

# 22<sup>ND</sup> ~~XXXXXX~~ CONFERENCE ON DISCRETE & CONTINUOUS

December 14, 15, 16, 1983  
Marriott Hotel  
San Antonio, Texas

## ADVANCE PROGRAM

SESSION ~		1	2	3	4	5	6	7	8	9
DAY	Room Time	Fiesta 1	Fiesta 2	Fiesta 3	Fiesta 4	Fiesta 5	Fiesta 6	Fiesta 7	River A	River B
WEDNESDAY	8:30-9:30	RIVER: Plenary I - Professor Roger W. Brockett								
	9:45 WA	Recent Developments in Decentralized Control	Parameter Estimation and Control in Distributed Systems	Estimation I	New Approaches to Multivariable Feedback Design	Linearization and Geometric Methods	Optimal Control I	Numerical Computations in Control - Three Tutorials	Global Convergence and Robustness of Adaptive Control	
	2:30 WP	Reduced-order Models for Large-scale Systems	Control of Distributed-Parameter Systems	Estimation II	Stability and Eigenvalue Considerations in Robustness Problems	Complicated Dynamics in Nonlinear Systems and Feedback Systems	Optimal Control II	Computer-Aided Design and Computational Methods	Adaptive Control	Traffic and Scheduling
THURSDAY	8:30 TA	Decentralized and Large Scale Systems	Aerospace and Applications	System Identification	Design of Robust Control Systems	Formal Power Series in System Theory	Game Theory	Estimation and Control with Quantized Data	Stochastic and Adaptive Systems	New Concepts in Nuclear Power Plant Instrumentation and Control
	12:00-2:30	MARRIOTT BALLROOM: Conference Luncheon								
	3:00 TP	Large Scale and Nonlinear Systems	Control of Large-Angle Spacecraft Rotational Maneuvers	Stabilization of Linear Systems	Robust Stability and Performance	The Geometry of Control	Optimization and Mathematical Programming	Applications of Microprocessors in Control	Robustness Issues in Adaptive Control	Fusion Energy - Where Does the Control Engineer Fit?
FRIDAY	8:30-9:30	MARRIOTT BALLROOM: Plenary II - Professor Thomas Kailath								
	9:45 FA	Modelling and Optimization of Discrete Event Dynamic Systems	Aerospace Applications	Non-Gaussian Problems in Detection and Estimation	Variable Structure Systems	Nonlinear Systems	Stochastic Control	Robotics and Microprocessor-Based Control	Control and Stabilization of Distributed Parameter Systems	
	2:30 FP	Model Reduction and Singular Systems	Application of Estimation and Control to Missile Guidance	Signal Processing	Linear Systems	Geometric Methods in Nonlinear Systems	Power Systems	Robots, Manipulators and Prostheses	Adaptive Systems: Practical Issues and Biomedical Applications	

## 22nd IEEE CONFERENCE ON DECISION AND CONTROL

711 East Riverwalk  
Marriott Hotel  
San Antonio, Texas 78205

### I. Invitation and General Information

The 22nd IEEE Conference on Decision and Control will be held Wednesday through Friday, December 14-16, 1983, at the Marriott Hotel, San Antonio, Texas and the adjacent San Antonio Convention Center. The Conference Operating and Program Committees join in inviting you to participate in this annual meeting of the IEEE Control Systems Society.

The Conference includes fifty-one technical sessions covering a wide range of theoretical and applied topics. There will be two plenary sessions addressing recent developments which will have great impact on the control field. This year's speakers will be Roger W. Brockett of Harvard University, speaking on "Chaos and Randomness in Dynamical Systems", and Thomas Kailath of Stanford University whose topic will be "Estimation and Control in the VLSI Era." A full-day Tutorial Workshop on adaptive control, organized by the Control Systems Society Education Committee, will be offered on December 13, 1983.

### II. Conference Registration

Registration fees for the 22nd CDC may be paid in advance by using the enclosed registration form or during the conference at the Conference Registration Desk. In order to facilitate planning for the conference activities, advance registration is encouraged. Those who have preregistered will be able to bypass the main Registration Desk to obtain their conference materials. All conference attendees, including speakers, MUST register and receive badges.

The registration fee, except for students, includes one copy of the Conference Proceedings, a ticket to the Conference Luncheon and a ticket for a complimentary drink at the Welcoming Reception. If you do not plan to attend the luncheon, please return the ticket to the registration desk. All tickets returned will be made available to students, registered at the Conference, who would like to attend the luncheon. The fee schedule is as follows:

#### Registration Postmarked

	November 15 or Earlier	After November 15
IEEE or SIAM Members	\$125.00	\$150.00
Non-Members	\$145.00	\$170.00
Students	\$ 30.00	\$ 30.00

Please make remittances in U.S. Dollars, since only U.S. Currency will be acceptable.

Additional copies of the Conference Proceedings will be available through IEEE headquarters after the conference. A limited number of copies may also be available at the Conference Registration Desk. The cost of these extra copies, if purchased at the conference, will be \$55.00 to IEEE members and \$75.00 to non-members.

The Registration Desk will be located initially in the area across from the hotel ballroom. On Wednesday, registration will be moved to the Convention Center. Directions and instructions for registration will be posted in the lobby of the hotel. The Registration Desk will be open at the following times:

For Tutorial Workshop registration only:			
Tuesday	December 13	7:30 a.m. to 9:30 a.m.	
For Conference registration:			
Tuesday	December 13	4:00 p.m. to 8:00 p.m.	
Wednesday	December 14	7:00 a.m. to 5:00 p.m.	
Thursday	December 15	7:00 a.m. to 3:00 p.m.	
Friday	December 16	7:00 a.m. to Noon	

**REFUND POLICY:** Registration fees for the Tutorial Workshop and the Conference may be refunded, provided that a written request is received by the Registration Chairman before December 1, 1983. There will be NO REFUNDS AFTER THAT DATE. Those registrants who do not obtain a refund but are unable to attend the conference will receive their copy of the proceedings, mailed to the address on the pre-registration form. Refund requests should be sent to:

Elizabeth R. Ducot  
35-410/LIDS  
Massachusetts Institute of Technology  
Cambridge, MA 02139

### III. Welcoming Reception and Conference Luncheon

Following CDC custom, a welcoming reception (cash bar) will take place on Tuesday evening, December 13th, from 6:30 to 8:30 p.m. in the ballroom. This year's welcoming reception will have a Mexican theme with a Mariachi band, Mexican hors d'oeuvres and Margaritas.

The traditional Conference Luncheon, included in the registration fee, will be held at 12 Noon Thursday, December 15th in the ballroom at the Marriott. The luncheon will feature the state-of-the-art society address by the CSS President, Edward J. Davison, and the presentation of awards including the newly established Distinguished Member Awards, The Outstanding Transactions Paper Award, and Fellow Awards. Professor James Meditch of the University of Washington will serve as the Master of Ceremonies.

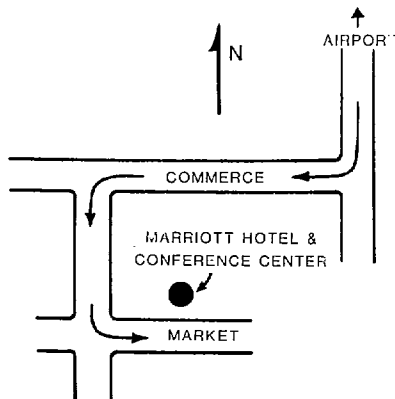
### IV. Hotel Reservations

From its commanding position at the head of the San Antonio Riverwalk, the Marriott Hotel rises 30 stories above HemisFair Park featuring the Tower of the Americas, the Convention Center, the Alamo, and the multitude of restaurants and specialty shops that line the Riverwalk. The San Antonio Marriott offers a wide choice of restaurants and lounges, including Gambits on the Riverwalk, with its unique two-story arrangement and view of the riverwalk. The focal point of the Marriott's light-filled atrium is a spectacular indoor-outdoor swimming pool, the facilities also include a hydrotherapy pool, sauna and game-room. There are private and municipal golf courses and night-lighted tennis courts in the near vicinity.

Special room rates have been established for the conference: \$58/night for single occupancy and \$69/night for double occupancy, plus tax. These rates are available for the period of December 11 to 17 for those who want to come early or stay late. **RESERVATIONS INCLUDING ONE NIGHT'S DEPOSIT MUST BE RECEIVED BY NOVEMBER 20, 1983.** Reservations received after that date will be subject to availability. All requests for reservations should be addressed to the Marriott Hotel using the enclosed form or by calling (512) 224-4555; you must mention the 1983 IEEE CDC to obtain the group rate.

### V. Transportation

Most will arrive at the San Antonio International Airport on the north side of the city. The San Antonio Marriott Hotel is about 10 miles south of the airport. (San Antonio has a second Marriott located very near the airport.) Both taxi and limousine service are readily available, however, the hotel does not provide a shuttle service. Taxi fare should be about \$10 for up to four people to the hotel. Limousine fare should be about \$5 per person. Since all CDC activities, as well as eating and entertainment facilities, are within pleasant walking distance of the Marriott, car rental is not necessary. Car rentals are, however, readily available at the airport. Reach the hotel from the airport by driving south on Route 281. Route 281 joins Interstates 35 and 37 South in the downtown area. Take the Commerce Street exit and turn right (west) on Commerce Street (a one-way street). The Marriott Hotel is only a few blocks from this exit. Commerce is at the rear of the hotel, thus, it will be necessary to take the first left just past the hotel. Then take the first left again onto Market Street, a one-way street which passes in front of the hotel.



American Airlines has been designated as the official airline of the 22nd CDC. They will provide fares equal to any American special promotional fare for which you qualify or 30% discount from day coach fare, whichever is less. Tickets must be purchased at least 14 days prior to departure but no later than 10 days after the reservations are made. The discount tickets will be subject to a \$30 cancellation penalty if submitted for refund. To obtain these special fares, you or your travel agent should contact American Airlines (800) 433-1741, and mention STAR file number S5698.

### VI. Authors Breakfast

Every morning from 7:30 to 8:15, breakfast will be provided on the Ballroom level of the Marriott Hotel for that day's authors and session chairmen. Tickets for each breakfast will be included in the registration packets of those who are participating in the technical program for that day. Registration will open at 7:00 a.m. in order to accommodate persons who arrived after registration had closed on the previous day. Each Session Chairman will host the participants in his session, in order to coordinate session presentations and disseminate any last minute information. Please plan to attend!

### VII. Preconference Tutorial Workshop

A full-day tutorial workshop on adaptive control is being offered by the Education Committee of the IEEE Control Systems Society. This workshop is scheduled for Tuesday, December 13th, from 9:00 a.m. to 5:30 p.m. and will include manufacturer's demonstration of recently introduced adaptive controllers by Foxboro, Honeywell, ASEA and others from 7:00 p.m. to 9:00 p.m. The registration fee is \$75 for those who also register for the 22nd CDC and \$125 for those attending the workshop only. Preregistration is strongly encouraged so that adequate arrangements can be made for all who wish to attend. (See the enclosed registration form.)

The Adaptive Control Workshop has been organized by C. R. Johnson, Jr. of Cornell University, Associate Editor of the CSS Transactions for identification, and will feature presentations by Lennart Ljung, Graham C. Goodwin and Karl Johan Astrom. The workshop will be held in the ballroom level of the Marriott Hotel.

### VIII. Exhibits

This year's Conference on Decision and Control is planning exhibits by book publishers as well as suppliers of robotic devices and computer-aided control-system design packages. The exhibits will be open daily in the registration area in the Convention Center. Be sure to take advantage of this opportunity to learn about the newest publications in the control field and to pick up some information on some of the rapidly changing control technology.

