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**This Newsletter may be re-
produced in whole or in part.
We encourage reprinting
in national and local auto-
matic control periodicals.
Acknowledgement to IFAC
would be appreciated.**

New IFAC Titles from Pergamon (An Imprint of Elsevier Science)

Intelligent Manufacturing Systems 1994

A Postprint Volume of the IFAC Workshop
Vienna, Austria, 13 - 15 June, 1994
Edited by P. Kopacek, Institute for Handling Devices
and Robotics, Vienna, Austria

During the last five years, intelligence techniques
have been increasingly employed in production
automation; giving rise to a new generation of
Intelligent Manufacturing Systems or IMS. The
concept of IMS is of vital importance to the 'factory
of the future' which will be mainly computer-
controlled, and this publication brings together the
latest research in key areas, such as: Manufacturing
systems operations, processes and planning,
concurrent engineering, simulation and fault
detection, in a way which will appeal to practitioners
in both academia and industry.

*Audience: Manufacturing engineers, control
engineers, systems managers and engineers,
production engineers and industrial engineers.*

© 1994 543 pages
ISBN 0-08-042235-7 Paperback
Publication: December 1994
Price: £ 57.00 (US\$ 91.00)

Computer Software Structures Integrating AI/KBS Systems in Process Control

A Postprint Volume of the IFAC Workshop
Lund, Sweden, 10 - 12 August, 1994
Edited by K.E. Arzen, Lund Institute of Technology,
Department of Automatic Control, Lund, Sweden

The past few years have seen rapid developments in
computer technology; giving rise to a range of
system control options which can be applied in the
process industries. These include: Open systems,
expert systems, neural networks, fuzzy systems
and object-oriented systems, all of which are covered
in this key volume which provides an invaluable
summary of the latest international research in this
area.

*Audience: For engineers in the process industries,
academics specializing in the control aspects.*

© 1994 232 pages
ISBN 0-08-042360-4 Paperback
Publication: November 1994
Price: £ 45.00 (US\$ 72.00)

Advances in Control Education 1994

A Postprint Volume of the IFAC Symposium
Tokyo, Japan, 1 - 2 August, 1994
Edited by A. Ichikawa, National Institute of
Environmental Studies, Ibaragi, Japan

The implementation of effective control systems
can help to achieve a wide range of benefits, not
least in terms of real cost savings. Education plays
a vital role in ensuring continued success, and its
importance is well recognized by IFAC with a
specifically designated Technical Committee in
this area. This invaluable publication brings together
the results of international research and experience

in the latest control education techniques, as
presented at the most recent symposium. Informa-
tion on course curricula is presented, as well as
teachware, including software and laboratory
experimental apparatus.

*Audience: For academics with a teaching interest
in control technology and applications*

© 1994 316 pages
ISBN 0-08-042230-6 Paperback
Publication: December 1994
Price: £48.00 (US\$ 77.00)

Advanced Control of Chemical Processes 1994

A Postprint Volume of the IFAC Symposium
Kyoto, Japan, 25 - 27 May, 1994
Edited by D. Bonvin, Ecole Polytechnique Fédérale
de Lausanne, Institute d'Automatique, Lausanne,
Switzerland

This publication brings together the latest research
findings in the key area of chemical process control,
including dynamic modelling and simulation -
modelling and model validation for application in
linear and nonlinear model-based control; nonlinear
model-based predictive control and optimization -
to facilitate constrained real-time optimization of
chemical processes; statistical control techniques
- major developments in the statistical interpretation
of measured data to guide future research;
knowledge-based v. model-based control - the
integration of theoretical aspects of control and
optimization theory with more recent developments
in artificial intelligence and computer science.

