PROCEEDINGS OF THE

37th IEEE CONFERENCE ON DECISION AND CONTROL

December 16–18, 1998

Hyatt Regency Westshore
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37th IEEE Conference on Decision and Control

Hyatt Regency Westshore, Tampa, Florida

December 16–18, 1998

Greetings from the General Chair

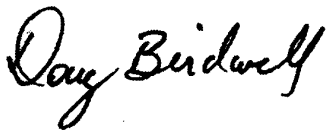
On behalf of the IEEE Control Systems Society (CSS) and the Program and Operating Committees, I welcome you to Tampa, Florida, and the 37th IEEE Conference on Decision and Control (CDC). The Tampa Bay area is known for its warm and sunny winter weather. Those of you who have attended the CDC for many years will recognize that this is our third CDC in the Tampa Bay area, and may in addition remember that the weather was, politely stated, less than ideal at the previous two. As I am writing this in August (with the season's first hurricane approaching the Southeastern United States), I have no idea what weather will await us in December. I can say that statistically we have good reason to expect nice weather, and I can hope that the folk saying "third time's the charm!" will bear out as fact. I can promise, however, that even if it is not warm and sunny outside the hotel, you will find an attractive variety of high-quality technical activities on the inside, along with excellent accommodations and gastronomic delights! This year the conference is at the Hyatt Westshore hotel in Tampa on December 16–18, 1998, with accommodations at both the Hyatt Westshore and the nearby Doubletree Guest Suites Tampa Bay. With these two excellent hotels and the technical and regional activities we have made available, I believe everyone will enjoy this 37th CDC.

The CDC is the annual meeting of the IEEE Control Systems Society, which was founded in 1954 and now has approximately 12,000 members from over 65 countries around the world. The 37th CDC is conducted in cooperation with the Society for Industrial and Applied Mathematics (SIAM) and the Institute for Operations Research and the Management Sciences (INFORMS). The CDC has a long and established record of offering technical programs of very high quality. I believe you will find this year is no exception. A total of 1,426 papers, including 994 regular, 188 short, 218 invited, and 26 SIAM papers, were submitted from 46 countries to this year's CDC. Of the submitted papers, 990 were accepted for presentation at the conference and publication in the Proceedings. These papers are organized into 17 parallel sessions on the first day and 16 parallel sessions during each remaining day of the conference, and an additional evening session on Wednesday. All submitted papers were reviewed by the Program Committee, chaired by Prof. David A. Castañon of Boston University, and by the IEEE Control Systems Society Conference Editorial Board under the direction of Prof. J. Jim Zhu at Louisiana State University. A Proceedings of all accepted papers has been published as a CD-ROM for distribution at the conference, and a hardcopy Proceedings will be printed and distributed after the conference to those attendees who request it.

Some **highlights** of the conference include a Wednesday evening session where the results of the CSS/NSF Workshop on Control Education held in September will be presented, and an evening CSS Awards Banquet on Thursday. The Technical Program includes a morning **Plenary Session** by Prof. Robert Gallager (MIT) on Wednesday on the control of telecommunications systems. A **moderated Plenary Discussion**, which will feature short presentations by the speakers followed by responses to questions, is a new feature of the CDC, and will be held Thursday morning. The topic is "Fuzzy vs. Conventional Control," and the featured speakers are Prof. Michael Athans (MIT) and Prof. Lofti Zadeh (Berkeley). Professor J. Boyd Pearson (Rice) will be awarded the 1998 **Bode Prize** at the evening CSS Awards Banquet on Thursday. On a sad note, although it has been customary for the recipient of the Bode Prize to deliver the Friday morning Plenary Lecture at the CDC, this will not be possible this year for medical reasons. I want to take this opportunity to wish Dr. Pearson a speedy and complete recovery, on behalf of both the Society and myself.

Eight pre- and post-conference **workshops** are being held on Monday and Tuesday before the conference, and on the following Saturday. The workshops represent a wide range of current topics covering the interests of both applied and theoretical control systems engineers, including Modern Sampled-Data Control, Control of Systems with Dynamic Friction, Control of Bifurcations and Chaos, Hybrid Systems, Smart Materials, Neural Networks for Intelligent Control, Control of Communication Networks, and Nonlinear Control Comparisons and Case Studies. Any attendees who wish to register for any of these workshops and who have not had an opportunity to preregister can do so on-site. Detailed workshop information is available on pages 8–15 and at the registration desk.