### IX. Local Arrangements Desk

A Local Arrangements Desk will be set up near the conference registration area in the Convention Center. Local information, restaurant suggestions, maps and local attractions will be available. In addition, two important conference services will be provided:

**MESSAGE CENTER:** Attendees can be reached during the conference by calling (512) 299-8532 or 299-8500 and asking for the CDC Message Center. Messages will be posted on the bulletin board as they arrive.

**COMMITTEE MEETING ROOMS:** Requests for committee meeting rooms should be made IN ADVANCE in order to insure adequate space. These requests, containing the subject of the meeting, an estimate of the number of attendees, and a description of the desired room arrangement (i.e., theater style, conference style, etc.) should be MAILED DIRECTLY to:

Dr. James L. Meisa  
Department of Electrical Engineering  
University of Notre Dame  
Notre Dame, IN 46556

Last minute requests will be handled through the Local Arrangements Desk on a space available basis.

## X. San Antonio Attractions

Will Rogers once said that San Antonio was one of America's unique cities; visitors couldn't agree more. The casual, relaxed pace and the friendly atmosphere invite you to "come as you are". It is a city that can claim a special charm as well as especially friendly people. This special charm, this uniqueness rests, in large part, with a gentle river which winds through the entire downtown area. Bordering the river and at its attractions is Paseo del Rio, the Riverwalk, by the head of the fabulous Riverwalk is where you'll find the Marriott Hotel and the San Antonio Convention Center. Next door to the Marriott is the Theater for Performing Arts. There is also the fabulous Hertzberg Circus Collection, the classic car exhibit at the Museum of Transportation, and the McNay Art Institute.

You can enjoy a leisurely stroll along the well-appointed banks of the river or board a river taxi for a pleasant cruise along the entire river route. Along and within very easy walking distance of the river are multiple attractions. The river is lined with European-style cafes, night clubs, specialty boules and graces; Spanish Colonial dwellings characteristic of San Antonio. The historic Alamo, location of Davy Crockett's last stand, is a must. The HemisFair Plaza, site of the 1968 World's Fair, includes the Institute of Texas Culture and the Tower of the Americas which rises 750 feet above the city to an observation deck with a cocktail lounge and revolving restaurant. Visit El Mercado, a bustling Mexican marketplace, to view authentic Mexican arts and crafts. La Villita, the Little Village, allows local artists to demonstrate and sell their wares in the original stone houses built by the first settlers in San Antonio. The Orientale Surken Gardens feature a Swiss skyride and the world's longest miniature train ride.

For those a little more venturesome, the area in and around San Antonio contains some of the most beautiful Spanish missions in North America, the famous Witte Museum, and the popular Southwest Craft Center. Brackenridge Park, the ever-popular Texas Hill country is just a short drive away.

A bus tour of a local brewery, site of the historic Buckhorn Saloon and the largest collection of horned trophies in the world, as well as fun and feather trophies, has been planned. But the Riverwalk will be our constant pleasure, especially beautiful in December. With the Riverwalk ablaze with colored red, blue, green, and yellow lights, it resembles an electric serape. Plan a most pleasant week with beautiful weather.

## TUTORIAL WORKSHOP ON ADAPTIVE CONTROL

TUESDAY, DECEMBER 13, 1983  
MARRIOTT HOTEL, BALLROOM LEVEL

Organizer: C. R. Johnson, Jr., Cornell University

**Summary:** The adaptive control problem can be viewed as one of on-line parameter estimation in structures that, when suitably parameterized, meet the control objective. Thus the quest for development of adaptive controllers can be seen as an attempt to automate the techniques of modeling and control design which have been the standard tools for control engineering for years. This tutorial workshop will exploit this "parameter estimation for control" viewpoint as indicated by the tentative program outlined below. The intent is to provide, for the first time, a unified, pedagogically sound approach to adaptive control design accessible to a broad range of control engineers. Not only deterministic but also stochastic problems will be addressed in this unified framework.

Only an introductory graduate level understanding of the mathematics of control and system theory will be presumed. Completion of this workshop hopefully will enable the participants to appreciate the perspectives of theoreticians as typically presented in CDC sessions and to realistically evaluate possible adaptive control implementations.

This workshop should appeal to both theoreticians and practitioners who are currently being attracted to the field of adaptive control.

Each of the lecturers is the author of a text soon to be published emphasizing their respective topics indicated in the tentative program below. The manufacturer's demonstrations are scheduled to include recently introduced adaptive controllers by Foxboro, Honeywell, ASEA and other companies.

## SESSION 1: 9:00-9:30 a.m.

### Introduction

Speaker: C. R. Johnson, Jr.

## SESSION 2: 9:30-11:30 a.m.

### Adaptive Parameter Estimation Algorithms

Lecturer: L. Ljung

## SESSION 3: 1:00-3:00 p.m.

### Formulation of Adaptive Control as Parameter Estimation Problem

Lecturer: G. C. Goodwin

## SESSION 4: 3:30-5:30 p.m.

### Software and Hardware Implementation (with Industrial Applications)

Lecturer: K. J. Astrom

## SESSION 5: 7:00-9:00 p.m.

### Manufacturer Displays of Adaptive Control Devices

Coordinator: C. R. Johnson, Jr.

## PROGRAM

**CODING:** WA = Wednesday morning  
WP = Wednesday afternoon  
TA = Thursday morning  
TP = Thursday afternoon  
FA = Friday morning  
FP = Friday afternoon  
(I) = Invited paper  
(SIAM) = Paper or session contributed by the Society for Industrial and Applied Mathematics

All sessions will be held in the Convention Center except for Penary Session I and the Conference Luncheon.

## WEDNESDAY MORNING DECEMBER 14, 1983

### 8:30-9:30 River

#### PLENARY SESSION 1

Chairman: J. L. Melsa, University of Notre Dame  
Co-Chairman: S. I. Marcus, University of Texas at Austin

#### Chaos and Randomness in Dynamical Systems

Roger W. Brockett, Harvard University

#### SESSION WA1: Fiesta 1

##### Recent Developments in Decentralized Control

Organizer and Chairman: T. Basar, University of Illinois  
Co-Chairman: H. K. Khalil, Michigan State University

### 9:45-10:15 (I)

Homotopic Invariance of the Decentralized Eigenvalue Placement Property

S. Richter, ITT Avionics, and R. DeCarlo, Purdue University

### 10:15-10:45 (I)

Decentralized Control of Multi-Zone Buildings

E. J. Davison and A. Solomon, University of Toronto  
CANADA

### 10:45-11:15 (I)

A Stochastic Inclusion Principle  
M. Hozic, University of Santa Clara, R. Krivacic, Serbian Academy of Arts and Sciences, YUGOSLAVIA, and D. D. Siljak, University of Santa Clara

### 11:15-11:45 (I)

An Approach to Order Reduction in Decentralized Systems

U. Ozguner and L. C. Lee, Ohio State University

### 11:45-12:15 (I)

Characterization of All Decentralized Stabilizing Compensators

M. Vidyasagar and N. Viswanadham, University of Waterloo  
CANADA

### 12:15-12:45 (I)

Pole Placement Under Structural Constraints

M. Sezer, University of Petroleum and Minerals, SAUDI ARABIA

## SESSION WA2: Fiesta 2

### Parameter Estimation and Control in Distributed Systems (SIAM)

Organizers and Chairmen: H. T. Banks, Brown University, and P. L. Daniel, Southern Methodist University

### 9:45-10:15 (I)

Asymptotic Solutions for Optimal Control Systems Governed by Hyperbolic Partial Differential Equations  
G. Chen, Pennsylvania State University

### 10:15-10:45 (I)

The Application of Legendre-Tau Approximation to Parameter Identification for Delay and Partial Differential Equations  
K. To, ICASE/NASA Langley Research Center

### 10:45-11:15 (I)

Computation of Closed Loop Eigenvalues Associated with the Optimal Regulator Problem for Functional Differential Equations

A. Z. Manitius and H. Tran, Rensselaer Polytechnic Institute

### 11:15-11:45 (I)

A Spline-Based Approximation Method for Inverse Problems for a Hyperbolic System Including Unknown Boundary Parameters

K. A. Murphy, Southern Methodist University

### 11:45-12:15 (I)

Identification of Parameters in Distributed Parameter Systems by Regularization

C. Kravaris and J. H. Seinfeld, California Institute of Technology

### 12:15-12:45 (I)

Identification of Drag Coefficients in Certain Fluid Flow Models

L. W. White, Oklahoma University

## SESSION WA3: Fiesta 3

### Estimation I

Chairman: W. Hopkins, Princeton University  
Co-Chairman: N. K. Loeh, Oakland University

### 9:45-10:15

Linear Estimation of Boundary Value Stochastic Processes  
M. B. Adams, C. S. Draper Laboratory, A. S. Willsky and B. C. Levy, Massachusetts Institute of Technology

### 10:15-10:45

Estimation in Random Fields with Scattered Data  
G. Bastin and M. Gevers, Louvain University, BELGIUM

### 10:45-11:00

On Scattering, Time Reversal and Information Forms  
A. M. Bruckstein and T. Kailath, Stanford University

### 11:00-11:15

Decentralized State Estimation Through On-Line Identification of Interaction Mode

A. K. Mahalanabish, Lehigh University and S. I. Ahson and R. Prasad, Indian Institute of Technology, New Delhi, INDIA

### 11:15-11:45

Asymptotic Behavior of Stochastic Approximation and Large Deviations

F. J. Kushner, Brown University

### 11:45-12:00

A Regular Perturbation Expansion in Nonlinear Filtering  
W. H. Fleming and R. W. McGwier, Brown University

### 12:00-12:15

Polytomial Feedback Predictor  
T. Namera, NEC Nippon Electric Co., Yokohama, JAPAN, and A. F. Stuberud, U.S. Air Force

### 12:15-12:45 (SIAM)

New Results on the Interpolation Problem for Continuous-Time Stochastic Incremental Processes  
M. Pavon, LADSEB-CNR, Padova, ITALY

**SESSION WA4: Fiesta 4****New Approaches to Multivariable Feedback Design**

Organizers: B. A. Francis, University of Waterloo, CANADA, and G. Stein, Honeywell Systems and Research Center

Chairman: B. A. Francis, University of Waterloo, CANADA  
Co-Chairman: G. Stein, Honeywell Systems and Research Center

**9:45-10:15 (I)**

Optimal Disturbance Reduction in Linear Multivariable Systems

B.-C. Chang and J. B. Pearson, Rice University

**10:15-10:45 (I)**

A CAD Methodology for Linear Multivariable Systems Based on Algebraic Design Theory

C. A. Desoer and C. L. Gustafson, University of California, Berkeley

**10:45-11:15 (I)**

Synthesis of Robust Controllers and Filters with Structural Plant Uncertainty

J. Doyle, Honeywell Systems and Research Center

**11:15-11:45 (I)**

Design of  $H^\infty$ —Optimal Multivariable Feedback Systems

B. A. Francis, University of Waterloo, CANADA, and G. Zames, McGill University, CANADA

**11:45-12:15 (I)**

Robustness Analysis of Sampled-Data Control Systems

N. Lehtomäki and J. Doyle, Honeywell Systems and Research Center

**12:15-12:45 (I)**

$L^\infty$  Optimal Sensitivity vs. Stability Margins

M. Safonov, University of Southern California

**SESSION WA5: Fiesta 5****Linearization and Geometric Methods**

Organizer and Chairman: M. Hazewinkel, Stichting

Mathematisch Centrum, THE NETHERLANDS

Co-Chairman: H. Nijmeijer, Twente Technological University, THE NETHERLANDS

**9:45-10:15 (I)**

Applications of Linearization to Flight Control

G. Meyer, NASA, Ames Research Center

**10:15-10:45 (I)**

Deformations, Obstructions and Linearization

R. Hermann, Association for Physical & Systems Mathematics, Inc.

**10:45-11:15 (I)**

Linear Approximations to Nonlinear Systems

L. R. Hunt and R. Su, Texas Tech University

**11:15-11:45 (I)**

Partial and Robust Linearization of Systems by Feedback

A. Krener, University of California, Davis, A. Isidori,

University of Rome, ITALY, and V. Respondek,

Technical University of Warsaw, POLAND

**11:45-12:15 (I)**

Noninteracting Control for Nonlinear Systems

H. Nijmeijer, Twente University of Technology, THE NETHERLANDS

**12:15-12:45 (I)**

An Approach to Nonlinear Feedback Control with

Applications to Robotics

E. G. Gilbert, University of Michigan

**SESSION WA6: Fiesta 6****Optimal Control I**

Chairman: W. E. Schmitendorf, Northwestern University

Co-Chairman: G. Lee, Colorado University

**9:45-10:15**

Reduction of Redundant Data in the Quadratic Cost Formulation for Linear Time-Variant Systems