*Audience: For process control engineers,
academics specializing in the control aspects of
process engineering, regulatory bodies, government
laboratories.*

© 1994 558 pages
ISBN 0-08-042229-2 Paperback
Publication: December 1994
Price: £ 48.00 (US\$ 77.00)

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News From Sister Organizations

**IFORS 96 – 14th Triennial Conference
Vancouver, B.C. Canada, July 8 – 12, 1996**

Call for Papers

The 1996 International Federation of Operational Research Societies conference will be held in Vancouver, located in the province of British Columbia in the Southern corner of the west coast of Canada. Vancouver is a popular tourist destination and is known for its natural beauty. July is typically one of the most popular times to visit this region of Canada. In addition, the IFORS Congress can be easily reached by all those who attend the **13th IFAC World Congress in San Francisco from 30 June to 5 July, 1996.**

Theme: OR Bridging the Theory and Practice of Decision Making

The theme of the 14th Triennial World Conference on Operations Research is to provide a bridge to link the researchers and practitioners in OR, in

order to better support the challenges facing the global village in which we all live as we approach the 21st century.

For further information on all details of abstract submission, Call for Papers, IFORS-OR in Development Prize, contact

**Venue West Conference Services Limited
645-375 Water Street
Vancouver, British Columbia, Canada V6B 5C6**

**Telephone: +1(604)681-5226
Fax: +1(604)681-2503**

Deadline for submission of abstracts is
October 31st, 1995

New IFIP Secretariat Officially Inaugurated

On July 6, 1995, the new premises of the IFIP Secretariat in Laxenburg, Austria, were officially opened by Dr. Rudolf Scholten, the Austrian Federal Minister of Science, Research and Arts. In the framework of the inaugural ceremony, addresses were also given by other official representatives of Austria, i.e. a representative of Lower Austria and the Mayor of Laxenburg. High-ranking persons from IIASA and UNIDO spoke on this occasion. IFAC was represented by its Secretary, Dr. Gusztav Hencsey who warmly welcomed Dr. Plamen Nedkov, the Administrative Manager of the IFIP Secretariat and wished him the best of success. The President of IFIP, Professor Asbjörn Rolstadas, as well as all other speakers stressed the spirit of international scientific cooperation that exists in Laxenburg. IFAC was repeatedly mentioned as one very important example of this spirit. IFAC is proud to say that the way business is conducted in its Laxenburg-based Secretariat, but of course also the support by the Republic of Austria and the Austrian Academy of Sciences, were strong motivations for IFIP to move its Secretariat to Laxenburg.

The inauguration of the IFIP Secretariat was widely covered by the Austrian-, but also the international media. "Die Presse", a national Austrian quality paper writes on the 10th of July: "...Laxenburg won against massive competition from London and New York.. Decisive for this choice seemed to have been a cooperation agreement with Austria,, as well as an agreement with the Austrian Academy of Sciences. In addition, IFIP expects synergies from having its Secretariat in Laxenburg, where already its sister Organization, the International Federation of Automatic Control (IFAC), and the International Institute of Applied Systems Analysis have their offices....."

After the official inaugural ceremony, Professor H. Zemanek gave a lecture on the development of IFIP over the last decades. This was followed by another very interesting lecture on the INTERNET, given by Professor Quirchmayer of the Technical University of Vienna. Also the IFAC Secretariat is following developments in this area with greatest interest and will, among others, ask for the input of Austrian computer scientists to continue providing the most advanced electronic services to the IFAC family. Already at the current time, information on IFAC is available on our information server in Spain, which can be reached via gopher.gopher.eunet.es.



Dr. Rudolf Scholten, Minister of Science, Research and Arts, Prof. Asbjörn Rolstadas, President of IFIP

Computer Applications in Biotechnology (CAB6)

**DECHEMA/IFAC/EFB Conference
Garmisch Partenkirchen, Germany
May 14 – 17, 1995**

The Conference was a continuation of two series of events: The IFAC Symposia on Modelling and Control of Biotechnical Processes and the International Conferences on Computer Applications in Fermentation Technology. As during the preceding conferences, the sponsor was a local one - this time: DECHEMA (Deutsche Gesellschaft für Chemisches Apparatewesen, Chemische Technik und Biotechnologie e.V., Frankfurt a.M.) -, whereas IFAC and EFB (The European Federation of Biotechnology) acted as co-sponsors. The IPC was mainly composed of members of the IFAC TC on Control of Biotechnological Processes and the WP on Measuring and Control in Biotechnology of the EFB. Both committees held their regular meetings during the Conference.

