

Proceedings of the  
**1994 American Control Conference**

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Sponsoring Organization

*The American Automatic Control Council*

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*International Federation of Automatic Control (IFAC)*

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The 1994 ACC is held in cooperation with *IFAC*

**Correction:** The following papers have been moved after the typesetting of the Proceedings, the changes are summarized in the list below:

Session Code in Proceedings		Session Code in Conference	
WP08	5:40pm	WP08	5:20pm
TM10	2:50pm	WM09	1:50pm
TM10	3:10pm	TM10	2:50pm
FM14	2:30pm	FM14	2:10pm
FM14	2:50pm	FM14	2:30pm
FM14	3:10pm	FM14	2:50pm
FA15	11:40am	FA15	11:20am
FP11	5:40pm	FM15	3:10pm
FP11	5:20pm	FP11	5:00pm

**Wednesday Morning Session**

**Plenary Session I**

**Chair** Hassan Khalil  
**Cochair** Jeff Kantor

*Michigan State Univ.  
Univ. of Notre Dame*

8:30 - 9:30

**Feedback in Command and Control Systems** ..... \*

Harold Sorenson

*MITRE Corporation*

**WA01 — Salon A**

**Intelligent Vehicle and Highway Systems - I**

**Chair** Andy Packard  
**Cochair** R. Mayr

*Univ. of California, Berkeley  
Univ. of Southern California*

10:00 - 10:20

**Modelling and Control of Longitudinal Vehicle Motion** ..... 1

St. Germann  
Rolf Isermann

*Technical Univ. of Darmstadt  
Technical Univ. of Darmstadt*

10:20 - 10:40

**Vehicle Following Controller Design for Autonomous Intelligent Vehicles** ..... 6

C.C. Chien  
Petros A. Ioannou  
Michael C. Lai

*Univ. of Southern California  
Univ. of Southern California  
Univ. of Southern California*

10:40 - 11:00

**Modelling of Automobile Dynamics for Digital Control of Vehicle Platoons** ..... 11

S. Ghaya  
David R. Mudgett

*Pennsylvania State Univ.  
Pennsylvania State Univ*

11:00 - 11:20

**Intelligent Cruise Control for Vehicles Based on Feedback Linearization** ..... 16

R. Mayr

*Univ. of Southern California*

11:20 - 11:40

**Continuous Platooning: A New Operating Concept for Automatic Vehicle Control Systems** ..... 21

Wei Ren  
David Green

*Univ. of California, Berkeley*

11:40 - 12:00

**Robust Stabilization of High Speed Oscillations in Single Track Vehicles** ..... 26  
Farshid Forouhar *Failure Analysis Associates, Inc.*  
Andy Packard *Univ. of California*

**WA02 — Salon B**

**Linear Matrix Inequalities in Control Theory - I**

**Organizer** Michael G. Safonov *Univ. of Southern California*  
**Organizer** Stephen P. Boyd *Stanford University*  
**Organizer** V. Balakrishnan *Univ. of Maryland*  
**Organizer** Eric Feron *Massachusetts Inst. of Tech.*  
**Chair** Michael G. Safonov *Univ. of Southern California*  
**Cochair** V. Balakrishnan *Univ. of Maryland*

10:00 - 10:20

**History of Linear Matrix Inequalities in Control Theory** . . . 31  
Eric Feron *Massachusetts Inst. of Tech.*  
V. Balakrishnan *Univ. of Maryland*  
Stephen P. Boyd *Stanford Univ.*  
L.M. El Ghaoui *Ecole Nationale Superieure De Techniques*

10:20 - 10:40

**A Unified Approach to Fixed Order Controller Design via Linear Matrix Inequalities** ..... 35  
T. Iwasaki *Purdue Univ.*  
Robert E. Skelton *Purdue Univ.*

10:40 - 11:00

**LMI Numerical Solution for Output-Feedback Stabilisation** . 40  
J. C. Geromel *UNICAMP*  
C. de Souza *UNICAMP*

11:00 - 11:20

**Control System Synthesis via Bilinear Matrix Inequalities** .. 45  
Michael G. Safonov *Univ. of Southern California*  
K. Goh *Univ. of Southern California*  
J. Ly *Univ. of Southern California*