E. B. Lee and W.-S. Lu, University of Minnesota

**10:15-10:45 (SIAM)**

Higher-Order Necessary Conditions in Optimization Theory: A Systematic Approach

D. S. Bernstein, Massachusetts Institute of Technology, Lincoln Laboratory

**10:45-11:15 (SIAM)**

On Deterministic Control Problems: An Approximation Procedure for the Optimal Cost

R. Gonzalez, University of Rosario, ARGENTINA, and E. Rofman, INRIA, Le Chesnay, FRANCE

**11:15-11:45**

The Optimal LO Regulator With Cheap Control for Not Strictly Proper Square Systems

B. M. Scherzinger and E. J. Davison, University of Toronto, CANADA

**11:45-12:15**

Explicit Optimality Conditions for Fixed-Order Dynamic Compensation

D. C. Hyland and D. S. Bernstein, Massachusetts Institute of Technology, Lincoln Laboratory

**12:15-12:45 (SIAM)**

A General Approach to Existence in Optimal Control Theory

E. J. Bader, University of Utrecht, THE NETHERLANDS

**12:45-1:00**

Time-Optimal Feedback Control of Oscillatory Third-Order Systems

J. T. Kouba, S. C. Bose, and R. W. Bass, Applied Science Analytics, Inc.

**SESSION WA7: Fiesta 7****Numerical Computations in Control—Three Tutorials (SIAM)**

Organizer and Chairman: J. Culium, IBM Research

Co-Chairman: A. Laub, University of Southern California

**9:45-10:45 (I)**

Instability, Condition Numbers, and Accuracy in Numerical Methods

C. Moler, University of New Mexico

**10:45-11:45 (I)**

A User's Guide to Optimization Algorithms

J. Dennis, Rice University

**11:45-12:45 (I)**

Numerical Aspects of Solving Algebraic Riccati Equations

A. Laub, University of California, Santa Barbara

**SESSION WA8: River A****Global Convergence and Robustness of Adaptive Control**

Chairman: P. E. Caines, McGill University

Co-Chairman: G. S. Axelby, Westinghouse Electric Corp.

**9:45-10:15**

Global Stability of a Direct Hybrid Adaptive Pole Placement Algorithm

H. Elliott, R. Cristi, and M. Das, University of Massachusetts

**10:15-10:45**

Convergence of an Adaptive Control Scheme Applied to Non-minimum Phase Plants

J. B. Moore, Australian National University, Canberra, AUSTRALIA, and R. Kumar, California State University, Fullerton

**10:45-11:15**

Towards a Globally Stable Direct Adaptive Control

Scheme for Not Necessarily Minimum Phase Systems

L. Praly, CNRS-Ecole des Mines de Paris, FRANCE

**11:15-11:45**

Design of Decentralized Adaptive Controllers

P. Ioannou, University of Southern California

**11:45-12:15**

Input Conditions for Continuous-Time Adaptive System Problems

S. Dasgupta and B. D. O. Anderson, Australian National University, Canberra, AUSTRALIA, and A.-C. Tsou, University of Auckland, NEW ZEALAND

**12:15-12:30**

Sufficient Excitation Criteria for Reduced-Order Adaptive Observers

J. H. Lilly, State University of New York at Stony Brook

**12:30-12:45**

Direct Adaptive Control with Bounded Tracking Errors

I. Bar-Kana and H. Kaufman, Rensselaer Polytechnic Institute

**WEDNESDAY AFTERNOON****DECEMBER 14, 1983****SESSION WP1: Fiesta 1****Reduced-order Models for Large-scale Systems**

Organizer and Chairman: N. K. Sinha, McMaster University, CANADA

Co-Chairman: P. Sarnuti, Rutgers University

**2:30-3:00 (I)**

Aggregate Modeling of Dynamic Networks with Sparse Connections

J. H. Chow, General Electric Company, and P. V. Kokotovic, University of Illinois

**3:00-3:30 (I)**

A Study of Stability Associated with Mode Reduction

F. Hamano and V. Shamasan, Florida Atlantic University

**3:30-4:00 (I)**

An Algebra-Geometric Approach for Mode Reduction

L. S. Shieh and Y. T. Tsay, University of Houston

**4:00-4:30 (I)**

Singular Perturbation Analysis of Cheap Control Problems

P. Sarnuti and H. Wason, Rutgers University

**4:30-5:00 (I)**

A Projection Approach for Model Reduction by Covariance Matching

A. Youssoufi, D. A. Wagle, and R. E. Skelton, Purdue University

**5:00-5:30 (I)**

Rough Approximation in the Time Domain

I. E. Naftas, N. K. Sinha, and R. T. H. A. den, McMaster University, CANADA

**SESSION WP2: Fiesta 2****Control of Distributed-Parameter Systems**

Organizers and Chairmen: L. Meirovitch, Virginia

Polytechnic Institute and State University, and T. I. Seidman, University of Maryland, Baltimore County

**2:30-3:00 (I)**

Approximation of Feedback Control for Parabolic Systems

H. T. Banks, Brown University and Southern Methodist University, and K. Kunisch, Technische Universität Graz, AUSTRIA

**3:00-3:30 (I)**

Ritz-Galerkin Approximations for Time-Optimal Control Problems

I. Lasiecka, University of Florida

**3:30-4:00 (I)**

A Function-Space Approach to Maximum Likelihood

Identification of Parameters in Elliptic Systems

G. Rodriguez, Jet Propulsion Laboratory

**4:00-4:30 (I)**

State Space and Input-Output Conditions for Stable

Feedback Control of Distributed Parameter Systems

M. J. Balas, Rensselaer Polytechnic Institute

**4:30-5:00 (I)**

Control of Nonconservative Distributed-Parameter Systems

L. Meirovitch and L. M. Silverberg, Virginia Polytechnic Institute and State University

**5:00-5:30 (I)**

Discrete-Time Optimal Control of Flexible Structures

J. S. Gieson, University of California, Los Angeles

**5:30-6:00 (I)**

Boundary Control for Maxwell's Equations

D. L. Russell, University of Wisconsin

**SESSION WP3: Fiesta 3****Estimation II**

Chairman: M. H. A. Davis, Imperial College of Science and Technology, ENGLAND  
 Co-Chairman: W. S. Wong, Bell Laboratories

**2:30-3:00**

Some Min-max Detection and Estimation Problems in a Hilbert Space Setting

S. Verdú and H. V. Poor, University of Illinois

**3:00-3:30**

Performance Bounds for Robust Decision Problems With Uncertain Statistics

E. A. Geraniotis, University of Massachusetts

**3:30-3:45**

An Approach to Robust Kalman Filtering

C. G. Boncelet, Jr. and B. W. Dickinson, Princeton University

**3:45-4:00**

Adaptive Suboptimal Kalman Filtering

S. Olcese, Stanford University

**4:00-4:30**

Information in Prediction and Estimation

J. Rissanen, IBM Research, San Jose, CA

**4:30-5:00**

Nonstationary Stochastic Realization and Single Sample Identification

A. Benveniste and J. J. Fuchs, IRISA/INRIA, Rennes, FRANCE

**5:00-5:30**

Identifiability in Dynamic Errors-in-Variable Models

B. D. O. Anderson, Australian National University, Canberra, AUSTRALIA, and M. Deslaurier, Technische Universität Wien, AUSTRIA

**5:30-5:45**

Properties of Non-Parametric Time-Domain Methods for Estimating Transfer Functions

L. Ljung and Z.-D. Yuan, Linköping University, SWEDEN

**SESSION WP4: Fiesta 4****Stability and Eigenvalue Considerations in Robustness Problems**

Organizer and Chairman: B. R. Barmish, University of Rochester

Co-Chairman: A. Fain, State University of New York, Buffalo

**2:30-3:00 (I)**

Minimizing Norm Sensitivity of Characteristic Roots

E. G. Gilbert, University of Michigan

**3:00-3:30 (I)**

Eigenvalues of Robust Observers with Unavailable Inputs

E. Rynasky, Calsonic Corp.

**3:30-4:00 (I)**

Robust Projector Matrix Decomposition in Time-Varying Observer Designs

G. H. Hostetter, University of California, Irvine

**4:00-4:30 (I)**

Design of Controllers to Solve the Robust Servomechanism Problem for a Class of Nonlinear Systems

A. Sotiropoulos and E. J. Davison, University of Toronto, CANADA

**4:30-5:00 (I)**

Robustness and Eigenstructure

A. N. Andry, E. Y. Shapiro, and C. Chung, Lockheed California Company

**5:00-5:30 (I)**

Global Stability/Local Optimality Tradeoffs in a Class of Decentralized ICR Filters

L. Chin, Nava Air Development Center, and A. Fain, State University of New York at Buffalo

**5:30-6:00 (I)**

Invariance of the Strict Hurwitz Property for Polynomials and Perturbed Coefficients

B. R. Barmish, University of Rochester

**SESSION WP5: Fiesta 5****Complicated Dynamics in Nonlinear Systems and Feedback Systems**

Organizers: F. M. A. Salam, J. E. Marsden, and S. S. Sastry, University of California, Berkeley

Chairman: F. M. A. Salam, University of California, Berkeley

Co-Chairman: J. E. Marsden, University of California, Berkeley

**2:30-3:00 (I)**

A Survey of Chaos and Arnold Diffusion via Melnikov's Method

J. E. Marsden, University of California, Berkeley

**3:00-3:30 (I)**

Chaos in the One-Generator System with Excitation Feedback

F. M. A. Salam, University of California, Berkeley

**3:30-4:00 (I)**

Chaotic Dynamics from Mode Interactions

J. Guckenheimer, University of California, Santa Cruz

**4:00-4:30 (I)**

Bifurcation and Chaos in a Simple Feedback Control System

P. J. Holmes, Cornell University

**4:30-5:00 (I)**

Chaos in the Swing Dynamics

N. Kopell, Northeastern University

**5:00-5:30 (I)**

Periodic Thermal Perturbation in a Van Der Waals Fluid Yielded Chaos: A Melnikov Approach

M. Serrano, Rensselaer Polytechnic Institute

**5:30-6:00 (I)**

Dynamics of the Josephson Junctions Circuits

M. Lev, Boston University

**SESSION WP6: Fiesta 6****Optimal Control II**

Chairman: P. Dorato, University of New Mexico

Co-Chairman: D. A. Pierre, Montana State University

**2:30-3:00**

Control Constraints, Abnormality and Improved Performance by Periodic Control

D. S. Bernstein, Massachusetts Institute of Technology, Lincoln Laboratory

**3:00-3:30 (SIAM)**

Extended Jacoby Sufficiency Criterion for Optimal Control: V. Zeidan, Université de Montréal, CANADA