The objective of the Conference was to provide a forum for the exchange of the latest knowledge and new ideas of science and technology in the field of computer applications in biotechnology. The main topics of the scientific programme were

- advanced measuring and bioprocess monitoring techniques;
- strategies and new concepts in process data analysis;
- progress in process modelling and identification;
- advanced (intelligent) control of bioprocesses;
- modelling of cell metabolism and its regulation;
- future trends in computer applications in biotechnology;

These topics provided also the titles of the main sessions, which were entirely organized as plenary sessions. In addition, two poster sessions, accompanied by software demonstrations by participants as well as of commercial products and a final debate were held. The opening address was given by Professor Manfred Thoma, a former President- and now Advisor of IFAC, whose research interests have been closely related to the topics of the conference for many years.

Concerning technology, major progress has recently been made in new sensors and process-related chemical analyzers such as FIA, HPLC, or even NMR. The numerical tools have been extended by fuzzy techniques, neural networks, wavelet functions and (non-linear) principal component analysis, which are applied in modelling as well as in process supervision and quality control. Modelling techniques are currently incorporating more and more biochemical knowledge, which increasingly requires interdisciplinary work by microbiologists and engineers.

Summing up, 35 papers, 41 posters and 8 software demonstrations were presented during the Conference. The refereeing procedure was based on full paper submission, which resulted in a very small number of papers to be rejected; however, it might have led to a somewhat smaller total number of submitted papers.

The event attracted 166 participants from 25 different countries; more than 60 % of the participants came from abroad. This large international participation is an indicator for the worldwide recognition of the importance of this interdisciplinary field. The next conference of this series will be organized in Japan in 1998. A postprint volume will be available from Elsevier Science Ltd in due time.

Karl Schügerl and Axel Munack, IPC Chairmen

Control Engineering Practice Volume 3, Number 8 August 1995

Preview

Application of Four Control Strategies to High-Speed Independent Drive Systems
(R.W. Beaven, L.D. Wilkes, M.T. Wright, S.D. Garvey and M.I. Friswell)
Multi-Input, Multi-Output Identification of a Pilot Plant Climbing Film Evaporator
(B.R. Young and R.M. Allen)
Design of an Active 4WS System with Physical Uncertainties
(L. Gianone, L. Palkovics and J. Bokor)

Papers from the IFAC Symposium on Automatic Control in Aerospace
(Guest Editor: K.R. Lorell)

Preface to the Papers from the IFAC Symposium on Automatic Control in Aerospace (AEROSPACE '94)
(K.R. Lorell)

High Angle of Attack Velocity Vector Rolls
(K.E. Boyum, M. Pachter and C.H. Houpis)
Topological Task Space Modelling for Planning Autonomous Space Robot Actions
(J. Matthiesen)

Development of On-Orbit Predictions for the Middeck Active Control Experiment
(J.P. How and D.W. Miller)

An Optimal Thruster Configuration Design and Evaluation for Quick Step
(H.-P. Jin, P. Wiktor and D.B. DeBra)

Spacecraft Control System for the Relativity Mission

(H. Dougherty, D. Hegel, J. Kirschenbaum, J. Vanden Beukel, W. Reeve and J. Kasdin)
GADACS: A GPS Attitude Determination and Control Experiment on a Spartan Spacecraft
(F.H. Bauer, E.G. Lightsey, J. McCullough, J. O'Donnell and R. Schnurr)

Papers from the 12th IFAC Workshop on Distributed Computer Control Systems
(J.A. de la Puente)

A Distributed Programming Model for a Fault-Tolerant Distributed Real-Time System
(H. Kopetz)

A Simulator for Performance Estimation of Open Distributed Computer Control Systems
(S. Horiike, Y. Okazaki and H. Soeda)

Distributed Industrial Control Systems - A Critical Review Regarding Openness
(T. Rahkonen)

Calculating Controller Area Network (CAN) Message Response Times
(K. Tindell, A. Burns and A.J. Wellings)

Communication Architectures for Distributed Computer Control Systems
(W. Dieterle, H.-D. Kochs and E. Dittmar)