I encourage you to explore and enjoy the Tampa Bay area during your stay. Tampa is one of the most exciting meeting destinations in the United States. Tampa offers a multicultural spectrum of dining, arts, and entertainment, as well as the beaches of Clearwater and St. Petersburg on the western side of Tampa Bay. Cultural attractions include the new Tampa Aquarium, Busch Gardens, and the shops, nightclubs, and restaurants of Ybor City. The Westshore is located on Tampa Bay and is one of Hyatt's top-rated hotels with grounds that are a wetland sanctuary for wildlife. The Hyatt Regency is just minutes away from the Tampa attractions and the Tampa International Airport. Additional accommodations at the same rate are available in the Doubletree Guest Suites Tampa Bay, an all-suites hotel located near the Westshore. Continuous bus service will be available during conference hours between the two hotels. Orlando and the Disney entertainment complexes are a short drive northeast of Tampa. For accompanying persons, several special tours have been organized on each day of the conference by Bay Area Destination Management Company, with Disney and Busch Gardens tours scheduled on both Saturday and Sunday after the conference.



IEEE CONFERENCES ON DECISION AND CONTROL—PAST AND PRESENT

Please find below the complete list of past CDCs with titles, chairs, and locations, following a tradition that started with the 1991 CDC. The CDC grew out of the former Symposium on Adaptive Processes, to become the premier conference in the field. Early on, it was associated with the Joint Automatic Control Conference (JACC, now called the ACC) and later the National Electronics Conference (NEC). In the following listing, GC denotes General Chair, PC stands for Program Chair, and SC is Symposium Chair. The proceedings of all past conferences may be found at the IEEE library, 345 47th Street, New York, NY 10017.

Discrete Adaptive Processes—Symposium and Panel Discussions (IEEE) *part of 3rd JACC*
GC: J Sklansky
New York University, New York City, NY;29 June 1962

Symposium on Adaptive Processes *part of NEC*
GC: L. Kanal
McCormick Place, Chicago, IL; 28–29 October 1963

Symposium on Adaptive Processes *part of NEC*
GC: F. J. Mullin
McCormick Place, Chicago, IL; 19–21 October 1964

Symposium on Adaptive Processes *part of NEC*
GC: E. C. Jones, Jr. ; PC: G. Brown
McCormick Place, Chicago, IL; 25–27 October 1965

Symposium on Adaptive Processes *part of NEC*
GC: F. N. Bailey; PC: J. C. Hancock
McCormick Place, Chicago, IL; 3–5 October 1966

Symposium on Adaptive Processes *part of NEC*
GC: F. M. Waltz; PC: P. I. Mayes
International Amphitheater, Chicago, IL
23–25 October 1967

IEEE Symposium on Adaptive Processes
GC, PC: J. M. Mendel
UCLA, Los Angeles, CA; 16–18 December 1968

IEEE Symposium on Adaptive Processes
GC: J. B. Lewis; PC: G. J. McMurty
Pennsylvania State University, PA
17–19 November 1969

1970 Symposium on Adaptive Processes (9th) Decision and Control
GC, PC: D. J. Lainiotis
University of Texas at Austin, Austin, TX;
7–9 December 1970

1971 IEEE Conference on Decision and Control
including the 10th Symposium on Adaptive Processes
GC: J. T. Tou; PC: S. K. Mitter: SC: J. M. Mendel
Americana Hotel, Miami Beach, FL
15–17 December 1971

1972 IEEE Conference on Decision and Control
including the 11th Symposium on Adaptive Processes
GC: J. M. Mendel; PC: Y. C. Ho; SC: G. N. Saridis
Fontainbleau Motor Hotel, New Orleans, LA
13–15 December 1972

1973 IEEE Conference on Decision and Control
including the 12th Symposium on Adaptive Processes
GC: J. S. Meditch; PC: D. C. Luenberger,
SC: L. A. Gerhardt
Sheraton-Harbor Island Hotel, San Diego, CA
5–7 December 1973

1974 IEEE Conference on Decision and Control
including the 13th Symposium on Adaptive Processes
GC: E. Axelband; PC: S. Kahne; SC: D P. Lindorff
Del Webb's Towne House, Phoenix, AX;
20–22 November 1974