**3:30-4:00**

Control of Linear Systems in Parallel

B. Friedland, Singer Keating Division

**4:00-4:30**

Guaranteed Robustness Properties of Multivariable Nonlinear Stochastic Optimal Regulators

J. N. Tsitsiklis and M. Athans, Massachusetts Institute of Technology

**4:30-5:00**

Exact Penalty Function Algorithms for Constrained Optimal Control Problems

D. G. Mayne and S. Smith, Imperial College of Science and Technology, ENGLAND

**5:00-5:30**

Sampled Data Systems on  $M \times L$ : The Quadratic Cost Formulation for Linear Delay Systems

E. Fernandez-Berdeguez and E. B. Lee, University of Minnesota

**5:30-6:00 (SIAM)**

A Complete Optimality Condition for the Inverse Problem of Optimal Control

T. Fujii, Osaka University, JAPAN, and M. Narazaki, Mitsubishi Precision Co., Ltd., Kamakura, JAPAN

**SESSION WP7: Fiesta 7****Computer-Aided Design and Computational Methods**

Chairman: H. A. Spang III, G. E. Research and Development Center

Co-Chairman: R. R. Strunce, C. S. Draper Laboratory

**2:30-2:45**

Development of an Interactive Graphical User Interface for the UMIST Control Design Suite

D. K. Frederick, Rensselaer Polytechnic Institute,

N. Munro, UMIST, Manchester, ENGLAND, P. Putz and D. Platzer, Rensselaer Polytechnic Institute

**2:45-3:00**

Nonuniform, Dynamically Adapted Discretization for Functional Constraints in Engineering Design Problems

H. Parsa and A. L. Tits, University of Maryland, College Park

**3:00-3:15**

The Role of Interactive Graphics in Parameter Optimization of Output Feedback Control Laws

T. Sadegh and R. Moz, Fairchild Republic Company

**3:15-3:30**

A Software Package for the Solution of Generalized Algebraic Riccati Equations

W. F. Arnold, Nava Weapons Center, and A. J. Laub, University of Southern California

**3:30-4:00**

Optimum System Design Using a Derivative Free Algorithm

T. E. McClellan and V. K. Jan, University of South Florida, and G. J. Doceck, Nava Coastal Systems Center

**4:00-4:30**

Numerical Aspects of the Inverse Function Theory

T. S. Lee, Massachusetts Institute of Technology, Lincoln Laboratory

**4:30-4:45**

Determining if a Noise Corrupted Matrix is Singular

J. E. Purvance, University of Idaho

**4:45-5:00**

A Numerical Solution for State Constrained Continuous Optimal Control Problems Using Improved Penalty Functions

R. V. Mayorga, I. E. Cuernavaca, MEXICO, and V. H. Quintana, University of Waterloo

**5:00-5:30**

A Fast Covariance Type Algorithm for Sequential Least-Squares Filtering and Prediction

N. Kalouptsis, University of Athens, G. Carayannis and D. Maniatakis, National Technical University of Athens, GREECE

**SESSION WP8: River A****Adaptive Control**

Chairman: H. Kaulman, Rensselaer Polytechnic Institute  
 Co-Chairman: H. Elliott, University of Massachusetts

**2:30-3:00 (SIAM)**

Recursive System Identification and Adaptive Control by Use of the Modified Least Squares Algorithm

H. F. Chen, McGill University, CANADA

**3:00-3:30**

Sidelobing the Positive Real Restriction for Stochastic Adaptive Schemes

J. B. Moore, Australian National University, Canberra, AUSTRALIA

**3:30-4:00**

Random Contraction and Convergence of Stochastic Recursions Arising in Adaptive Systems

P. R. S. Kumar, Rensselaer Polytechnic Institute

**4:00-4:30**

Ljapunov Functions for Adaptive Systems

R. Johansson, Lund Institute of Technology, SWEDEN

**5:00-5:30**

Prior Knowledge in Mode Reference Adaptive Control of Multi-Input Multi-Output Systems

L. Dugard, G. C. Goodwin, and C. E. de Souza, University of Newcastle, AUSTRALIA

**5:30-5:45**

Persistence of Excitation of Adaptive Control Schemes Without Continually Disturbed Controls

R. R. Bitmead, Australian National University, Canberra, AUSTRALIA

**5:45-6:00**

Input Conditions for Hybrid Adaptive Identification and Control

A. C. Tsor and R. R. Bitmead, Australian National University, Canberra, AUSTRALIA

**SESSION WP9: River B  
Traffic and Scheduling**

Chairman: P. K. Houpt, Massachusetts Institute of Technology  
Co-Chairman: J. S. Meditch, University of Washington

**2:30-3:00**

Realization of Asynchronous Finite-State Machines  
T. L. Johnson, Bot. Beranek and Newman, Inc., and M. E. Kaliski, Northeastern University

**3:00-3:15**

The Disturbance Decoupling Problem for Controlled Finite State Systems  
T. Nomura, Southern Illinois University

**3:15-3:30**

Decentralized Dynamic Routing Strategies for Communication Networks  
G. Casarino, F. Davoli, R. Minciardi, and R. Zoppoli, Istituto di Elettrotecnica, Università di Genova, ITALY

**3:30-4:00**

Optimality Properties of Proportional Capacity Assignment in Message and Packet-Switched Networks  
J. S. Meditch, University of Washington

**4:00-4:30**

Time Scheduling of a Mix of 4D Equipped and Unequipped Aircraft  
L. Tobias, NASA Ames Research Center

**4:30-5:00**

An Optimal Rescheduling for Online Train Traffic Control in Disturbed Situations  
S. Araya and K. Abe, Mitsubishi Electric Corp., Amagasaki, JAPAN

**5:00-5:30**

A Two-Level Control Scheme for Merging of Automated Vehicles  
G. K. Schmitz and B. Posch, Technische Universität München, WEST GERMANY

**THURSDAY MORNING  
DECEMBER 15, 1983**

**SESSION TA1: Fiesta 1  
Decentralized and Large Scale Systems**

Chairman: S. Lefebvre, Institut de Recherche d'Hydro-Québec, CANADA  
Co-Chairman: S. Brodsky, Office of the Undersecretary of Defense for Research and Engineering, D.O.D.

**8:30-9:00**

Hierarchical Lyapunov Functions  
M. Ikeda, Kobe University, JAPAN, and D. D. Siljak, University of Santa Clara

**9:00-9:30**

Computer Generated Lyapunov Functions for Interconnected Systems: Improved Results with Applications to Power Systems  
A. N. Michel, B. H. Nam, and V. Vittal, Iowa State University

**9:30-10:00**

Information Structure and Decomposition of Large Scale Systems  
D. K. Lindner, Virginia Polytechnic Institute and State University, and W. R. Perkins, University of Illinois

**10:00-10:30**

Design of Decentralized Static and Low-Order Dynamic Output Regulators for Large Scale Linear Systems  
J. Medanic, M. Pupir Institute, YUGOSLAVIA, and Z. Uskokovic, Titograd University, YUGOSLAVIA

**10:30-10:45**

Some Graph-Theoretic Properties in Decentralized Control  
C. Y. Chong, Advanced Information & Decision Systems

**10:45-11:00**

On the Simultaneous Design of Decentralized Linear Control Systems  
N. Schiavoni, Politecnico di Milano, ITALY

**11:00-11:15**

Nonlinear Data Fusion  
D. A. Castanon and J. Tenenetzis, AlphaTech, Inc.

**11:15-11:30**

Robust Stability of Additively Perturbed Interconnected Systems  
D. J. N. Limebeer and Y. S. Hung, Imperial College of Science and Technology, ENGLAND

**11:30-11:45 (SIAM)**

Exact Reachability For a Class of Semilinear Control Systems  
H. X. Zhou, Shantong University, JINAN, PRC

**SESSION TA2: Fiesta 2  
Aerospace and Applications**

Chairman: C. A. Harvey, Honeywell Systems and Research Center  
Co-Chairman: B. Doorn, Computer Sciences Corporation

**8:30-9:00**

Feedback Controllers for a Wind Tunnel Model Involving a Delay Analytical Design and Numerical Simulation  
A. Z. Manitius, Rensselaer Polytechnic Institute

**9:00-9:30**

Adaptive Estimation Scheme for Random Error Calibration  
W. R. Yueh, General Dynamics Pomona Division

**9:30-10:00**

A Sub-optimal Kalman Filter Design for Target Tracking Applications  
R. S. Baheti, General Electric Company

**10:00-10:15**

Estimating Target Acceleration in Intercept Problems Using Mosaic Equation Errors  
A. E. Pearson, Brown University

**10:15-10:30**

The Tracking Index: A Generalized Parameter for  $\alpha$ - $\beta$  and  $\alpha$ - $\beta$ - $\gamma$  Target Trackers  
P. R. Kalata, Drexel University

**10:30-10:45**

An Optimal Proportional-Plus-Integral/Tracking Control Law for Aircraft Applications  
T. Saccgni, Fairchild Republic Company

**10:45-11:00**

Dynamic Brake for an Automotive Engine Test Bench  
H. P. Geering and E. Schafer, ETH-Zentrum, Zurich, SWITZERLAND

**11:00-11:30**

Sensitivity Reduction and Robust Tracking with Application to Aircraft Control  
J. D. de Meo and S. N. Singh, Universidade Federal de Santa Catarina, BRAZIL

**SESSION TA3: Fiesta 3  
System Identification**

Chairman: A. H. Haddad, Georgia Institute of Technology  
Co-Chairman: P. S. Maybeck, Air Force Institute of Technology

**8:30-9:00**

Recursive Identification Algorithms for Right Matrix Fraction Description Models  
A. Neforai and M. Morf, Stanford University

**9:00-9:30**

A Time Varying Multivariate Autoregressive Modeling of Time Series  
W. Gersch, University of Hawaii, and G. Kitagawa, Institute of Statistical Mathematics, Tokyo, JAPAN

**9:30-10:00**

Convergence Analysis of a Linear Recursive Algorithm for ARMA Processes  
D. Q. Mayne and J. M. C. Clark, Imperial College of Science and Technology, ENGLAND

**10:00-10:30**

Identification of Moving Average Systems Using a Feedback Ladder Algorithm  
C. H. Muravchik and M. Morf, Stanford University

**10:30-11:00**

A Fast-Converging and High-Precision Recursive Identification Algorithm  
T. C. Hsia, University of California, Davis

**11:00-11:30**

A Partitioned Recursive Algorithm for the Estimation of Dynamical and Initial-Condition Parameters from Cross-Sectional Data  
D. W. Porter, M. D. Shuster, and B. P. Gibbs, Business and Technological Systems, Inc., and W. S. Levine, University of Maryland, College Park

**11:30-11:45**

Identification of Time-Varying Linear Models  
R. Lozano, CIEA del IPN, Mexico City, MEXICO

**SESSION TA4: Fiesta 4  
Design of Robust Control Systems**

Chairman: C. Holland, Office of Naval Research  
Co-Chairman: J. E. Wall, Jr., Honeywell Systems and Research Center

**8:30-9:00**

Worst Case Analysis in the Frequency Domain: The H<sup>∞</sup> Approach to Control  
J. W. Helton, University of California, San Diego

**9:00-9:30**

Relations Between Frequency Dependent Control and State Weighting in LQG Problems  
B. D. O. Anderson and J. B. Moore, Australian National University, Canberra, AUSTRALIA, and D. L. Mingori, University of California, Los Angeles

**9:30-10:00**

Robustness Optimization of Linear Feedback Systems  
H. Kwakernaak, Twente University of Technology, THE NETHERLANDS

**10:00-10:30**

Sensitivity Reduction, Nonminimum Phase Zeros, and Design Tradeoffs in Single Loop Feedback Systems  
J. S. Freudenberg and D. P. Looze, University of Illinois