Analysis of the User's Response Time for Mini-Map Systems
(Hong Seong Park, Changhoon Lee and Wook Hyun Kwon)

IFAC Meeting Papers - Keywords Listing

Transportation Systems: Theory and Application of Advanced Technology, August 1994, Tianjin, China, P.R.
Automatic Control in Aerospace, September 1994, Palo Alto, CA, USA

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Book Reviews
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Control Engineering Practice Volume 3, Number 9 September 1995

Preview

Parameter-Robust Flight Control System for a Flexible Aircraft

(F. Kubica, T. Livet, X. Le Tron and A. Bucharies)
Control of an Automated Dispensing Cell with Vision Controlled Feedback

(A. Razban, B.L. Davies, S. Harris and J. Efstathiou)
Step Motor Supply: Minimizing Torque Ripple Induced by Digital Linearization

(J.E. McInroy, R.M. Lofthus and S.A. Schweid)
Intelligent Visual Inspection of Valve-Stem Seals

(D.T. Pham, N.R. Jennings and I. Ross)
Applying System Identification using Commercially Available Software and Hardware

(K.R. Godfrey, A.S. McCormack and J.O. Flower)
Robust Force/Position Control of a Robot Manipulator Using Time-Delay Control

(P.H. Chang, D.S. Kim and K.C. Park)
Developments in Industrial Applications of Self-Tuning Control

(K.J. Burnham, K.J. Disdell, D.J.G. James and C.A. Smith)

Optimal Control of Overhead Cranes
(A.Z. Al-Gami, K.A.F. Moustafa and S.S.A.K. Javeed Nizami)

Identification and Position Control of a Servo Pneumatic Cylinder
(Ming-Chang Shih and Shy-I Tseng)

Power Demand Prediction Using Fuzzy Logic
(A.Al-Anbuky, S. Bataineh and S. Al-Aqtash)

Papers from the IFAC Symposium on Robot Control (SYROCO '94)
(Guest Editor: L. Sciavicco)

Preface to the Papers from the IFAC Symposium on Robot Control (SYROCO '94)
(L. Sciavicco)

Random Exploration Strategy: A New Paradigm in Robotics. A Comparison with Determinist Approaches

(F. Badano, M. Bétemps, R. Clavel, A. Jutard and M. Hongler)

Implementation of Sensor-Based Control Algorithms in an Industrial Robot-Controller
(C. Carozzi, G. Magnani and S. Nicolodi)

Vibration Suppression Control of Spatial Flexible Manipulators
(A. Konno and M. Uchiyama)

Inner-Loop Design and Analysis for Hydraulic Actuators, with an Application to Impedance Control

(J. Heintze and A.J.J. van der Weiden)
Experiments with Flexible Manipulators
(H. Bremer and F. Pfeiffer)

IFAC Meeting Papers - Keyword Listing

Integrated Systems Engineering, September 1994, Baden-Baden, Germany
Artificial Intelligence in Real-Time Control, October 1994, Valencia, Spain

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Scopes of IFAC Technical Committees

In our Newsletter Issue 1/1994 (February), we published the new structure of the Technical Board. This Technical Board now encompasses 46 Technical Committees, grouped into nine Coordinating Committees. In this and in forthcoming Newsletters we shall publish the scopes of some of these Technical Committees to provide information on the great variety of activities that go on within our Federation.

Coordinating Committee on Manufacturing and Instrumentation (Chairman: L. Basanez)

Technical Committee on Manufacturing, Modelling, Management and Control
(Chairman: A. Villa)

Scope: Descriptive and prescriptive formal models of Computer Integrated Manufacturing Systems for simulation and design of management and control strategies, including process and production planning, control, supervision and maintenance.

Technical Committee on Robotics

(Chairman: F. Nicolò)

Scope: Sensor-based robotics for operation in structured and unstructured environments, including robot architecture, elements, modelling, control, task planning and programming, reasoning and learning, mobility and locomotion, and telepresence. Robotics application in industry and other fields.

Technical Committee on Architectures for Enterprise Integration

(Chairman: T.J. Williams)

Scope: Architectural framework, methodology and tools for all phases of use of information-system physical and functional description architectures (type 1) and of project and program architectures for complete enterprise life cycle development and management.