1975 IEEE Conference on Decision and Control
including the 14th Symposium on Adaptive Processes
GC: J. B. Cruz Jr.; PC: J. B. Pearson; SC: G. Stein
Hyatt Regency Houston, Houston, TX;
10–12 December 1975

1976 IEEE Conference on Decision and Control
including the 15th Symposium on Adaptive Processes
GC: M. Athans; PC: E. R. Barnes; SC: T. Pavlidis
Sheraton-Sand Key Hotel, Clearwater, FL;
1–3 December 1976

1977 IEEE Conference on Decision and Control
including the 16th Symposium on Adaptive Processes
GC: K. S. Fu; PC: H. Sorenson; SC: T. Pavlidis
Fairmont Hotel, New Orleans, LA; 7–9 December 1977

1978 IEEE Conference on Decision and Control
including the 17th Symposium on Adaptive Processes
GC: Robert E. Larson; PC: Alan S. Wilsky;
SC: Jerry M. Mendel
Islandia Hyatt House Hotel, San Diego, CA;
10–12 January 1979

18th IEEE Conference on Decision and Control
including the Symposium on Adaptive Processes
GC: S. Kahne; PC; A. H. Levis; SC: Y. Bar-Shalom
Galt Ocean Mile Hotel, FT. Lauderdale, FL;
12–14 December 1979

19th IEEE Conference on Decision and Control
including the Symposium on Adaptive Processes
GC: P. R. Belanger; PC: D. L. Kleinman;
SC: R. V. Monopoli
The Regent Hotel, Albuquerque, NM;
10–12 December 1980

20th IEEE Conference on Decision and Control
including the Symposium on Adaptive Processes
GC: William R. Perkins; PC: Abraham H. Haddad;
SC: Kumpati S. Narendra
Vacation Village Hotel, San Diego, CA;
16–18 December 1981

21st IEEE Conference on Decision and Control
GC: Alexander H. Levis; PC: William S. Levine
Holiday Inn-International Drive, Orlando FL;
8–10 December 1982

22nd IEEE Conference on Decision and Control
GC: James L. Melsa; PC: Steven I. Marcus
Marriott Hotel, San Antonio, TX; 14–16 December 1983

23rd IEEE Conference on Decision and Control
GC: Abraham H. Haddad; PC: Michael P. Polis
Las Vegas Hilton, Las Vegas, NV; 12–14 December 1984

24th IEEE Conference on Decision and Control
GC: Gene F. Franklin; PC; Antony N. Michel
Bonaventure Hotel & Spa, Ft. Lauderdale, FL
11–13 December 1985

25th IEEE Conference on Decision and Control
GC: A. Ephremides; co-GC: S. Tzafestas; PC: H. V. Poor
Atheneum Intercontinental Hotel, Athens, Greece
10–12 December 1986

26th IEEE Conference on Decision and Control
GC: William S. Levine; PC: John Baillieul
Westin Century-Plaza Hotel, Los Angeles, CA
9–11 December 1987

27th IEEE Conference on Decision and Control
GC: Michael P. Polis; PC: William E. Schmitendorf
Hyatt Regency Austin on Town Lake, Austin, TX
7–9 December 1988

28th IEEE Conference on Decision and Control
GC: Leonard Shaw; PC: Tamer Basar
Hyatt Regency Tampa Hotel, Tampa, FL;
13–15 December 1989

29th IEEE Conference on Decision and Control
GC: Charles J. Herget; PC: Raymond A. DeCarlo
Hilton Hawaiian Village, Honolulu, HI;
5–7 December 1990

30th IEEE Conference on Decision and Control
GC: Derek Atherton; PC: Panos J. Antsaklis
Metropole Hotel, Brighton, England;
11–13 December 1991

31st IEEE Conference on Decision and Control
GC: Tamer Basar; PC: Sergio Verdu
Westin La Paloma, Tucson, AZ; 16–18 December 1992

32nd IEEE Conference on Decision and Control
GC: Raymond A. DeCarlo; PC: Peter Ramadge
Marriott Rivercenter, San Antonio, TX;
15–17 December 1993

33rd IEEE Conference on Decision and Control
GC: Michael K. Masten; PC: N. Harris McClamroch
Buena Vista Palace, Lake Buena Vista, FL
14–16 December 1994