**10:30-10:45**

The Relationship Between the Zames Representation and LQG Compensators  
M. Athans, Massachusetts Institute of Technology

**10:45-11:00**

Some Remarks on H<sup>∞</sup>-Sensitivity Minimization  
J. S. Freudenberg and D. P. Looze, University of Illinois

**11:00-11:30**

Robust Pole Assignment for Systems with Parameters  
T. E. Djaferis, University of Massachusetts

**SESSION TA5: Fiesta 5  
Formal Power Series in System Theory**

Chairman: J. B. Pearson, Rice University  
Organizer and Co-Chairman: A. C. Antoulas, Rice University

**8:30-8:45 (I)**

A Review of Some Applications of Formal Power Series in Non-Commuting Variables in Non-Linear Realization  
E. D. Sonntag, Rutgers University

**8:45-9:00 (I)**

Modeling of Non-Linear Systems from Input-Output Data  
B. W. Dickinson, Princeton University

**9:00-9:30 (I)**

Global Realization of Analytic Non-Linear Systems Via Non-Commutative Generating Power Series  
M. Fliess, Laboratoire des Signaux et Systemes, CNRS-ESE, Gif-sur-Yvette, FRANCE

**9:30-10:00 (I)**

Formal Infinite Zeros of Non-Linear Systems  
A. Isidori, University of Rome, ITALY

**10:00-10:30 (I)**

A Generalized Fock Space Model for Non-Linear Systems Driven By Random Inputs  
R. J. P. de Figueiredo, Rice University, and T. A. W. Dwyer, III, Colorado State University

**10:30-11:00 (I)**

Direct and Feedback Immersion of Non-Linear Systems Into Linear or State-Affine Systems  
S. Monaco, University of Rome, ITALY, and D. Normand-Cyrot, Laboratoire des Signaux et Systemes, CNRS-ESE, Gif-sur-Yvette, FRANCE

**11:00-11:30 (I)**

Recent Results on Linear Systems and Connections with Formal Power Series  
A. C. Antoulas, Rice University

**SESSION TA6: Fiesta 6****Game Theory**

Chairman: A. Haurie, Ecole des Hautes Etudes  
Commerciales, GERAD, CANADA  
Co-Chairman: D. L. Kleinman, University of Connecticut

**8:30-9:00**

An Equilibrium Theory for Multi-Person Decision Making  
with Multiple Probabilistic Models. Part II: Asymmetric  
Mode of Decision Making  
T. Basar, University of Illinois

**9:00-9:30**

Three-Level Stackelberg Decision Problems  
P. B. Luh, University of Connecticut, T. S. Chang, State  
University of New York at Stony Brook, and T. Ning,  
University of Connecticut

**9:30-10:00**

On the Interactions of Incentive and Information  
Structures  
Y. C. Ho, Harvard University, and D. Teneketzis,  
Aphatech, Inc

**10:00-10:30**

A Stackelberg Equilibrium For Continuous-Time Differential  
Games  
B. Tolwinski, University of Puerto Rico

**10:30-11:00**

A Realistic Aerial Combat Duel as a Differential Game  
Study  
B. Järnmark, SAAB-SCANIA, Linköping, SWEDEN

**11:00-11:30**

Non Classical Information and Optimality in Continuous-  
Time Dynamic Team Problems  
J. Levine, Centre d'Automatique et d'Informatique de  
l'Ecole Nationale Supérieure des Mines de Paris,  
Fontainebleau, FRANCE

**11:30-11:45 (SIAM)**

Existence of Value in Generalized Pursuit-Evasion Games  
L. S. Zaremba, Agricultural and Pedagogical University,  
Siedlce, POLAND

**SESSION TA7: Fiesta 7****Estimation and Control with Quantized Data**

Organizer and Chairman: J. D. Gibson, Texas A&M  
University  
Co-Chairman: T. R. Fischer, Texas A&M University

**8:30-9:00 (I)**

Fixed Point Implementations of Fast Kalman Algorithms  
L. L. Scharf, University of Rhode Island

**9:00-9:30 (I)**

A Companding Approximation for the Statistical  
Divergence of Quantized Data  
H. V. Poor, University of Illinois

**9:30-10:00 (I)**

A Unified Approach to Parameter Estimation  
C. C. Lee, Northwestern University

**10:00-10:30 (I)**

Quantizer Effects in RML-Based ADPCM  
C. Heegard, C. R. Johnson, Jr., and J. P. Lyons, Jr.,  
Cornell University

**10:30-11:00 (I)**

Adaptive Prediction with Quantized Data  
J. D. Gibson and R. C. Reininger, Texas A&M  
University

**11:00-11:30 (I)**

Communication Rate Allocation in Quantized Control  
T. R. Fischer and C. J. Meadow, Texas A&M University

**SESSION TA8: Fiesta 8****Stochastic and Adaptive Systems (SIAM)**

Organizer and Chairman: S. K. Mitter, Massachusetts  
Institute of Technology  
Co-Chairman: P. R. Kumar, University of Maryland,  
Baltimore County

**8:30-9:00 (I)**

Open Problems in Stochastic and Adaptive Systems  
S. K. Mitter, Massachusetts Institute of Technology

**9:00-9:30 (I)**

Inverse Scattering Methods for Linear Estimation  
B. C. Levy, Massachusetts Institute of Technology

**9:30-10:00 (I)**

The Effects of Small Noise on Implicitly Defined Nonlinear  
Dynamic Systems  
S. S. Sastry and P. P. Varaiya, University of California,  
Berkeley

**10:00-10:30 (I)**

Approximation and Robustness of Estimates of Escape  
Times for Systems with Small Noise Effects  
H. J. Kushner, Brown University

**10:30-11:00 (I)**

Memory Allocation and Routing: Some Dynamic  
Programming without Computation  
V. Benes, Bell Laboratories

**11:00-11:30 (I)**

Convergence in Self Tuning Controllers  
P. R. Kumar and W. Lin, University of Maryland, Baltimore  
County

**SESSION TA9: River B****New Concepts in Nuclear Power Plant  
Instrumentation and Control**

Organizer and Chairman: J. L. Tylee, EG&G Idaho, Inc  
Co-Chairman: J. E. Purviance, University of Idaho

**8:30-9:00 (I)**

New Concepts in Nuclear Power Plant Instrumentation  
and Control  
J. L. Tylee, EG&G Idaho, Inc.

**9:00-9:30 (I)**

A Performance Measure for System Monitoring and  
Sensor Placement  
J. E. Purviance, University of Idaho, and J. M. Griffith  
and J. L. Tylee, EG&G Idaho, Inc

**9:30-10:00 (I)**

Experimental Evaluation of Digital Control Schemes For  
Nuclear Reactors  
J. A. Bernard, Massachusetts Institute of Technology, and  
A. Ray, C. S. Draper Laboratory

**10:00-10:15 (I)**

An Adaptive Nuclear Reactor Simulator for Plant  
Monitoring  
R. B. Linford, S. C. Bhatt, S. P. Congdon, C. L. Martin, and  
G. R. Parkos, General Electric Company

**10:15-10:30 (I)**

Failure Detection and Isolation in a Nuclear Power Plant  
Under Steady-State Process Conditions  
J. J. Feeley, Energy, Inc.

**10:30-11:00**

Fault Analysis of In-Core Detectors in a PWR Using Time-  
Series Models  
B. R. Upadhyaya and M. Skorska, University of Tennessee

**11:00-11:30 (I)**

Use of Kalman Filter Methods in Analysis of In-Pile  
LMFBR Accident Simulations  
C. C. Meek, Exxon Production Research Company

**THURSDAY NOON  
DECEMBER 15, 1983****12:00-2:30 Marriott Ballroom  
CONFERENCE LUNCHEON**

Master of Ceremonies  
James S. Meditch, University of Washington  
State of the Society  
E. J. Davison, University of Toronto, CANADA, and  
President of IEEE Control Systems Society  
Awards Presentation

**THURSDAY AFTERNOON  
DECEMBER 15, 1983****SESSION TP1: Fiesta 1****Large Scale and Nonlinear Systems**

Chairman: O. P. Manley, Department of Energy  
Co-Chairman: A. J. Fish, Jr., University of Hartford

**3:00-3:30 (SIAM)**

State Deadbeat Response and Observability in Multi-Modal  
Systems  
L. T. Conner, Jr. and D. P. Stanford, College of William  
and Mary

**3:30-4:00**

Parametric Coordination in Hierarchical Control  
D. W. H. Cahulu and D. P. Looze, University of Illinois

**4:00-4:30**

Realization Algorithms and Approximation Methods of  
Bilinear Systems  
C. S. Hsu and U. B. Desai, Washington State University,  
and C. A. Crawley, IBM Corporation

**4:30-5:00**

Analysis of Limit Cycle Behavior Using a Modified Tsypkin  
Method  
M. Youhanaie and R. E. Reid, University of Illinois

**5:00-5:15**

Input-Output Stability Analysis with Hysteresis Nonlinearity  
M. G. Safonov and K. Karimlou, University of Southern  
California

**5:15-5:30**

Projection Methods for Discrete Descriptor Systems with  
Large Nonlinearities  
S. L. Campbell and J. Rodriguez, North Carolina State  
University

**5:30-5:45**

A New Technique for the Solution of a Nonlinear  
Functional Differential Equation  
A. S. C. Sinha, Purdue University

**5:45-6:00**

Observability and Non Linear Dead Beat Observers  
S. T. Glad, Linköping University, SWEDEN

**SESSION TP2: Fiesta 2****Control of Large-Angle Spacecraft Rotational  
Maneuvers**

Organizer and Chairman: J. D. Turner, C. S. Draper  
Laboratory  
Co-Chairman: J.-N. Juang, NASA Langley Research  
Center

**3:00-3:30 (I)**

Design of an Exact Nonlinear Model Follower for the  
Control of Large-Angle Rotational Maneuvers  
T. A. W. Dwyer, III, Colorado State University

**3:30-4:00 (I)**

Eigenvalue Optimization for High-Dimensioned Feedback  
Control Systems  
J. P. Dunnak, J. L. Junkins, and L. T. Watson, Virginia  
Polytechnic Institute and State University

**4:00-4:30 (I)**

Dynamics of Rotating Flexible Structures  
J. Baillet, Scientific Systems, Inc., and M. Lev, Scientific  
Systems, Inc. and Boston University

**4:30-5:00 (I)**

Optimal Slewing Maneuvers for Flexible Spacecraft Using  
a Closed Form Solution for the Linear Tracking Problem  
J. D. Turner and H. M. Chun, C. S. Draper Laboratory,  
Inc., and J.-N. Juang, NASA Langley Research Center

**5:00-5:30 (I)**

The Generalized Rigid Body Problem  
P. S. Krishnaprasad, University of Maryland, College Park

**5:30-6:00 (I)**

The Optimal Control of Flexible Systems Using a  
Convolution Integral Description of Motion  
S. B. Skaar and D. Tucker, Iowa State University

**SESSION TP3: Fiesta 3****Stabilization of Linear Systems**

Chairman: K. S. Kumar, University of Minnesota  
Co-Chairman: M. Schafer, University of Virginia

**3:00-3:30 (SIAM)**

Spectral Assignability of Systems with Scalar Control and Application to a Degenerate Hyperbolic System  
L. F. Ho, University of Iowa

**3:30-4:00**

Feedback System Design: The Pole Placement Problem  
A. Iyer and R. Saeks, Texas Tech University

**4:00-4:15**

Eigenstructure Assignment Via State-Feedback Control  
M. M. Fahmy, Assiut University, Assiut, EGYPT, and H. S. Tantawy, Al-Azhar University, Cairo, EGYPT