Technical Committee on Components and Instruments

(Chairman: A. Ollero)

Scope: Hardware and software components and instruments for process control, robotics and automation, including perception systems, intelligent devices and controllers and new control technologies to be embedded in intelligent components and instruments.

Technical Committee on Low Cost Automation

(Chairman: J. Paiuk)

Scope: Control strategies and measurement and control devices that could be easily implemented in existing production processes. Analysis of the improvement afforded by low cost automation in productivity, reliability, flexibility and process and systems quality.

Technical Committee on Advanced Manufacturing Technology

(Chairman: M. Zaremba)

Scope: Modern manufacturing systems and processes, including control strategies, performance evaluation and monitoring, CIM, concurrent engineering, information technology for engineering and manufacturing. Issues related to knowledge-based management and control, intelligent manufacturing systems. Novel technologies; factories of the future.

Papers

- Numerical Approximation of the H^∞ Norm for Nonlinear Systems (M.R. James, S. Yuliar)
- Relative/Multiplicative Model Reduction for Unstable and Non-minimum-phase Systems (Kemin Zhou)
- A Novel Approach to the Attitude Control of Axisymmetric Space (P. Tsiotras, M. Corless, J.M. Longuski)
- Sensitivity Integrals for Multivariable Discrete-time Systems (Jie Chen, C.N. Nett)
- The Block Regularised Parameter Estimator and its Parallelisation (J. Kadlec, F.M.F. Gaston, G.W. Irwin)
- Parameter Identification of Induction Motor Drives (Ch. Moons, B.de Moor)
- Two-dimensional Movement Controlled by a Chaotic Neural Network (S.A. Barton)
- Variable Structure Control with a Second-order Sliding Condition: Application to a Steam Generator (H.F. Chiacchiarini, A.C. Desages, J.A. Romagnoli, A. Palazoglu)
- Dual Adaptive Control of Chip Refiner Motor Load (B.J. Allison, J.E. Ciarniello, P.J.J.-C. Tessier, G.A. Dumont)

Brief Paper

- A Velocity Algorithm for the Implementation of Gain-Scheduled Controllers (I. Kaminer, A.M. Pascoal, P.P. Khargonekar, E.E. Coleman)

Technical Communiques

- A Connection Between H^∞ Control and the Absolute Stabilizability of Discrete-time Uncertain Linear Systems (S.O.R. Moheimani, A.V. Savkin, I.R. Petersen)
- A Rational Test for Strong Stabilization (V. Blondel, Ch. Lundvall)
- On the Small- μ Theorem (A.L. Tits, M.K.H. Fan)

Obituary - Patrick C. Parks

Papers

- Bifurcation Control of a Chaotic System (H.O. Wang, E.H. Abed)
- Parameter Identification for Uncertain Plants Using H^∞ Methods (G. Didinsky, Z-G. Pan, T. Basar)
- Self-scheduled H^∞ Control of Linear Parameter-varying Systems: A Design Example (P. Apkarian, P. Gahinet, G. Becker)
- Block Bialternate Sum and Associated Stability Formulae (D. Mustafa, T.N. Davidson)
- Experimental Comparison of Parameter Estimation Methods in Adaptive Robot Control (H. Berghuis, H. Roebbers, H. Nijmeijer)
- Minimax Control under a Bound on the Partial Covariance Sequence of the Disturbance (S.V. Gusev)

Brief Papers

- Global Asymptotic Linearisation of the Pole Placement Map: a Closed-form Solution for the Constant Output Feedback Problem (J. Leventides, N. Karcanias)
- Algorithms for the Computation of the Transfer Function Matrix for Two-dimensional Regular and Singular General State-Space Models (Zou Yun, Yang Chengwu)
- Discrete-time LQG Dynamic Controller Design Using Plant Markov Parameters (K. Furuta, M. Wongsaisuan)
- Optimal Feedback Production Planning in a Stochastic N-machine Flowshop (E. Presman, S. Sethi, Q. Zhang)
- A General and Exact Method for Determining Limit Cycles in Decentralized Relay Systems (Z.J. Palmor, Y. Halevi, T. Efrati)
- A Simple Iterative Learning Controller for Manipulators with Flexible Joints (Danwei Wang)
- On Compensation of Nonminimum-phase Zeros (U. Homberg, P. Myszkowski, Y. Piguët, R. Longchamp)
- A Recording-horizon Regulator for Nonlinear Systems and a Neural Approximation (T. Parisini, R. Zoppoli)