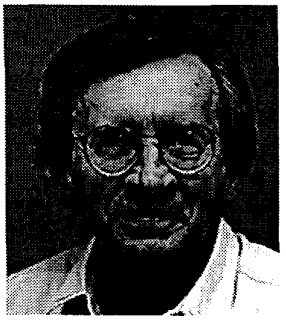
34th IEEE Conference on Decision and Control
GC: Panos J. Antsaklis; PC: Edward W. Kamen
New Orleans Hilton Riverside, New Orleans, LA
13–15 December 1995

35th IEEE Conference on Decision and Control
GC: Hidenori Kimura;
Co-PCs: Katsuhisa Furuta, J. Douglas Birdwell
Portopia Hotel and International Conference Center, Kobe, Japan;
11–13 December 1996

36th IEEE Conference on Decision and Control
GC: Anthony N. Michel; PC: Theodore E. Djaferis
Hyatt Regency San Diego, San Diego, CA
10–12 December 1997

37th IEEE Conference on Decision and Control
GC: J. Douglas Birdwell; PC: David Castañon
Hyatt Regency Westshore, Tampa, FL;
16–18 December 1998

BIOGRAPHY of the RECIPIENT OF THE 1998 CSS BODE AWARD

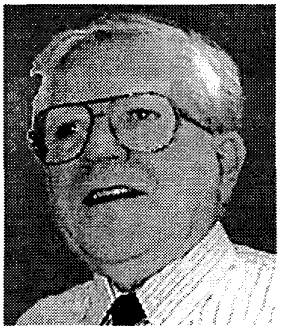


J. Boyd Pearson is a J. S. Abercrombie Professor in Electrical and Computer Engineering at Rice University. He received the B.S.E.E. and M.S.E.E. degrees from the University of Arkansas and the Ph.D. from Purdue University in 1962. Since 1965, he has been with the Electrical Engineering Department at Rice University. He served as Department Chairman from 1974 to 1979.

Dr. Pearson has served in various capacities in the IEEE Control Systems Society. He was President of the Society in 1984. He also served as President of the American Automatic Control Council in 1992–1993. Dr. Pearson received an IEEE Outstanding Paper Award from the Control Systems Society for his work with Dr. Bor-Chin Chang. He also received the George S. Axelby Outstanding Paper Award from the Society in 1989 for his work with Dr. Muther Dahleh. In 1995, he received the American Automatic Control Council's Education Award.

Dr. Pearson's main field of interest is linear multivariable control. He is the recipient of the 1998 H. W. Bode Prize from the IEEE Control Systems Society, awarded for his lifetime contributions to the development of linear control theory from dynamic compensation to robust control, especially development of l_1 optimal control theory, and for education of numerous researchers in the field.

BIOGRAPHY of 37th IEEE CDC PLENARY 1 SPEAKER



Robert G. Gallager was born in Philadelphia on May 29, 1931. He received the B.S.E.E. degree in electrical engineering from the University of Pennsylvania in 1953, and the S.M. and Sc.D. degrees in electrical engineering from the Massachusetts Institute of Technology in 1957 and 1960, respectively.

Following two years at Bell Telephone Laboratories and two years in the U. S. Signals Corps, Dr. Gallager has been at MIT since 1956. He received the Fujitsu Chair of Electrical Engineering in 1988, and became co-director of the Laboratory for Information and Decision Systems in 1986. Dr. Gallager was also involved in the founding of Codex Corporation in 1962, and has continued as a consultant. He holds four patents in coding and modulation.

Dr. Gallager is the co-author of *Data Networks* (Prentice Hall, 1988 and1992) and the author of *Information Theory and Reliable Communication* (Wiley, 1968) and *Discrete Stochastic Process* (Kluwer, 1996). He won the 1966 IEEE Baker Prize for his work on information theory and coding. He also received the William Bennet Prize in 1993 for his work on data networks, and the Prize Paper award at Infocomm'93. His research contributions span the areas of information theory, data networks, wireless communication, optical networks, and stochastic processes.

Dr. Gallager was President of the Information Theory Society of the IEEE in 1971. He was Chairman of the Advisory Committee to the NSF Division on Networking and Communication Research and Infrastructure from 1989 to 1992. His is an IEEE Fellow, a Guggenheim Fellow, and a member of the National Academy of Engineering. He received the Shannon award from the IEEE Information Theory Society in 1983, the IEEE Centennial Medal in 1984, and was elected to the National Academy of Sciences in 1992. He received the IEEE's highest honor in 1990, the Medal of Honor, awarded for fundamental contributions to communications coding techniques.

