IFAC International Federation of Automatic Control
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Newsletter

Contents:

Invitation to the
14th IFAC World Congress
Beijing, China, 5 – 9 July, 1999
Call for Papers

It is our great pleasure to invite you to participate in the 14th IFAC World Congress of IFAC to be held in Beijing, China, from July 5 to July 9, 1999. The Beijing Congress, being the last IFAC Congress in the 20th century, will serve as a unique forum for the international control community to review the great impact of automation on the elapsing century and to look forward to its development in the next century.

The Congress provides a spectrum of categories for technical presentations, including plenary lectures, survey papers, regular papers of both lecture and poster session types, panel discussions and case studies. Immediately preceding the formal opening of the Congress, tutorials are being offered (cf. Page 3 of the Newsletter) to provide participants an opportunity to learn new principles, methodologies, technologies and applications that have been developed and/or are developing in recent years.

The Beijing Congress will be the first IFAC Congress to be held in a developing country. As one of the oldest capitals and one of the fastest developing cities in the world, Beijing affords tourist attractions for the participants and their guests.

We look forward to seeing our old and new friends in Beijing in 1999.

Yong-Xiang Lu, NOC Chairman — Han-Fu Chen, IPC Chairman

Congress Dates:

Monday to Friday, July 5 - July 9, 1999
Pre-Congress Tutorials: Saturday to Sunday, July 3 - July 4, 1999

Congress Venue: International Convention Center, Beijing, China, P.R.

Important Dates:

June 15, 1998
Draft paper submission, Invited Sessions and Panel Discussion proposals must reach the IPC Secretariat

November 30, 1998
Notification of acceptance of submissions and proposals for Invited Sessions and Panel Discussion Sessions

February 1, 1999
Deadline for receiving camera-ready manuscripts

The Call for Papers, including the comprehensive information and details on the program as well as the paper submission form was mailed to all IFAC Affiliates by the organizers of the Congress.

Should the Call for Papers not reach you for whatever reason, please request it from the organizers at the address given below.

IFAC'99 IPC Secretariat
Profesor Jifeng Zhang
Institute of Systems Science
Chinese Academy of Sciences
Beijing 100080, P.R. China
e-mail: ifac99@iss03.iss.ac.cn
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IFAC Council- and Related Meetings

Kokura, Kitakyushu, Japan

8 – 11 July, 1997

The Council- and Related Meetings this year were characterized, among others, by the festivities organized to celebrate IFAC's 40th anniversary.

On the evening of the 8th the Anniversary Session gave an overview over the past and present of IFAC, took a look at the future and presented the state-of-the-art in various areas of control engineering. A summary of all the speeches delivered on that occasion was given in the Anniversary Issue of the IFAC Newsletter. Another highlight of the celebrations was a banquet organized by the Japanese hosts of this Council- and Related Meetings. Past President Steve Kahne showed pictures from IFAC's past, bringing back to mind many dear friends and colleagues who have played important roles in the development of the Federation. This shows that IFAC is more than the sum total of all the control engineers who are active in it, but that it is the spirit of friendship and cooperation which ultimately is to be seen as one of the pillars of success. This was also stressed by Advisor and former President, Professor Manfred Thoma.

But of course, work had to be done in addition to all the festivities. Before the Council meeting on the 11th of July, the Technical Board and the Executive Board held their meetings. Another important meeting was the one of the International Program Committee for the IFAC World Congress in Beijing in 1999.

At the Council meeting, IFAC President, Professor Yong-Zai Lu, reported on the developments in IFAC over the last year. One very important feature was that a new contract between IFAC and Elsevier, the IFAC publisher, had been signed. Further he reported on the situation with the IFAC Foundation, informing the Council that two NMOs have formed such Foundations, the Chinese NMO and the Romanian NMO.

The Chairman of the Technical Board, Professor Vladimir Kucera reported that the Coordinating Committees and the Technical Committees were doing excellent work. Considering the number of events which are sponsored by these Committees every year, the problems were minor and easy to solve. Care was nevertheless taken that new developments and trends were being closely monitored so as to be at the cutting edge of technological developments. Two new journals had been recommended for Affiliation. The Chairman of the Technical Board also reported on the IPC meeting of the World Congress in Beijing in 1999. A first information on this Congress is given in this Newsletter on page 1.