**4:15-4:30**

Lyapunov Steepest Descent Control of Constrained Linear Systems

W. J. Grantham and A. O. Chingcuanco, Washington State University

**4:30-5:00 (SIAM)**

A Local Approach to the Stabilization of Linear Systems Defined Over Non-Commutative Normed \*-Algebras  
W. L. Green, Georgia Institute of Technology, and E. W. Kamen, University of Florida

**5:00-5:30**

On Decoupling and Stabilization of Linear Systems  
Z. V. Rekasius, Northwestern University

**5:30-6:00**

A Necessary and Sufficient Condition for Feedback Stabilization in a Factorial Ring  
V. R. Raman and R. Liu, University of Notre Dame

**6:00-6:15**

Stability of Linear Time-Varying Systems via Differential Inequalities

E. I. Verriest, Georgia Institute of Technology

**SESSION TP4: Fiesta 4****Robust Stability and Performance**

Chairman: M. Vidyasagar, University of Waterloo, CANADA

Co-Chairman: S. Banda, Wright Aeronautical Laboratories

**3:00-3:30**

Reliable Stabilization Using a Multi-Controller Configuration

M. Vidyasagar, University of Waterloo, CANADA, and N. Viswanadham, Indian Institute of Science, Bangalore, INDIA

**3:30-4:00**

Robust Stabilizability for a Class of Transfer Functions  
H. Kimura, Osaka University, JAPAN

**4:00-4:30**

Robust Stability of Systems with Integral Control  
M. Morari, University of Wisconsin

**4:30-5:00**

Solution of the Robust Servomechanism Problem Subject to Specified Gain Margin and Time Lag Tolerance Constraints

E. J. Davison, University of Toronto, CANADA, and B. Copeland, University of Trinidad

**5:00-5:15**

The Multivariable Nature of Multivariable Feedback Systems

J. S. Freudenberg and D. P. Looze, University of Illinois

**5:15-5:30**

Design of Robust Asymptotic Tracking and Disturbance Rejection

S. Y. Zhang and C. T. Chen, State University of New York at Stony Brook

**5:30-6:00**

Nonlinear State Feedback Control of Uncertain Linear Systems and Application to Control of Aircraft

S. N. Singh, Universidade Federal de Santa Catarina, BRAZIL, and A. A. R. Coelho, Universidade Federal do Para, BRAZIL

**SESSION TP5: Fiesta 5****The Geometry of Control (SIAM)**

Organizer and Chairman: A. J. Krener, University of California, Davis

Co-Chairman: C. Byrnes, Harvard University

**3:00-3:30 (I)**

Compactifications of Spaces of Systems and Dynamic Compensators

C. Byrnes, Harvard University

**3:30-4:00 (I)**

Nipotent Approximation of Control Systems

H. Hermes, University of Colorado

**4:00-4:30 (I)**

Geometric Aspects of Minimum Energy Estimation

O. Hijab, Ohio State University

**4:30-5:00 (I)**

Polynomial Control Systems

V. Jurdjevic, University of Toronto, CANADA

**5:00-5:30 (I)**

Geometry of Multi-Lift Helicopter Systems

C. Martin, Case Western Reserve University, and J. Lewis, NASA, Ames Research Center

**5:30-6:00 (I)**

Distributed Bilinear Control Systems

M. Slemrod, Rensselaer Polytechnic Institute

**6:00-6:30 (I)**

Quadratic Control Systems

B. Bonnard, Laboratoire d'Automatique de Grenoble, FRANCE

**SESSION TP6: Fiesta 6****Optimization and Mathematical Programming**

Chairman: J. Chandra, U.S. Army Research Office

Co-Chairman: H. Mukai, Washington University

**3:00-3:30 (SIAM)**

Convergence Rates of Quasi-Newton Algorithms for Some Non-Smooth Optimization Problems

E. Sachs, North Carolina State University

**3:30-4:00 (SIAM)**

Structural Properties of Solutions to Continuous Linear Programs

J. Jasielek, Simon Fraser University, CANADA

**4:00-4:15**

Constrained Reachability Problems

W. E. Schmitendorf, Northwestern University, and W.-G. Hwang, Chonnam University, KOREA

**4:15-4:30**

New Lagrangian Function for Nonconvex Primal-Dual Decomposition

A. Tanikawa and H. Mukai, Washington University

**4:30-5:00 (SIAM)**

A Study of Minimizing Sequences

E. Polak, University of California, Berkeley, and Y. Y. Wardi, Bell Laboratories

**5:00-5:30 (SIAM)**

Synthesis of Optimization Algorithms by Concatenating Deterministic and Autonomous Algorithm Components

G. G. L. Meyer, The Johns Hopkins University

**5:30-6:00 (SIAM)**

Algorithm Models for Nondifferentiable Optimization

E. Polak, University of California, Berkeley, and D. Q. Mayne, Imperial College of Science and Technology, ENGLAND

**SESSION TP7: Fiesta 7****Applications of Microprocessors in Control**

Organizer: G. H. Hostetter, University of California, Irvine

Chairman: C. Lindquist, California State University

Co-Chairman: L. Mintzer, Rockwell International

**3:00-3:30 (I)**

Microprocessor-Based Optimum Control

C. S. Lindquist and E. N. Evans, California State University, Long Beach

**3:30-4:00 (I)**

Microprocessor-Based Adaptive Control Systems

R. Hurteau and R. M. DeSantis, Ecole Polytechnique de Montreal, CANADA

**4:00-4:30 (I)**

Microprocessor-Based Controllers for Intelligent Robot Systems

C.-F. Lin, University of Wisconsin-Madison

**4:30-5:00 (I)**

Distributed Processors: Local Allocation and Design Techniques

L. M. Mintzer, Rockwell International Marine Systems Division

**5:00-5:30 (I)**

Low Cost Microprocessor Based Optimal Controller for Solar Cooling Systems

S. Kotob, M. Salman, S. Ayyash, and M. Farhat, Kuwait Institute for Scientific Research, Safat, KUWAIT

**5:30-6:00 (I)**

Design of Optimal Holds for Reduced Control Update Rates

G. H. Hostetter, University of California, Irvine

**SESSION TP8: River A****Robustness Issues in Adaptive Control**

Organizer and Chairman: C. E. Rohrs, University of Notre Dame

Co-Chairman: G. Stein, Honeywell Systems and Research Center

**3:00-3:30 (I)**

On the Design of Robustly Performant Adaptive Controllers for Partially Modelled Systems

R. Ortega and I. D. Landau, Laboratoire d'Automatique de Grenoble, Saint-Martin-d'Herès, FRANCE

**3:30-4:00 (I)**

Conditions for Local Stability and Robustness of Adaptive Control Systems

R. L. Kosut, Integrated Systems, Inc., and C. R. Johnson, Jr., Cornell University

**4:00-4:30 (I)**

Robustness Studies in Adaptive Control

J. Krause, M. Athans, S. S. Sastry, and L. Valavani, Massachusetts Institute of Technology

**4:30-5:00 (I)**

An Explanation of the Counter-example to Adaptive Control by Rohrs

K. J. Astrom, Lund Institute of Technology, SWEDEN

**5:00-5:30 (I)**

Stabilization of Adaptive Systems with Parasitics and Disturbances

B. Riedle, B. Cyr, and P. V. Kokotovic, University of Illinois

**5:30-6:00 (I)**

A Frequency Selective Adaptive Controller

C. E. Rohrs, University of Notre Dame

**6:00-6:30 (I)**

Robustness Effects of Model Reference and Minimum Variance Control

G. C. Goodwin and C. E. de Souza, University of Newcastle, AUSTRALIA

**SESSION TP9: River B****Fusion Energy—Where Does the Control Engineer Fit?**

Organizer and Chairman: R. Gran, Grumman Aerospace Corporation

Co-Chairman: M. Balas, Rensselaer Polytechnic Institute

**3:00-3:30 (I)**

Fusion Energy—An Overview of the Physics, and the Control Problems

R. Gran, Grumman Aerospace Corporation

**3:30-4:00 (I)**

Feedback Control of Toroidally Confined Fusion Plasmas

S. W. Radovsky, INESCO, Inc.

**4:00-4:30 (I)**

Feedback Stabilization and Control of MHD Instabilities: What Can (And Cannot) Be Accomplished With Implementable Controllers?

M. J. Balas, Rensselaer Polytechnic Institute, and R. Gran, Grumman Aerospace Corporation

**4:30-5:00 (I)**

Feedback Control of Important Plasma Instabilities

A. K. Sen, Columbia University

**5:00-5:30 (I)**

Elements of Plasma Control in Tokamak Discharges

M. Colsaerts, CENFAR, Paris, FRANCE, and P. K. C. Wang, University of California, Los Angeles



**FRIDAY MORNING  
DECEMBER 16, 1983**

**8:30-9:30 Marriott Ballroom  
PLENARY SESSION II**

Chairman: S. I. Marcus, University of Texas at Austin  
Co-Chairman: J. L. Melsa, University of Notre Dame

**Estimation and Control in the VLSI Era**  
Thomas Kailath, Stanford University

**SESSION FA1: Fiesta 1  
Modeling and Optimization of Discrete Event  
Dynamic Systems**

Chairman: Y. C. Ho, Harvard University  
Organizer and Co-Chairman: R. Suri, Harvard University

**9:45-10:15 (I)**  
Perturbation Analysis of Sojourn Times in Queueing  
Networks  
Y. C. Ho and X. Cao, Harvard University

**10:15-10:45 (I)**  
Infinitesimal Perturbation Analysis of Discrete Event  
Dynamic Systems: A General Theory  
R. Suri, Harvard University

**10:45-11:15 (I)**  
A Linear-System-Theoretic View of Discrete-Event  
Processes, and Its Use for Performance Evaluation in  
Manufacturing  
G. Cohen, ENSMP, FRANCE, D. Dubois, CERT, FRANCE,  
and J. P. Quadrat and M. Viot, INRIA, FRANCE

**11:15-11:45 (I)**  
Iterative Queueing Network Techniques for Modeling  
Complex Manufacturing Systems  
K. R. Pattipati and M. P. Kastner, Alphatech, Inc.

**11:45-12:15 (I)**  
A New Approach Based on Operational Analysis for  
Flexible Manufacturing Systems Performance  
Evaluation  
Y. Dallery and R. David, Polytech. de Grenoble, FRANCE

**12:15-12:45 (I)**  
Models to Analyze Performance of Real Time Control of  
Manufacturing Systems  
K. E. Stecke, University of Michigan

**SESSION FA2: Fiesta 2  
Aerospace Applications**

Organizers: K. M. Sobel, A. N. Andry, and E. Y. Shapiro,  
Lockheed California Company  
Chairman: K. M. Sobel, Lockheed California Company  
Co-Chairman: A. N. Andry, Lockheed California Company

**9:45-10:15 (I)**  
Shortcomings of Modern Control  
P. Chandler and D. Potts, Wright Patterson AFB

**10:15-10:45 (I)**  
Identification and Optimal Control of Aeroelastic Systems  
J. Burns, Air Force Office of Scientific Research, and  
E. Cliff, Virginia Polytechnic Institute and State  
University

**10:45-11:15 (I)**  
A Control System for the X-29 Forward Swept Wing  
Airplane  
R. Gran, Grumman Aerospace Corporation

**11:15-11:45 (I)**  
End Gain Performance Tradeoff Analysis for NNK  
Interceptors  
J. Korn and S. W. Gully, Alphatech, Inc.