11:20 - 11:40

**Positive Real Parrott Theorem with Application to LMI Controller Synthesis** ..... 50  
J. Ly *Univ. of Southern California*  
Michael G. Safonov *Univ. of Southern California*  
F. Ahmad *Univ. of Southern California*

11:40 - 12:00

**The L-R Iteration - an Alternative to the D-K Iteration** .. 53  
Mario A. Rotea *Purdue Univ.*

**WA03 — Salon C**

**Robust Adaptive Control**

**Chair** Kostas S. Tsakalis *Arizona State Univ.*  
**Cochair** Lee Keel *Tennessee State Univ.*

10:00 - 10:20

**On a Quantitative Theory of Robust Adaptive Control: An Interval Plant Approach** ..... 58  
A.K. Datta *Texas A & M Univ.*  
S.P. Bhattacharyya *Texas A & M Univ.*

10:20 - 10:40

**Simple Adaptive Control Can Robustify Uncertain Control Systems** ..... 63  
Izhak Bar-Kana *Drexel Univ.*

10:40 - 11:00	<b>Robust Direct Adaptive Control for a Class of Systems with Delays</b> .....	68
	Manuel de la Sen	<i>Univ. del Pais Vasco</i>
	Josu Jugo	
11:00 - 11:20	<b>Robust/Adaptive Observers for Systems Having Uncertain Functions with Unknown Bounds</b> .....	73
	Engin Yaz	<i>Univ. of Arkansas</i>
	Asad Azemi	<i>Univ. of Arkansas</i>
11:20 - 11:40	<b>Weak-Duality in Worst-Case Adaptive Control</b> .....	75
	Sandor M. Veres	<i>Univ. of Birmingham</i>
11:40 - 12:00	<b>On Adaptive Control in the Presence of Impulsive Measurement Noise</b> .....	80
	Maciej Niedzwiecki	<i>Technical Univ. of Gdansk</i>

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**WA04 — Salon D**

**Biosystems Analysis and Control**

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<b>Organizer</b>	Ali Cinar	<i>Illinois Insitute of Technology</i>
<b>Chair</b>	M. A. Henson	<i>Louisiana State Univ.</i>
<b>Cochair</b>	Francis J. Doyle	<i>Purdue Univ.</i>
10:00 - 10:20	<b>Real Neural Networks in Movement Control</b> .....	84
	D.A. Robinson	<i>Johns Hopkins Hospita;</i>
10:20 - 10:40	<b>The Role of Baroreceptor Resetting in Habituating Control of Blood Pressure</b> .....	87
	S. R. Carden	<i>Univ. of Pennsylvania</i>
	Lyle H. Ungar	<i>Univ. of Pennsylvania</i>
	W. C. Rose	<i>E. I. DuPont de Nemours</i>
	J. S. Schwaber	<i>E. I. DuPont de Nemours</i>
10:40 - 11:00	<b>A Biologically-Motivated Dynamic Nonlinear Scheduling Algorithm for Control</b> .....	92
	Francis J. Doyle	<i>Purdue Univ.</i>
	I. Rybak	<i>Univ. of Pennsylvania</i>
	J. S. Schwaber	<i>E. I. DuPont de Nemours</i>
11:00 - 11:20	<b>A Parallel Control Strategy Abstracted From the Baroreceptor Reflex</b> .....	97
	M. Pottmann	<i>DuPont Central Science and Engineering</i>
	M. A. Henson	<i>Louisiana State University</i>
	Babatunde A. Ogunnaiké	<i>DuPont Central Science and Engineering</i>
	J. S. Schwaber	<i>DuPont Central Science and Engineering</i>
11:20 - 11:40	<b>The Use of Neurobiological Models in Neural Network Control System Design</b> .....	*
	J. J. Abbas	<i>Shriners Hospital for Crippled Children</i>
	H.J. Chizeck	<i>Case Western Reserve Univ.</i>
11:40 - 12:00	<b>Model Predictive Control of a Nonlinear Drug Infusion System</b> .....	102
	R. S. Gopinath	<i>Rensselaer Polytechnic Inst.</i>
	P. B. Sitsu	<i>Rensselaer Polytechnic Inst.</i>
	B. Wayne Bequette	<i>Rensselaer Polytechnic Inst.</i>
	H. Kaufman	<i>Rensselaer Polytechnic Inst.</i>
	R. J. Roy	<i>Rensselaer Polytechnic Inst.</i>