The Chairman of the Executive Board, Professor Rolf Isermann reported on the work done by the Executive Committees. One aspect stressed in particular by the Policy Committee was the need to develop other forms or formats of meetings to attract more participants from industry. In the coming year an experimental virtual conference will be organized. The Publications Committee reported on two new journals which had been accepted for Affiliation, i.e. the Journal on Computers and Electronics in Agriculture and the Journal on Real-Time Systems. The Awards Committee had finetuned procedures for the various Congress awards. The Administrative and Finance Committee had studied the budget and surveyed the income and expenditure situation of IFAC. Everything had been found in excellent order.

One very important task of the Council meeting was the preliminary selection of sites for the IFAC World Congress in 2008. Three applications had been received. All of them were excellent and thus all of the candidates will be invited to make a presentation at the next Council meeting in 1998. The applying National Member Organizations are the NMOs of Germany, Japan and Korea (in alphabetic order).

The next Council- and Related Meetings will take place in Nantes, France, in conjunction with the IFAC Conference on System Structure and Control from 8 - 11 July, 1998. The President thanked the French NMO for extending this invitation to IFAC. He also thanked the Japanese organizers for their hospitality and their readiness to host the Council and Related Meetings and to organize the Anniversary Session and the Anniversary Banquet.

Mathematical Modelling

IMACS/IFAC Symposium

Vienna, Austria, 5 – 7 Feb., 1997

During Feb. 5 - 7, 1997 the second internationational IMACS symposium took place at the Technical University Vienna. This event was sponsored by theTechnical University Vienna and cosponsored by IFAC (Int. Fed. for Automatic Control), IAMCM (Int. Ass. for Math. & Comp. Mod.), ASIM (German Speaking Simulation Group), GAMM (Soc. Appl. Math. Mech., Germany), VDI/VDE-GMA (Soc. for Meas. & Autom. at VDE), OCG (Austrian Computer Soc.), OEMG (Austrian Math. Soc.), EUROSIM (Fed. European Simulation Soc.).

The conference gathered 211 scientists from 27 countries from four continents. The growing interest in a topic like this is due to an increasing need for reliable formal models. In some disciplines, use of mathematical models is a rather new approach to problem solution whereas in other disciplines mathematical models have been used for a long time but need continuing adaptation and refinement. The possibility to solve a certain problem and the quality of a solution of a certain task depend essentially on appropriate modelling of the question and of all available information. In some cases, the system under investigation and its behaviour are understood rather well. In such cases an appropriate model will assist in finding a good solution to the problem to be solved. In other situations such a model is primarily intended to help towards a better understanding of what is going on in the system. Examples for the first case are many types of design problems being encounterd in typical engineering systems, such as controller design, design of a production line etc. whereas the request for an improved understanding is often found in connection with non-engineering systems such as biological or medical systems, economic or environmental systems and their control etc.

In order to allow for a fruitful exchange of ideas across traditional borderlines, three survey lectures were given on topics of current interest (the report follows the sequence of their presentation and does not indicate any evaluation). Vectors with elements being 'independent' (pseudo)random numbers are needed for many modelling tasks, such as modelling of measurement noise, stochastic disturbances etc. Frequently, prediction of a systems behaviour – usually called simulation – is the main modelling goal and then, the practitioner has to decide which random number generator will suit his needs best. Hence, in a survey entitled 'Good random number generators are (not so) easy to find', Peter Hellekalek (Salzburg, A) indicated why which difficulties may and do occur. Further, he reviewed in a critical manner recent algorithms and software tools for the generation of random numbers and vectors of such numbers.

A further challenge to all modellers is the fact that most (engineering) systems of today cannot be considered any longer to belong either to the so-called 'continuous' or to the so-called 'discrete' (i.e. discrete-event) world. In most systems of today 'continuous' processes (which can be described also by difference equations) interact with discrete (stochastic) events. Sebastian Engell (Dortmund, D) working on the frontier of this new development discussed various aspects and recent trends in this field in his survey on 'Modelling and Analysis of Hybrid Systems'.

Among others, growing demands on the performance of technical systems forced also engineers working in such traditional areas as mechanical or electrical engineering, to pay more attention to all sorts of uncertainties occurring in such systems. Moreover, expenses for the modelling task must be kept low and modelling must often be done within a short time. Hence, it is not astonishing that slogans such as 'fuzzy modelling' or 'qualitative model' are attractive not only to scientists but also to those working in an industrial environment. In the third invited lecture entitled 'Qualitative Modelling of Dynamical Systems – Motivation, Methods, and Prospective Applications', Jan Lunze (Hamburg, D) did not only survey the main lines of current research but explained also the main ideas of an automata-theoretic approach which was successfully used in supervisory control.