**11:45-12:15 (I)**  
Output Feedback Design for Aircraft with Ill-Conditioned  
Dynamics  
D. Moerder and A. J. Calise, Drexel University

**12:15-12:45 (I)**  
Robust Pitch Pointing Control Law for a Fighter Aircraft  
K. M. Sobel, Lockheed California Co

**SESSION FA3: Fiesta 3  
Non-Gaussian Problems in Detection and Estimation**

Chairman: W. L. Root, University of Michigan  
Organizer and Co-Chairman: C. R. Baker, University of  
North Carolina

**9:45-10:15 (I)**  
Detection of Weak Signals in Non-Gaussian Noise  
T. T. Kadota, Bell Laboratories

**10:15-10:45 (I)**  
Some Results on Robust Signal Detection  
H. V. Poor, University of Illinois

**10:45-11:15 (I)**  
Threshold Detection of Stochastic Signals in Narrowband  
Non-Gaussian Noise  
S. C. Schwartz and K. S. Vastola, Princeton University

**11:15-11:45 (I)**  
Detection of Non-Gaussian Signals  
C. R. Baker, University of North Carolina, and A. F.  
Gualtierotti, University of Lausanne, SWITZERLAND

**11:45-12:15 (I)**  
Nonlinear Filtering: Problems, Examples, Applications  
V. E. Benes, Bell Laboratories

**12:15-12:45 (I)**  
On a Suboptimal Nonlinear Filter  
T. U. Halawani, University of Petroleum and Minerals,  
Dhahran, SAUDI ARABIA, W. J. Kolodziej and R. R.  
Monter, Oregon State University

**SESSION FA4: Fiesta 4  
Variable Structure Systems**

Organizer and Chairman: K. A. Loparo, Case Western  
Reserve University  
Co-Chairman: C.-Y. Chong, Advanced Information and  
Decision Systems

**9:45-10:15 (I)**  
A Compensator Based Approach to Variable Structure  
Servo-Mechanism Design  
K. K. D. Young, Systems Control, Inc.

**10:15-10:45 (I)**  
Robustness Issues in the Sliding Control of Nonlinear  
Systems  
J. J. Slotine, Massachusetts Institute of Technology, and  
S. S. Sastry, University of California, Berkeley

**10:45-11:15 (I)**  
Multitask Control of Distributed Processes  
T. L. Johnson, Bolt Beranek and Newman, Inc.

**11:15-11:45 (I)**  
Control of Variable Structure Systems in the Plane  
J. T. Aslans and K. A. Loparo, Case Western Reserve  
University

**11:45-12:15 (I)**  
Markovian Jump Linear Quadratic Optimal Control in  
Discrete Time  
H. J. Chizeck, Case Western Reserve University, A. S.  
Willsky, Massachusetts Institute of Technology, and  
D. Castanon, Alphatech, Inc.

**12:15-12:45 (I)**  
Stochastic Hybrid State Systems for Electric Load  
Modeling  
R. Mulhame and C. Y. Chong, Advanced Information and  
Decision Systems

**SESSION FA5: Fiesta 5  
Nonlinear Systems**

Organizer and Chairman: H. J. Sussmann, Rutgers  
University  
Co-Chairman: E. D. Sontag, Rutgers University

**9:45-10:15 (I)**  
Random and Pseudo-Random Processes in Control  
J. Baillieul, Scientific Systems, Inc.

**10:15-10:45 (I)**  
Picard-Vessiot Theory of Bilinear Systems  
M. Fliess and C. Reutenauer, Laboratoire des Signaux et  
des Systemes, CNRS-ESE, Gil-sur-Yvette, FRANCE

**10:45-11:15 (I)**  
Existence and Uniqueness of Minimal Realizations for a  
Class of  $C^\infty$  Systems  
J. P. Gauthier, Laboratoire d'Automatique de Grenoble,  
Saint-Martin-d'Herès, FRANCE

**11:15-11:45 (I)**  
Internal Symmetries of Nonlinear Control Systems  
P. S. Krishnaprasad, University of Maryland, College Park

**11:45-12:15 (I)**  
Linearization of Nonlinear Systems about Constant  
Operating Points  
R. Lejeune and W. J. Rugh, The John Hopkins University

**12:15-12:30 (I)**  
Nonlinear Sampling  
E. D. Sontag, Rutgers University

**12:30-12:45 (I)**  
Regularity of Optimal Cost Functions  
H. J. Sussmann, Rutgers University

**SESSION FA6: Fiesta 6  
Stochastic Control**

Chairman: C. C. White, University of Virginia  
Co-Chairman: J. Walrand, University of California,  
Berkeley

**9:45-10:15**  
Two Competing Queues With Linear Costs: The  $\mu c$ -Rule Is  
Often Optimal

J. S. Baras, University of Maryland, College Park, A. J.  
Dorsey, IBM—Federal Systems Division, and A. M.  
Makowski, University of Maryland, College Park

**10:15-10:45**  
Extensions of the Multi-armed Bandit Problem  
P. Varaiya, J. Walrand, and C. Buyukkoc, University of  
California, Berkeley

**10:45-11:15**  
Serving Process with Least Thinking Time Maximizes  
Resource Utilization  
C. Courcoubetis and P. Varaiya, University of California,  
Berkeley

**11:15-11:45 (SIAM)**  
An Optimal Control of a Brownian Motion  
Y. C. Luo, Brown University

**11:45-12:15**  
Discrete Time Stochastic Control for Time Varying  
Systems  
X. X. Ya and R. J. Evans, University of Newcastle,  
AUSTRALIA

**12:15-12:30**  
Optimal Stochastic Control Involving Impulse and  
Switching Actions  
S. A. Belbas, University of Maryland, College Park, and  
S. M. Lenhart, University of Tennessee

**12:30-12:45**  
Robust LQG Design of Discrete Systems Using a Dual  
Criterion  
M. J. Grimble, University of Strathclyde, SCOTLAND

**SESSION FA7: Fiesta 7  
Robotics and Microprocessor-Based Control**

Chairman: J. F. Cassidy, Jr., General Electric Research  
and Development Center  
Co-Chairman: M. Spong, Cornell University

**9:45-10:15**  
Suboptimal Control of Industrial Manipulators with a  
Weighted Minimum Time-Fuel Criterion  
B. K. Kim and K. G. Shin, University of Michigan

**10:15-10:45**  
Development of the Generalized d'Alembert Equations of  
Motion for Mechanical Manipulators  
C. S. G. Lee, B. H. Lee, and R. Nigam, University of  
Michigan

**10:45-11:15**  
Robust Non Linear Control of Robotic Manipulators  
C. Samson, IRISA/INRIA, Rennes, FRANCE

**11:15-11:30**  
Robot Path Control Based on Iterative Coordinate  
Transformation Procedure  
V. J. Lumelsky, General Electric Co.

**11:30-11:45**  
A Microprocessor-Based Kalman Filter  
D. Tabak, Z. Arman, and S. Shkoinik, Ben Gurion  
University of the Negev, Beer Sheva, ISRAEL

**11:45-12:00**  
Equations for Robot 3D Curve Determination Decisions  
R. W. Newcomb and D. A. Panagiotopoulos, University of  
Maryland, College Park

**12:00-12:15**  
Design of Microprocessor-Controlled Suspensions  
H.-G. Yeh, California State Polytechnic University

**12:15-12:45**  
On the Interactive Design of Control Systems for Robotic Manipulators  
A. A. Goldenberg, University of Toronto, CANADA

**SESSION FA8: River A**  
**Control and Stabilization of Distributed Parameter Systems**

Chairman: E. Infante, National Science Foundation  
Co-Chairman: R. H. Flake, University of Texas at Austin

**9:45-10:15 (SIAM)**  
Boundary Control and Stability of Linear Water Waves  
R. M. Reid, Michigan Technological University, and D. L. Russell, University of Wisconsin

**10:15-10:45 (SIAM)**  
Feedback Control of the Second Order Evolution Equations with Damping  
Y. Sakawa, Osaka University, JAPAN

**10:45-11:15 (SIAM)**  
Feedback Control of Dissipative Hyperbolic Distributed Parameter Systems with Finite Dimensional Controllers  
M. J. Balas, Rensselaer Polytechnic Institute

**11:15-11:30**  
Stabilization of the Wave Equation in a Bounded Domain by Localized Feedback and Exact Controllability  
S. K. Biswas and N. U. Ahmed, University of Ottawa

**11:30-11:45**  
Boundary Feedback Hyperbolic Equations  
R. Triggiani, University of Florida

**11:45-12:15 (SIAM)**  
Riccati Equation Arising in a Boundary Control Problem with Distributed Parameters  
F. Flandoli, Scuola Normale Superiore, Pisa, ITALY

**12:15-12:45 (SIAM)**  
Optimality Conditions for Distributed Control Problems with Nonlinear State Equation  
D. Tiba, INCREST, Bucuresti, ROMANIA

**12:45-1:00 (SIAM)**  
Positive Controllability to  $W_2^{(1)}$  and Regular Reachability of Hereditary Systems  
F. Coionius, Universitat Bremen, WEST GERMANY

**FRIDAY AFTERNOON**  
**DECEMBER 16, 1983**

**SESSION FP1: Fiesta 1**  
**Model Reduction and Singular Systems**

Chairman: D. Cobb, University of Toronto, CANADA  
Co-Chairman: F. Alexandro, University of Washington

**2:30-3:00**  
Approximation of Stochastic Systems  
U. B. Desai, Washington State University

**3:00-3:30**  
Stochastic Balancing and Approximation—Stability and Minimality  
P. Harshavardhana, E. A. Jonckheere, and L. M. Silverman, University of Southern California

**3:30-4:00**  
A Comparison of the Balanced Matrix Method and the Aggregation Method of Model Reduction  
G. J. Lastman, University of Waterloo, CANADA, and N. K. Sinha, McMaster University, CANADA

**4:00-4:15**  
On the Design of Simple Structure Control Laws for Complex Processes  
G. Duc, M. Drouin, and P. Bertrand, Laboratoire des Signaux et Systemes, CNRS-ESE, Gif-sur-Yvette, FRANCE

**4:15-4:30**  
Computation of Simplified Models for Estimator and Controller Design  
D. A. Wilson and A. Kumar, University of Leeds, ENGLAND

**4:30-5:00**  
Multiparameter Singular Systems: Nondissective Approaches  
S. L. Campbell, North Carolina State University

**5:00-5:30**  
Adjoint Matrix, Bezout Theorem, Cayley-Hamilton Theorem, and Fadeev's Method for the Matrix Pencil (SE-A)  
F. L. Lewis, Georgia Institute of Technology

**5:30-5:45**  
An Aggregation Approach to Controller Reduction  
A. Yousuff and R. E. Skelton, Purdue University

**SESSION FP2: Fiesta 2**  
**Application of Estimation and Control to Missile Guidance**

Organizers: C.-F. Lin, University of Wisconsin-Madison, and M. Athans, Massachusetts Institute of Technology  
Chairman: C.-F. Lin, University of Wisconsin-Madison  
Co-Chairman: M. Athans, Massachusetts Institute of Technology

**2:30-3:00 (I)**  
A Stochastic Analysis of the Pseudomeasurement Filter and a Modified Gain Extended Kalman Filter  
T. Song and J. L. Speyer, University of Texas at Austin

**3:00-3:30 (I)**  
Dual Control Guidance for Simultaneous Identification and Interception of a Target  
K. Birnir and Y. Bar-Shalom, University of Connecticut

**3:30-4:00 (I)**  
A Comparison of Three Guidance Laws in the FAMMS (Future Army Modular Missile System) Airframe  
H. L. Pastrick, R. J. York, C. L. Lewis, and C. Will, Control Dynamics Company

**4:00-4:30 (I)**  
An Optimal Control and Estimation Algorithm for Missile Endgame Guidance  
J. R. Dowdle, M. Athans, S. W. Gully, and A. S. Willsky, Alphatech, Inc.