BIOGRAPHIES of 37th IEEE CDC PLENARY 2 SPEAKERS

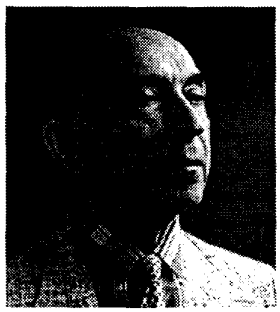
Michael Athans was born in Drama, Macedonia, Greece, on May 3, 1937. He received his B.S.E.E., M.S.E.E., and Ph.D. in control from the University of California at Berkeley in 1958, 1959, and 1961, respectively.

From 1961 to 1964 he worked at MIT Lincoln Laboratory, Lexington, Massachusetts. From 1964 until his retirement in 1998 he was a faculty member in the MIT Electrical Engineering and Computer Science department. He also was the director of the MIT Laboratory for Information and Decision Systems (formerly the Electronic Systems Laboratory) from 1974 to 1981. In 1978 he co-founded ALPHATECH Inc., Burlington, Massachusetts, where he serves as Chairman of the Board of Directors and Chief Scientific Consultant. He has also served as Visiting Professor in the Department of Electrical and Computer Engineering at the National Technical University of Athens, Greece, and at the Instituto Superior Tecnico, Lisbon, Portugal.

Dr. Athans is the co-author of *Optimal Control* (McGraw Hill, 1966), *Systems, Networks and Computation: Basic Concepts* (McGraw Hill, 1972), and *Systems, Networks and Computation: Multivariable Methods* (McGraw Hill, 1974). He has authored or co-authored more than 325 technical papers and reports. His research interests span the areas of optimum system and estimation theory, multivariable control systems, and the application of these methodologies to defense, large space structures, IVHS transportation systems, aerospace, marine, automotive, power, manufacturing, economic, and C3 systems.

Dr. Athans was the first recipient of the American Automatic Control Council's Donald P. Eckman Award in 1964. In 1969 he was the first recipient of the Frederick E. Terman Award of the American Society for Engineering Education. In 1980 he received the second Education Award of the American Control Council for his "outstanding contributions and distinguished leadership in automatic control education." He is a Fellow of the IEEE and the AAAS, and a Distinguished Member of the IEEE Control Systems Society. He received the 1993 H. W. Bode Prize from the IEEE Control Systems Society and the Richard E. Bellman Control Heritage Award of the American Automatic Control Council in June 1995. He has been awarded honorary doctorates from the National Technical University of Athens, Greece, and from the Technical University of Crete, Chania, Crete, Greece.

Dr. Athans has served in numerous committees of IEEE, IFAC, AACC, and AAAS; he was president of the IEEE Control Systems Society from 1972 to 1974. He has also served as Associate Editor of the *IEEE Transactions on Automatic Control, Journal of Dynamic Systems and Control,* and *Automatica.*



Lotfi A. Zadeh is a professor in the Computer Science Division of the Department of Electrical Engineering and Computer Science at the University of California, Berkeley. He received his BS, MS, and PhD degrees from the University of Teheran, MIT, and Columbia University. He joined the Department of Electrical Engineering at the University of California, Berkeley, in 1959, and served as its chairman from 1963 to 1968. He held visiting appointments at the Institute for Advanced Study, Princeton, New Jersey; MIT; IBM Research Laboratory, San Jose, California; SRI International, Menlo Park, California; and the Center for the Study of Language and Information, Stanford University. He is currently the director of the Berkeley Initiative in Soft Computing (BISC).

Dr. Zadeh's early research work centered on system theory, decision analysis, and information systems. Since 1965, his research interests have shifted to the theory of fuzzy sets and its applications to artificial intelligence, linguistics, logic, decision analysis, control theory, expert systems, and neural networks. His current research is focused on fuzzy logic, computing with words and soft computing, which is a coalition of fuzzy logic, neurocomputing, evolutionary computing, probabilistic computing, and parts of machine learning.