To make the exchange of ideas even more profound, 18 well-known scientists followed the invitation to organize a so-called special session where not only those interested in a more specialized topic could meet and interact but also colleagues with a different area of specialization could get a good impression of the most recent research topics in this particular area(s). In addition, the Call for Papers invited scientists to contribute individually. As a result, 180 extended abstracts were submitted and were carefully reviewed by the 37 members of the International Program Committee (chaired by Inge Troch) coming from 18 countries worldwide. This reviewing resulted in invitations to 125 authors to present their contribution during the conference. Unfortunately, not all these authors were able to participate in the 2nd MATHMOD conference. Nevertheless, the scientific program contained 88 contributed plus 90 papers presented in a special session, thus a total of 178 regular papers which were colleted and arranged in 16 strings of sessions according to their main subject:

* Fuzzy and Qualitative Modelling
* Automation of Modelling and Bond Graphs
* Petri Nets and Discrete Event Modelling
* Identification
* Software Tools
* Modelling in Practice
* General Engineering Applications
* Traffic Modelling
* Electrical Systems
* Mechanics and Mechatronics, incl. Robotics
* Automatic Control
* Physical Applications
* Environmental Systems
* Biology and Biotechnical Engineering
* Economic and Social Systems
* Theoretic Aspects

The organizing committee, Inge Troch, Felix Breitenecker and Friedrich Urbanek, was careful to provide enough time for scientific and other discussions. Hence, there were not only sufficiently long coffee and lunch breaks where participants could meet or could have a look at the books and journals on display or at the 24 posters. These posters could be

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(N.V. Joshi, P. Murugan and R.R. Rhinehart)
Reference Trajectory Generation for Single-Loop Controllers
(O. Dahl)
Robust Vibration Control for SCARA-Type Robot Manipulators
(Z.B. Kang, T.Y. Chai, K. Oshima, J.M. Yang and S. Fujii)
Grey-Box Identification of a Continuous Digester - A Distributed Parameter Process
(G. Funkquist)
Analysis of a Computer-Aided Teleoperation Process by Means of Generalized Stochastic Petri Nets
(S. Marier, A. El Mhamedi and Z. Binder)
Determination of the Glass Fiber Freezing Point by Time-Delay Estimation
(S.A. Milinkovic)
Robust Servo Control System Design for Two Flexibly Linked Masses
(T.L. Hsien, Y.Y. Sun, M.C. Tsai and S.J. Huang)

Preface to the Special Section of Papers on Real-Time Programming
(C.E. Pereira and W.A. Halang)
Quality Requirements for Real-Time-Safety-Critical Systems
(T.G. Kimer)
A Real-Time Programming Language as a Means of Expressing Specifications
(M. Colnaric, D. Verber and W.A. Halang)
Support for RTO.k Object Structured Programming in C++
(K.H. Kim, C. Subbaraman and L. Bacellar)
Modeling Computer-based Real-Time Systems: Which Views do we Need?
(P. Darscht and C. E. Pereira)
Building Safety-Critical Real-Time Systems with Reusable Cyclic Executives
(J. Zaramo, A. Alonso and J.A. de la Puente)
Dynamic Scheduling Solutions for Real-Time Multiprocessor Systems
(S. Saez, J. Vila and A. Crespo)

IFAC Meeting Papers - Keyword Listing
13th IFAC Triennial World Congress (Volume O), July 1996, San Francisco, USA)
13th IFAC Triennial World Congress (Volume P), July 1996, San Francisco, USA)

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Control Engineering Practice Volume 5 Number 8, Aug. 1997

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State Feedback Control of the Strip Steering for Aluming Hot Rolling Mills
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Adaptive Quality Control for Springs Production
(F. Lorito)
A Priori Nonlinear Model Structure Selection for System Identification
(M.H. Petrick and B. Widgorowitz)
Predictive Control of Wind Turbines in Small Power Systems at High Turbulent Wind Speed
(N. Nanayakkara, M. Nakamura and H. Hatazaki)
A Neural-Network-Based Velocity Tracking Control Method for Direction-Changing Motions
(Chen-Wen V. Yen, Tsong-Zen Liu and Tsang-Yi Wang)
Evaluation of Order and the Spread of Time Constants for Aperiodic Processes Using Step Response
(S. Skoczowski)