**4:30-5:00 (I)**  
Optimal Guidance and Control of Tactical Missiles  
C. F. Lin, University of Wisconsin-Madison

**5:00-5:15 (I)**  
Modern Guidance for Beyond Visual Range Missiles  
D. P. Glasson, The Analytic Sciences Corporation

**5:15-5:30 (I)**  
Adaptive State Variable Estimation Using Robust Smoothing  
F. D. Groutage, Naval Ocean Systems Center

**SESSION FP3: Fiesta 3**  
**Signal Processing**

Chairman: D. R. Falkenburg, Oakland University  
Co-Chairman: J. Treichler, Cornell University and ARGO Systems, Inc.

**2:30-3:00**  
Convergence of Decision-Directed Adaptive Equalizer  
R. Kumar, California State University, Fullerton

**3:00-3:30**  
Analysis and Performance Evaluation of an Adaptive Notch Filter  
B. Friedlander and J. O. Smith, Systems Control Technology, Inc.

**3:30-4:00**  
Spectral Estimation for Noisy Signals Observed Through a Linear System  
J. K. Tugnait, Exxon Production Research Company

**4:00-4:30**  
Parametric Techniques for Adaptive Signal Detection  
B. Porat, Haifa, ISRAEL, and B. Friedlander, Systems Control Technology, Inc.

**4:30-4:45**  
Covariance Eigenstructure Approach for Estimating the System Poles from its Natural Response  
M. Wax and T. Kailath, Stanford University

**4:45-5:00**  
Enhanced Maximum Entropy Spectrum Estimation via Highly Concurrent Toeplitz Eigen-System Solver  
Y. H. Hu, Southern Methodist University

**5:00-5:30**  
A Fast Approach to Identification Using Deconvolution  
C.-Y. Chi and J. M. Mendel, University of Southern California

**5:30-5:45**  
A Realization Approach to Spectral Line Estimation  
S. Y. Kung, K. S. Arun, and D. V. B. Rao, University of Southern California

**5:45-6:00**  
Difference Equation Implementation of Time-Variant Digital Filters  
T. Y. Leou and J. K. Aggarwal, University of Texas at Austin

**SESSION FP4: Fiesta 4**  
**Linear Systems**

Chairman: R. Lobbia, ORINCON  
Co-Chairman: T. Fortmann, Bolt, Beranek, and Newman, Inc.

**2:30-3:00 (SIAM)**  
Output Feedback and Generic Stabilizability  
C. I. Byrnes, Harvard University, and B. D. O. Anderson, Australian National University, Canberra, AUSTRALIA

**3:00-3:15**  
A New Sufficient Condition for Generic Pole Assignment by Output Feedback  
T. E. Djaferis and A. Narayana, University of Massachusetts

**3:15-3:30**  
Canonical Forms Under Dynamic Compensation and Zero Structure at Infinity  
P. J. Antsaklis, University of Notre Dame

**3:30-4:00**  
Infinite Zero Structure and the Exact Model Matching Problem  
A. I. G. Vardulakis, University Engineering Department, Cambridge, ENGLAND

**4:00-4:30**  
Linear Time Varying Systems: Skew Polynomial Fractions  
K. R. Poolla and P. P. Khargonekar, University of Florida

**4:30-5:00 (SIAM)**  
H-Controllability and Observability of Linear Periodic Systems  
S. Bittanti, P. Colaneri, and G. Guardabassi, Politecnico di Milano, ITALY

**5:00-5:15**  
On Adaptive Identification/Observers for Linear Systems  
E. Emre, Texas Tech University

**5:15-5:30**  
Regulation of Linear Systems Over Rings by Dynamic Output Feedback  
E. Emre, Texas Tech University

**SESSION FP5: Fiesta 5**  
**Geometric Methods in Nonlinear Systems**

Chairman: D. L. Elliott, Washington University  
Co-Chairman: A. Arapostathis, University of Texas at Austin

**2:30-3:00**  
The Structure of Nonlinear Control Systems Possessing Symmetries  
J. W. Grizzle and S. I. Marcus, University of Texas at Austin

**3:00-3:30 (I)**  
Periodically Forced Matrix Riccati Equations  
D. A. Sanchez, University of New Mexico

**3:30-4:00 (I)**  
A Complete Global Phase Portrait for the Matrix Riccati Equation  
M. A. Shayman, Washington University

**4:00-4:30**  
Analytic Stabilization and the Algebraic Riccati Equation  
D. F. Delchamps, Cornell University

**4:30-5:00**  
A Natural Coordinate System for Nonlinear Systems  
R. Su and L. R. Hunt, Texas Tech University

**5:00-5:15 (SIAM)**  
On Decentralisation, Symmetry and Special Structure in Linear Systems  
M. Hazewinkel, Erasmus University, THE NETHERLANDS, and C. F. Martin, Case Western Reserve University

**5:15-5:30**  
Orbit Structure of Hamiltonian Systems Arising from Lie Transformation Group Actions  
M. R. Garzia, Bell Laboratories, and K. A. Loparo, Case Western Reserve University

**5:30-5:45**  
Reduction of Large-Scale Systems via Generalized Gramians  
C. S. Hsu, U. B. Desai, and R. J. Darden, Washington State University

**SESSION FP6: Fiesta 6  
Power Systems**

Chairman: P. J. Clelland, Philadelphia Electric Co.  
Co-Chairman: M. Ilic-Spong, Cornell University

**2:30-3:00**  
Arnold Diffusion in the Swing Equations of a Power System  
F. M. A. Salam, Drexel University, J. E. Marsden and P. P. Varaya, University of California, Berkeley

**3:00-3:15**  
Optimized Production of Electric Energy  
S. Olcer, Stanford University

**3:15-3:30**  
The Control of Variable-Speed Wind Turbine Generators  
J. P. Lyons, Jr. and R. J. Thomas, Cornell University

**3:30-4:00**  
A Two Level Approach to Reactive Planning in Power Systems  
R. Rouhani, P. B. Usoro, W. Lebow, and R. K. Mehra, Scientific Systems, Inc.

**4:00-4:30**  
Power System Control With Disturbance-Accommodation  
M. Mohadjer, University of Alabama

**4:30-5:00**  
Preconditioned Conjugate Gradient Methods for Optimal Control Problems with Delays with Application in Hydroelectric Power Systems Scheduling  
D. Bertsekas, Massachusetts Institute of Technology, J. Shaw and R. Gendron, Alphatech, Inc.

**5:00-5:30**  
A Basis Factorization Method for Multi-Stage Linear Programming Problems with an Application to Optimal Operation of an Energy Plant  
T. Nishiyama and M. Funabashi, Systems Development Laboratory, Kawasaki, JAPAN

**SESSION FP7: Fiesta 7  
Robots, Manipulators and Prostheses**

Organizer and Chairman: A. K. Bejczy, Jet Propulsion Laboratory  
Co-Chairman: N. Caplan, National Science Foundation

**2:30-3:00 (I)**  
An Efficient Robot Arm Control Under Geometric Path Constraints  
K. G. Shin and N. D. McKay, University of Michigan

**3:00-3:30 (I)**  
Industrial Robot That Moves Around Obstacles With a Minimum Distance  
J. Y. S. Luh, Purdue University

**3:30-4:00 (I)**  
Coordinated Compliant Motion Control of Robot Arms  
T. L. Johnson, Bolt Beranek and Newman, Inc., and W. J. Chrochotiere, Tufts University

**4:00-4:30 (I)**  
Robot Arm Dynamic Model Reduction for Control  
S. Lee, University of Southern California, and A. K. Bejczy, Jet Propulsion Laboratory

**4:30-5:00 (I)**  
Robot Arm Geometric Link Parameter Error Estimation  
S. Hayati, Jet Propulsion Laboratory

**5:00-5:30 (I)**  
Swing-Free Transport of Suspended Objects with a Robot Manipulator  
G. P. Starr and A. K. Morimoto, University of New Mexico

**SESSION FP8: River A  
Adaptive Systems: Practical Issues and Biomedical Applications**

Chairman: P. Belanger, McGill University, CANADA  
Co-Chairman: R. Goodrich, Scientific Systems, Inc.

**2:30-3:00**  
Adaptive Controllers with a Vector Variable Forgetting Factor  
S. Saelid, The Norwegian Institute of Technology, NORWAY, and B. Foss, SINTEF, NORWAY

**3:00-3:30**  
Adaptive Control of Left Ventricular Assist Devices  
B. C. McInnis, Z. W. Guo, and P. C. Lu, University of Houston

**3:30-4:00**  
Stability and Control of Compartmental Systems Arising in Cell Proliferation Studies  
M. K. Sundareshan, University of Arizona, and R. A. Fundakowski, Honeywell, Inc.

**4:00-4:15**  
Pulse-Train Controllers for Functional Neuromuscular Stimulation  
H. J. Chizeck, Case Western Reserve University and Cleveland Veterans Administration Medical Center, L. Kolman, P. E. Crago, and G. F. Wilner, Case Western Reserve University

**4:15-4:30**  
On the Design of Robust Model Reference Adaptive Systems Using Frequency Domain Concepts  
P. T. Kidd and N. Munro, University of Manchester, ENGLAND

**4:30-4:45**  
Probing and Caution in Adaptive Control Systems  
K. H. Gurubasavaraj and W. L. Brogan, University of Nebraska-Lincoln

**4:45-5:00**  
Evaluation of a Self-Tuning Controller  
C. K. Goh and P. R. Bunn, Teesside Polytechnic, Cleveland, ENGLAND

**5:00-5:30**  
Robust Identification of Partially Known Systems  
S. Dasgupta, B. D. O. Anderson, and R. J. Kaye, Australian National University, Canberra, AUSTRALIA

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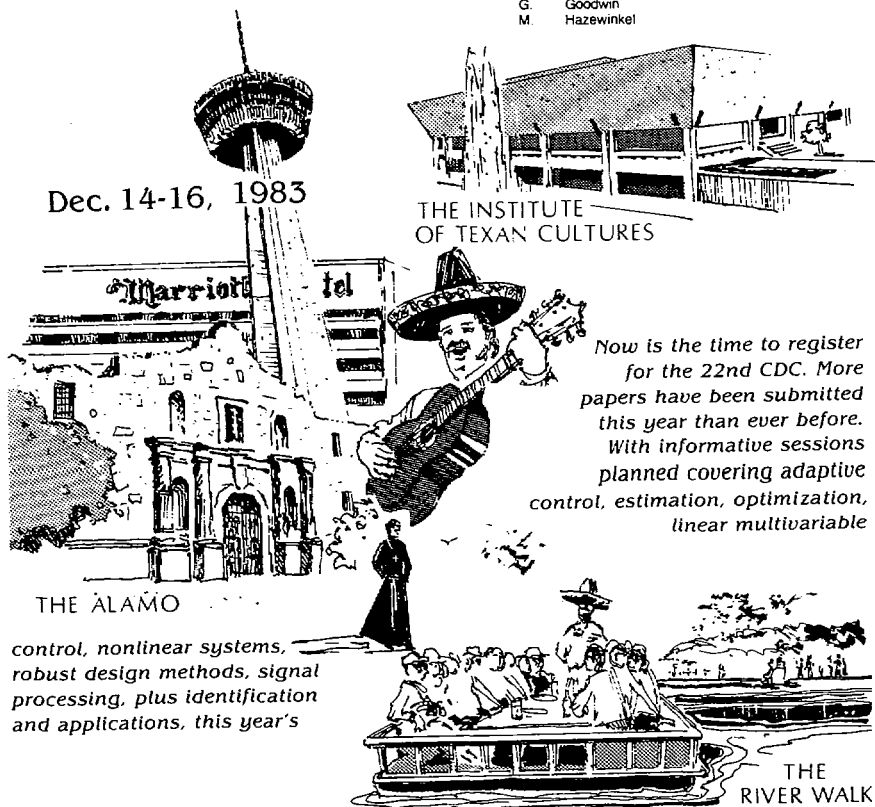
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