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**WA05 — Salon E**

**Identification - I**

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<b>Chair</b>	Gert-Wim van der Linden	<i>Delft Univ. of Technology</i>
<b>Cochair</b>	Guoxiang Gu	<i>Louisiana State Univ.</i>
10:00 - 10:20	<b>Frequency Domain Structural System Identification by Observability Range Space Extraction</b> .....	107
	Ketao Liu	<i>Massachusetts Inst. of Tech.</i>
	R. N. Jacques	<i>Massachusetts Inst. of Tech.</i>
	D.W. Miller	<i>Massachusetts Inst. of Tech.</i>

10:20 - 10:40	<b>Linear Algorithms for Worst Case Identification in <math>H_\infty</math> with Application to Flexible Systems</b> .....	112
	Guoxiang Gu	Louisiana State Univ.
	Cheng-Chih Chu	Jet Propulsion Lab
	Gisoon Kim	Louisiana State Univ.
10:40 - 11:00	<b>Linear Programming Algorithms for Worst-Case Identification in <math>L_1</math></b> .....	117
	Theodore Theodosopoulos	Massachusetts Inst. of Tech.
11:00 - 11:20	<b>Recursive Identification of Time-Varying Systems via Incremental Estimation</b> .....	122
	Q.G. Zhou	Univ. of Toronto
	William R. Cluett	Univ. of Toronto
11:20 - 11:40	<b>Identification of Stochastic System and Controller via Projection Filters</b> .....	127
	Hyun Chang Lee	Old Dominion Univ.
	Min-Hung Hsiao	Old Dominion Univ.
	Jen-Kuang Huang	Old Dominion Univ.
	Chung-Wen Chen	North Carolina State Univ.
11:40 - 12:00	<b>Design of Optimal Experiments for Identification of Grey Box Models</b> .....	132
	P. Sadegh	Technical Univ. of Denmark
	H. Melgaard	Technical Univ. of Denmark
	H. Madsen	Technical Univ. of Denmark
	J. Holst	Technical Univ. of Denmark

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**WA06 — Salon F**

**Control of Nonholonomic Systems**

	<b>Chair</b> N. Harris McClamroch	Univ. of Michigan
	<b>Cochair</b> Andrzej Banaszuk	Georgia Inst. of Tech.
10:00 - 10:20	<b>Orientation Control of the Dynamic Satellite</b> .....	138
	Gregory Walsh	Univ. of California, Berkeley
	Raymond C. Montgomery	NASA
	Shankar S. Sastry	Univ. of California, Berkeley
10:20 - 10:40	<b>Exact Tracking for a Planar Multilink in Space using Internal Actuation</b> .....	143
	Ilya Vladimir Kolmanovsky	Univ. of Michigan
	N. Harris McClamroch	Univ. of Michigan
	Vincent T. Coppola	Univ. of Michigan
10:40 - 11:00	<b>Control of Balance for a Nonlinear Nonholonomic Non-minimum Phase Model of a Bicycle</b> .....	148
	Neil H. Getz	Univ. of California, Berkeley
11:00 - 11:20	<b>On-Line Approximation of Control Programs for a Class of Nonlinear Free-Floating Systems</b> .....	152
	Dimitry M. Gorinevsky	Univ. of Toronto
	A. Kapitanovsky	Univ. of Toronto
	A.A. Goldenberg	Univ. of Toronto
11:20 - 11:40	<b>High-Order Averaging on Lie Groups and Control of an Autonomous Underwater Vehicle</b> .....	157
	Naomi Ehrich Leonard	Univ. of Maryland
	P. S. Krishnaprasad	Univ. of Maryland
11:40 - 12:00	<b>Dynamics and Controller Design of Gyroscopic Systems</b> ...	163
	Kuang Yow Lian	National Taiwan Univ.
	Li-Chen Fu	National Taiwan Univ.
	Li-Sheng Wang	National Taiwan Univ.