Preface to the Special Section on Automotive Control
(D. Hrovat)
Models and Control Methodologies for IC Engine Idle Speed Control Design
(D. Hrovat and Jing Sun)
Feedback Linearizing Air/Fuel-Ratio Controller
(L. Guzzella, M. Simons and H.P. Gessing)
Ionization Current Interpretation for Ignition Control in Internal Combustion Engines
(L. Eriksson and L. Nielsen)
Application of Nonlinear Sliding-Mode Observers for Cylinder Pressure Reconstruction
(S.X. Chen and J.J. Moskwa)
Event-Based Estimation of Indicated Torque for IC Engines Using Sliding-Mode Observers
(Y-Y. Wang, V. Krishnaswami and G. Rizzoni)
Yaw Disturbance Attenuation by Robust Decoupling of Car Steering
(J. Ackermann and T. Bünte)
Identification and Control of Nonlinear Active Pneumatic Suspension for Railway Vehicles, Using Neural Networks
(M. Nagai, A. Moran, Y. Tamura and S. Koizumi)
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(U. Kiencke and A. Daiß)
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(C. Halfmann, M. Ayoubi and H. Holzmann)
Formal and Architectural Aspects of Modelling; Implications in the Case of Vehicles
(Y. Chamaillard and G.L. Gissinger)

IFAC Meeting Papers – Keyword Listing
13th IFAC Triennial World Congress (Volume Q), July 1996, San Francisco, USA
13th IFAC Triennial World Congress (Plenary Volume), July 1996, San Francisco, USA)
Intelligent Autonomous Control in Aerospace, August 1995

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IFAC Control Engineering Textbook Prize Call for Nominations

The Textbook Prize Selection Committee of the Education Committee (EDCOM) of IFAC calls for nominations for the Triennial Textbook Prize. The Prize is to author(s) of that control engineering textbook judged to have most contributed to the education of control engineers. The nominated book must be written in one of the official IFAC languages, preferably in English, must have been published between September 1, 1990 and July 31, 1996. The Prize, consisting of a monetary award and a certificate, will be presented at the closing ceremony of the 14th IFAC World Congress in Beijing, 1999.

A nomination letter must include the full title, name(s) and address(es) of the author(s), date of publication, name and address of the publisher.

The Selection Committee asks for and will take into account any additional information to be submitted with the nomination letter such as book reviews (in IFAC affiliated journals), letter of support, publisher's data, list of adoptions, etc. Any further information will be appreciated.

Please send the nomination material to

Prof. Em. Dr. Karl Heinz Fasol
Regelungssysteme und Steuerungstechnik
IB 3/138
Ruhr-Universität Bochum
D-44780 Bochum, Germany

Your cooperation will be greatly appreciated. Please respond at your earliest convenience. To be considered, nominations must be received by June 30, 1998 at the latest. The winner(s) will be notified in due time so that advance plans can be made to attend the award ceremony.

CALL FOR TUTORIALS 1999 IFAC WORLD CONGRESS

Tutorial workshops will be conducted on July 3–4 prior to the 1999 IFAC World Congress in Beijing, China. If you are interested in organizing and conducting one of these tutorials, please send a brief proposal by January 1, 1998 to,

Mike Masten
2309 Northcrest
Plano, TX 75075, USA

e-mail: m.masten@ieee.org

The proposal should contain:

- Workshop Title
- Goal of Workshop
- Brief Synopsis
- Outline of Topics
- List of Presenters
- Duration of Tutorial (one- or two-days)

The criteria for selecting final workshops will focus on anticipated breadth of interest, suitability for Congress attendees, and expected depth/breadth of the presentations.

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discussed with the authors during these breaks but especially during the special Poster Session where also a selection of the 'best poster' took place. K. Kleemayr et al. with their poster on 'Modeling of Stresses and Movements of the Seasonal Snow Cover with Finite Element Method' were the winner of the poster award consisting of a one year subscription to the journal 'Mathematical Modelling of Systems'.