Technical Communiques

- Parallel Computation of the Solutions of Coupled Algebraic Lyapunov Equations (I. Borno)
- Memoryless Stabilization of Uncertain Dynamic Systems with Time-varying Delayed States and Controls (Han Ho Cho, Myung Jin Chung)
- Stability of a Truncated Infinite Constrained Receding Horizon Scheme: The General Discrete Nonlinear Case (M. Alamir, G. Bornard)
- A Necessary and Sufficient Condition of Output Feedback Stabilizability (V. Kucera, C.E. de Souza)

Intelligent Autonomous Vehicles - IAV'95 2nd IFAC Conference

Espoo, Finland, June 12 - 14, 1995

The IAV'95 Espoo Conference was the second one in the series started in Southampton, UK in spring 1993. The area of intelligent autonomous vehicles or robots has turned out lively and extensive both in challenging applications as well as in the source of theoretical development. There are presently several streams in automation technology which bring development in the same direction. Many traditional working machines already long used, e.g. in construction, mining or agriculture, are going through changes to become remotely operated or even autonomous. Technology has made this feasible and machine users like to improve efficiency by making use of advanced computer control systems at the worksite. In another traditional field, the automotive industry has put much effort into developing perception and control systems to make the modern car safer and easier to operate. Autonomous driving under certain conditions is a realistic objective in the near future. The strongest development in robotics is going on in applications outside the traditional manufacturing industry. Service, maintenance, operations in hostile environments, guarding etc. are examples of areas where prototype robots have already been developed. Last but not least, space exploration should be mentioned. Future space programs, such as explorations of the Mars will rely strongly on mobile robots instead of astronauts. All these aspects were treated in the IAV'95 conference with specialists from 22 different countries.

The conference expressed the latest results both in generic methods and technologies for all IAV subsystems as well as specific applications. Sessions were presented on vision and non-vision based perception, route and motion planning, motion control, localization and navigation techniques, and man-machine interfaces. Several types of applications from autonomous road vehicles to off-road working machines were also reported. Developments in mobility and locomotion of robots were considered especially in sessions on walking and climbing machines. The session on multirobot systems provided an interesting new dimension to develop IAV technology in the future. One of the special papers reviewed mobile robots for planetary exploration and another one the development of vision-guided autonomous mobile systems. Altogether 66 contributed papers from 18 countries were presented in 17 sessions.

In connection with the conference, a competition of autonomous intelligent vehicles was organized in Europe for the first time. The motivation behind this idea was initially two-sided. First the organizers wanted to give research groups and development teams, that have put a lot of efforts into practical work, the opportunity to show their results not only on paper but also in practice. Secondly, such an activity was a chance to hold a lively and interesting session out in the open, and was in itself a small exhibition of autonomous vehicles and their current state of development. An award of 40000 Finmark (about 7000 ECU) was announced. After publishing the call for competition, the organizers got a lot of enquiries, 7 preliminary registrations after the deadline, and finally 4 teams from 4 different European countries (Finland, Spain, Sweden, Switzerland) were brave enough to take part in the competition itself. The winner of the competition was determined by the international jury on the basis of the following criteria:

- intelligence
- autonomusness
- reliability
- navigation capability
- usability in real world applications
- safety
- difficulty (how demanding is the performed task)
- innovativeness

The winner was the Finnish team Modulaire. The conference included a small exhibition, and a group of engineers from the St. Petersburg-based space institute Transmash, demonstrated their model vehicles for a Mars exploration. An industrial visit as well as a visit to VTT and to the local laboratories of Helsinki University of Technology were also organized.

The total attendance for the conference was 131 persons from 22 different countries.

Aarne Halme IPC Chairman

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