Dr. Zadeh is a fellow of the IEEE, AAAS, ACM, and AAAI; a member of the National Academy of Engineering; and a foreign member of the Russian Academy of Natural Sciences. He was the recipient of the IEEE Education Medal in 1973 and a recipient of the IEEE Centennial Medal in 1984. His numerous honors include the Honda Prize by the Honda Foundation in 1989, the Berkeley Citation, University of California, in 1991, the IEEE Richard W. Hamming Medal in 1992, the Certificate of Commendation from the International Foundation for Artificial Intelligence in 1992, the Kampe de Feriet Medal from Austrian Society of Cybernetic Studies in 1992, the Rufus Oldenburger Medal from the American Society of Mechanical Engineers in 1993, the Grigore Moisil Prize for Fundamental Researches in 1995, the IEEE Medal of Honor in 1995 "for pioneering development of fuzzy logic and its many diverse applications," the Okawa prize in 1996, the B. Bolzano Medal Medal by the Academy of Sciences of the Czech Republic in 1997, the J. P. Wohl Career Achievement Award of the IEEE Systems, Man and Cybernetics Society in 1997, the Edward Feigenbaum Medal, and the Richard E. Bellman Control Heritage Award by the American Council on Automatic Control in 1998. Dr. Zadeh also holds eleven honorary doctorates.

Dr. Zadeh has authored close to two hundred papers and serves on the editorial boards of more than fifty journals. He is a member of several advisory boards, including the Senior Advisory Board of the International Institute for General Systems Studies and the Board of Governors of the International Neural Networks Society, and is the honorary president of the Biomedical Fuzzy Systems Association of Japan and the Spanish Association for Fuzzy Logic and Technologies.

37th IEEE Conference on
Decision and Control

Program at a Glance

Tables

and

Technical Program

IEEE CDC'98 Wednesday Sessions

Track	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Room	Audubon A	Audubon B	Audubon C	Audubon D	Audubon E	Audubon F	Cormorant	Roseate Spoonbill	Herring Gull	Pelican	Snowy Egret N	Snowy Egret S	Sandhill Crane S	Wilson's Plover N&S	White Ibis N	White Ibis S	Sandhill Crane N
Plenary Lecture I: 8:30–9:30 am Audubon Ballroom **The Perils of Controlling High Speed Integrated Service Networks** Dr. Robert G. Gallager, Massachusetts Institute of Technology																	
WA 10:00 to 12:00	Optimal Control I	Control Methods for Communication Networks I	New Approaches to Robust Fault Diagnosis	The Behavioral Approach	Linear Matrix Inequalities I	Recent Developments in Nonlinear and Adaptive Learning Control	System Identification I	Information Fusion for Intelligent Decision Making	Estimation and Stochastic Approximation	Delay Systems I	Sampled Data Systems I	Control and Observation of Nonlinear Systems	Linear Systems with Input Saturation	Control of Robotic and Mechanical Systems	Chemical Process Control	Automotive Control Systems	Neural Network Based Control
WM 1:20 to 3:40	Open Problems in Mathematical Systems and Control Theory I	Control Methods for Communication Networks II	Fault Detection and Diagnosis I	Linear Systems I	H^2/H^∞ Filtering and Control	New Trends in Iterative Learning Control Design	System Identification II	Target Tracking	Stochastic Control I	Infinite Dimensional Systems I	Sampled Data Systems II	Advances in Nonlinear Feedback Design	Control of Saturating Systems	Advanced Methods for Robot Control I	Control of Induction Motors	Motion Control Systems	Neural Networks
WP 4:00 to 6:20	Open Problems in Mathematical Systems and Control Theory II	Control Methods for Communication Networks III	Fault Detection and Diagnosis II	H^2 Control and Estimation	Robust Control I	Repetitive and Learning Control	System Identification III	Detection and Estimation	Stochastic Systems	Delay Systems II	Model-Based Predictive Control	Nonlinear Systems Theory	Nonlinear Stabilization I	Advanced Methods for Robot Control II	Control of Automotive System	Noise and Vibration Control	Applications of Neural Networks
Evening Session: 8–10 pm Audubon II-III/ABC **NSF/CSS Workshop on New Directions in Control Engineering Education** Dr. Karl Åstrom, Lund; Dr. Kishan Baheti, NSF; Dr. Ken Loparo, Case Western Reserve Univ.; Dr. N. Harris McClamroch, Univ. of Michigan; Dr. Jack Rugh, Johns Hopkins Univ.; Dr. Mark Spong, Univ. of Illinois at Urbana-Champaign																