The written versions of the three invited lectures, of all contributions to the conference as well as abstracts of all posters are collected in a Proceedings volume (ISBN 3-901608-11-7), edited by I. Troch and F. Breitenecker. Moreover, the survey lectures and some 15 regular papers will appear also in a special double issue of the IMACS journal 'Mathematics and Computers in Simulation'. Selection of these papers is based on a second reviewing procedure based on full papers. It is to be expected that there are more contributions which merit publication in a scientific journal than can be included in this special issue. Hence, authors of such outstanding contributions will get an invitation to submit a suitably adapted and enlarged version to one of the following journals into the scope of which the paper fits best: 'Mathematical Modelling of Systems', ,J. of Intelligent and Robotic Systems' and 'Simulation – Theory and Practice'.

Finally it should be mentioned that there were also several committee meetings during or immediately after the conference. Among them was a meeting of the IMACS TC-2, the Technical Committee on 'Mathematical Modelling'. There the recommendation was given to organize – in view of the growing interest in a conference like this – a 3rd MATHMOD conference during February 2000.

Inge Troch
Chairman, IPC

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A Journal of IFAC the International Federation of Automatic Control

Papers from the July 1997 Issue

Papers

The Jogger's Problem: Control of Dynamics in Real-time Motion Planning
(A.M. Shkel, V.J. Lumelsky)
Optimal Hankel-norm Identification of Dynamical Systems
(S. Weiland, A.A. Stoorvogel)
Nonlinear L_2-gain Suboptimal Control
(L. Baramov, H. Kimura)
Linear Fractional Representations of Uncertain Systems
(J.C. Cockburn, B.G. Morton)
Traffic Density Control for Automated Highway Systems
(Chen-Chih Chien, Youping Zhang, P.A. Ioannou)
3-D Structure from Visual Motion: Modeling, Representation and Observability
(S. Soatto)
Sliding-mode Design for Robust Linear Optimal Control
(K.D. Young, Ü. Özgüner)
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(T. Iwasaki, S. Hara, M.A. Rotea)

Brief Papers

Necessary Conditions for Some Typical Fuzzy Systems as Universal Approximators
(H. Ying, G. Chen)
On Nonregular Feedback Linearization
(Z. Sun, X. Xia)
System Impulse Response Identification using a Multiresolution Neural Network
(Zi-Jiang Yang, S. Sagara, T. Tsuji)
Non-parametric Estimation of the Frequency-response Functions of the Linear Blocks of a Wiener-Hammerstein Model
(G. Vandersteen, Y. Rolain, J. Schoukens)
Robust Stability Conditions for SISO Model Predictive Control Algorithms
(T.A. Badgwell)
Robust Analysis and Design of Control Systems Using Inerval Arithmetic
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(L. Cao, Y. Hori)
Frequency-domain Method for H_2 Optimization of Time-delayed Sampled-data Systems
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Tracking Control of Mobile Robots: A Case Study in Backstepping
(Zhong-Ping Jiang, H. Nijmeijer)
Nonlinear Control of a Rodless Pneumatic Servoactuator, or Sliding Modes versus Coulomb Friction
(S. Drakunov, G.D. Hanchin, W.C. Su, .Özgüner)
Weights Determine Stability of Sensitivity-optimal Controllers
(K.E. Lenz)

Technical Communiques

Robust Disturbance Rejection with Simultaneous Robust Input-Output Decoupling
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A Variable-structure Regulator for Robotic Systems
(P. Muraca, P. Pugliese)
Some Classes of Step-response Models without Extrema
(J.R. Howell)

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(S.A. Bortoff)
Optimal Design of Adaptive Tracking Controllers for Non-linear Systems
(Zhong-Hua Li, M. Krstic)
A New Reduced-Order Adaptive Filter for State Estimation in High Dimensional Systems
(S. Hoang, P.D. Mey, O. Talagrand, R. Baraille)
Recursive Algorithms for Identification in Closed Loop: A Unified Approach and Evaluation
(I.D. Landau, A. Karimi)

