, M.W. Spong
- Adaptive backstepping with a high-order tuner
V.O. Nikiforov, K. V. Voronov

Brief Papers

- Trading robustness with optimality in nonlinear control
A. Astolfi, P. Colaneri
- Comparison of nonlinear control design techniques on a model of the Caltech ducted fan
J. Yu, A. Jadbaie, J. Aimbis, Y. Huang

An LMI approach to the design of a robust observer with application to a temperature control problem for space vehicle testing

M. Mattei

Simultaneously stabilizing controller design for a class of MIMO systems

A.N. Gündec, M.G. Kabuli

Robust multivariable PID control for linear parameter varying systems

M. Mattei

Subspace identification using instrumental variable techniques

T. Gustafsson

On the design of ILC algorithms using optimization

S. Gunnarsson, M. Norrlöf

Sensor scheduling in continuous time

H.W.J. Lee, K.L. Teo, A.E.B. Lim

PI stabilization of first-order systems with time delay

G.J. Silva, A. Datta, S.P. Bhattacharyya

Nonlinear stabilization of a thermal convection loop by state feedback

D.M. Boskovic, M. Krstic

Single-loop controller design via IMC principles

Qing-Guo Wang, C.C. Hang, X.-P. Yang

Identification and control of open-loop unstable processes by relay

G. Marchetti, C. Scali, D.R. Levin

Misfit versus latency

P. Lemmerling, B. de Moor

Technical Communiques

Extensions to "Output prediction under scarce data operation: Control applications"

R. Wallin, A.J. Isaksson, O. Norens

Bounds on the response time under control constraints

S.T. Glad, A.J. Isaksson

Book Reviews

Space vehicle dynamics and control, by B. Wie

N.H. Mcclamroch

Nonlinear control systems – an algebraic setting, by G. Conte, C.H. Moog, A.M. Perdon

A. Bacciotti

WHO IS WHO IN IFAC



Prof. Thomas McAvoy
Member of the Technical Board

Thomas J. McAvoy received his B.S. in Chemical Engineering from Brooklyn Polytechnic Institute in 1961. He received his M.S. and Ph. D. degrees also in Chemical Engineering from Princeton University in 1963 and 1964 respectively. In 1964 he joined the Department of Chemical Engineering at the University of Massachusetts as

an Assistant Professor. He became a Professor in 1974 and then in 1980 he moved to the University of Maryland.

He currently is a Professor at Maryland with a joint appointment in the Department of Chemical Engineering and the Institute for Systems Research.

Dr. McAvoy's research has focused on process control. Over the past 37 years, he has studied control system operability, distillation control, the integration of process design and control, multivariate statistical methods and A.I. applications including neural networks. In 1983, he drew together results on a key operability index, the relative gain array and published a monograph dealing with this important subject. Afterwards, he and his students developed a new operability index, the relative disturbance gain, which accounts for the effect of process disturbances on control system performance.

Recently, Dr. McAvoy has broadened his research focus to include: plantwide control design, chemical microsensors, waste water modeling/control and fault detection. Plantwide control design involves the issues of which variables should be measured, controlled, and manipulated in a chemical plant, and how these variables should be linked together. Chemical microsensors have the potential to be used cost effectively for many applications including environmental monitoring, detection of hazardous conditions, process control, medical diagnosis, and control of automobile emissions, and as a result they can be of enormous benefit to society. Finally, one current research project involves combining data based and model based approaches to fault detection. Over the years Dr. McAvoy has published over 160 research articles.

Dr. McAvoy began his affiliation with IFAC at the 1981 World Congress in Kyoto. He has held the positions of Vice-Chair and Chair of the Technical Committee on Chemical Process Control. In 1996 he became the Chair of Coordinating Committee on Industrial Applications and a member of IFAC's Technical Board. He is Editor in Chief of the Journal of Process Control and he has served on the Editorial Boards of I&EC Research, Automatica, and Instrumentation Technology. He has also served as the Chair of AIChE's Area 10B and as AIChE's representative to the American Automatic Control Council which is the American NMO within IFAC.