IEEE CDC'98 Thursday Sessions

Track	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Room	Audubon A	Audubon B	Audubon C	Audubon D	Audubon E	Audubon F	Cormorant	Roseate Spoonbill	Herring Gull	Pelican	Snowy Egret N	Snowy Egret S	Sandhill Crane N & S	Wilson's Plover N&S	White Ibis N	White Ibis S
Plenary Debate: 8:30–9:30 am Audubon II-III/ABC **Fuzzy vs. Conventional Control** Dr. Michael Athans, Massachusetts Institute of Technology Dr. Lofti A. Zadeh, University of California Berkeley																
TA 10:00 to 12:00	Modeling, Analysis and Stability of Hybrid Systems	Systems and Control Methods in Computer/ Communication Systems	Analysis and Optimization of Discrete Event Dynamical Systems	Pole Placement	Linear Matrix Inequalities II	Optimal Control II	Adaptive Control	Identification and Estimation	Stochastic Control II	Distributed Control	Sliding Mode Observers and Control	Control and Synchronization of Chaos	Nonlinear Stabilization II	Robotic Applications	Power Systems	Dynamical System Methods in the Control of Mechanical Systems
TM 1:20 to 3:40	Synthesis and Verification of Hybrid Control Laws	Control of Communication Systems	Manufacturing Systems: planning and scheduling	Model Reduction	Topics in Robust Design	Optimal Control III	Applications of Adaptive Control I	Parameter Estimation and Filtering	Control of Stochastic Systems	Control of Infinite Dimensional Systems	Sliding Mode Control	Nonlinear Oscillations and Bifurcations	Nonlinear Stabilization III	Telerobotic Systems	Compressor Control	Applications of Control to Machines
TP 4:00 to 6:20	Embedded Control Applications of Hybrid Systems	Stochastic Control and Finance	Production and Inventory Systems	Linear Systems II	Robust Stability I	H^{∞} Control	Robust Adaptive Control	Filtering and Estimation	Fuzzy Control	Control of Interactive Structures Governed by Distributed Parameter Systems	Gain Scheduling/ LPV Control	Dynamics and Control of Nonlinear Systems Exhibiting Bifurcations	Output Regulation of Nonlinear Systems	Nonholonomic Systems and Wheeled Vehicles	Manufacturing Applications of Control	Trajectory Control
Awards Dinner 7:45 pm Audubon Ballroom																

IEEE CDC'98 Friday Sessions

Track	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Room	Audubon A	Audubon B	Audubon C	Audubon D	Audubon E	Audubon F	Cormorant	Roseate Spoonbill	Herring Gull	Pelican	Snowy Egret N	Snowy Egret S	Sandhill Crane N&S	Wilson's Plover N&S	White Ibis N	White Ibis S
FA 8:30 to 10:30	Hybrid Systems: Modeling	Active Vision: A New Challenge for Control Theory	Discrete Event Systems and Supervisory Control I	L^1 Control Design	Probability and Robustness	Optimization	Identification for Control	Estimation I	Recent Advances in Stochastic Theory and Adaptive Control	Boundary Control	Nonlinear H^{∞} Control	New Geometric and Structural Results	Mechanics and Control	Flexible Systems	Control Design and Implementation for Autonomous Helicopters	Industrial Applications of Polynomial Methods
FM 10:50 to 1:10	Hybrid Systems: Stability	Vision and Control	Discrete Event Systems and Supervisory Control II	Time-Varying Systems	Robust Control II	Stochastic Optimization	System Identification IV	Estimation II	Adaptive Control	Adaptive Identification and Control of Distributed Parameter Systems	Nonlinear H-inf Control and Stabilization	Analysis and Control of Nonlinear Systems	Passivity and Dissipation	Lie Theory for Nonholonomic Systems	Aerospace Guidance and Control	Application of Fuzzy-based Methods
FP 2:30 to 4:50	Hybrid Systems: Control and Verification	Novel Sensors and Actuators	Modeling and Control of Discrete Event Dynamical Systems	Linear Systems III	Robust Stability II	Numerical Methods in Control	System Identification V	Parameter Identification and Estimation	Applications of Adaptive Control II	Infinite Dimensional Systems II	Applications of Nonlinear Control	Nonlinear Control	Nonlinear Discrete Time Systems and Control	Control Applications	Aerospace Applications	Control Applications II

Closing Reception
6–9 pm
Audubon Pavilion