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A Nonlinear Observer for Estimating Parameters in Dynamic Systems
(B. Friedland)
Minimum-variance Control of Linear Time-varying Systems
(Z. Li, R.J. Evans)
A Dynamic Recurrent Neural-network-based Adaptive Observer for a Class of Nonlinear Systems
(Young H. Kim, F.L. Lewis, Ch.T. Abdallah)
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(E.G. Eszter, C.V. Hollot)
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(L.R. Hunt)
Decoupling and Pole Assignment of Singular Systems: A Frequency Domain Approach
(D. Vafiadis, N. Karcanias)
Canonical Decomposition of Non-linear Systems
(C.H. Moog, A.M. Perdoni, G. Conte)
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(R. Mahony, I. Mareels, G. Bastin, G. Campion)
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(Chee-Fai Yung, Jenq-Lang Wu, Tsu-Tian Lee)

Technical Communiques

A Note on Convergence Property of Iterative Learning Controller with Respect to sup Norm
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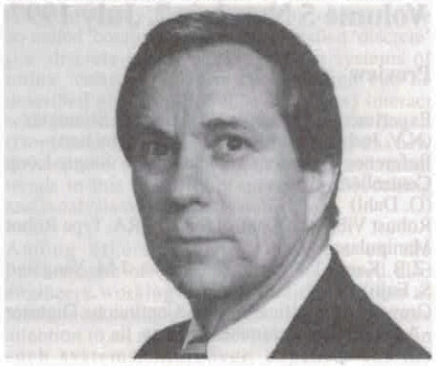

Dr. Michael K. Masten
Vice-Chairman, Technical Baord

Michael K. Masten was born in Gainesville, Texas (USA) in 1939. He received BSEE, MSEE, and PhD degrees from the University of Texas at Austin. He also earned an MBA from the University of Dallas. After joining Texas Instruments (TI) in 1968, Mike initially worked on adaptive information processing techniques for automatic pattern recognition applications. In 1973, Dr. Masten was one of the charter members and later became the manager of a technical support organization within TI to design/develop precision line-of-sight stabilization systems, target tracking techniques, inertial navigation, missile/aircraft autopilot-flight control systems, and real-time hardware-in-the-loop test processes. He also led an Inertial Products Team responsible for specifying and selecting precision inertia instruments for various military vehicles designed by Texas Instruments. Mike was elected TI Senior Member of Technical Staff in 1980, and promoted to TI Fellow in 1989. Since 1994, Dr. Masten has directed a TI electronics research program to develop practical electronics for improved control system techniques.

Dr. Masten has published almost 50 papers in IEEE, SPIE, IFAC, and AIAA journals and conference proceedings on various control systems topics. He has taught approximately 20 tutorial workshops on precision stabilization/target tracking, and since 1991 he has been co-chair for the annual SPIE „Acquisition, Tracking, and Pointing" Conference. He is also joint editor of a Milestone (survey) Series on stabilization/tracking published during the summer of 1996. He was editor/author of a self-study course, „Introduction to Modern Control Systems Techniques" published by IEEE in late 1995. (Several of his co-authors in this project are IFAC members.)

Dr. Masten has been very active in IFAC where he served as chairman for the Transportation and Vehicles Coordinating Committee for 1993-96. He was a member of the 1996 IFAC World Congress Program Committee, responsible for both the Transportation and Vehicles Coordinating Committee activities and for the pre-Congress tutorial workshops. (He will also be responsible for the tutorial workshops for the 1999 IFAC World Congress in Beijing.) Dr. Masten is a member of the Editorial Board of the IFAC Journal, CONTROL ENGINEERING PRACTICE. Within the American Automatic Control Council (the USA IFAC National Member Organization), Mike has served several years as chair of the Workshop Committee and has been Workshop Chair for almost all of the American Control Conferences since 1986.

In other professional societies, Dr. Masten has served six years on the IEEE Control Systems Board of Governors, and has held four offices within the Executive Committee, including Society President (1996). He has also served as chair of the Dallas/Ft. Worth Texas Chapter of the IEEE Control Systems Society. Mike was General Chair of the 1994 IEEE Conference on Decision and Control and served on the Advisory Board for the IEEE TRANSACTIONS ON CONTROL SYSTEMS TECHNOLOGY in 1992–94. Within the broader context of IEEE, Dr. Masten has served on the Technical Activities Board, Educational Activities Board, and on several committees. He was co-chair of IEEE's INDUSTRY 2000 Workshop in 1994, and he wa recently elected to the IEEE Board of Directors for 1997–98. He was elected an IEEE Fellow in 1990.

Mike received the 1994 „Engineer of the Year" award from the Dallas Section of the Society of Professional Engineers and the 1995 IEEE Educational Activities Board Meritorious Service Citation.