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**WA07 — Federal Hill**

**Fuzzy Control**

<b>Chair</b> George J. Vachtsevanos	Georgia Institute of Technology
<b>Cochair</b> Kevin Passino	Ohio State Univ.

10:00 - 10:20	<b>Some Crisp Thoughts on Fuzzy Logic</b> .....	168
	Daniel Y. Abramovitch	<i>Hewlett-Packard Laboratories</i>
10:20 - 10:40	<b>An Initial Assessment of Neural Network and Fuzzy Logic Technology for Flight Control Systems</b> .....	173
	Marc Steinberg	<i>Naval Air Warfare Center</i>
10:40 - 11:00	<b>An Introduction to Nonlinear Analysis of Fuzzy Control Systems</b> .....	178
	David F. Jenkins	<i>Ohio State Univ.</i>
	Kevin Passino	<i>Ohio State Univ.</i>
11:00 - 11:20	<b>Fuzzy Sliding Mode Controller Design for Tracking Control of Non-Linear System</b> .....	180
	Chung-Chun Kung	<i>Tatung Inst. of Tech.</i>
	Chia-Chang Liao	
11:20 - 11:40	<b>Self-Organization of a Fuzzy Logic Controller using Fuzzy Auto-Regressive Moving Average Model</b> .....	185
	Un-chul Moon	<i>Seoul National Univ.</i>
	Young-Moon Park	<i>Seoul National Univ.</i>
	Kwang Y. Lee	<i>Pennsylvania State Univ.</i>
11:40 - 12:00	<b>Adaptive Fuzzy Logic Approximation of Unknown Nonlinear Systems: State-Variable Feedback Tuning</b> .....	190
	Kai Liu	<i>Univ. of Texas, Arlington</i>
	In Hyeob Yu	<i>Univ. of Texas, Arlington</i>

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**WA08 — Fells Point**

**Control of Robot Manipulators**

<b>Chair</b>	Masayoshi Tomizuka	<i>Univ. of California, Berkeley</i>
<b>Cochair</b>	Ricardo Carelli	<i>Univ. Nacional de San Juan</i>
10:00 - 10:20	<b>Hybrid Force/Motion Control of Two Arms Carrying an Object</b> .....	195
	Masayoshi Tomizuka	<i>Univ. of California at Berkeley</i>
	P. Pagilla	<i>Univ. of California at Berkeley</i>
10:20 - 10:40	<b>A Unified Approach to Stable Adaptive Force/Position Control of Robot Manipulators</b> .....	200
	Q.-H. Meng	<i>Univ. of Alberta</i>
	W.-S. Lu	<i>Univ. of Victoria</i>
10:40 - 11:00	<b>Lyapunov Based Collision Avoidance and Control of Multiple Robots</b> .....	202
	Zohreh Erfan	<i>Purdue Univ.</i>
	Shaheen Ahmad	<i>Purdue Univ.</i>
11:00 - 11:20	<b>Adaptive Learning Control of Robot Manipulators in Task Space</b> .....	207
	Y.A. Jiang	<i>Univ. of New South Wales</i>
	J.S. Park	<i>Univ. of New South Wales</i>
	D.J. Clements	<i>Univ. of New South Wales</i>
	T. Hesketh	<i>Univ. of New South Wales</i>
11:20 - 11:40	<b>An Object Space Control Scheme for Cooperative Manipulators</b> .....	212
	Pasquale Chiacchio	<i>Univ. degli Studi Di Napoli, Federico II</i>
	Stefano Chiaverini	<i>Univ. degli Studi Di Napoli, Federico II</i>
	Bruno Siciliano	<i>Univ. Degli Studi Di Napoli, Federico II</i>
11:40 - 12:00	<b>Robust Position/Force Control of Robot Manipulators During Contact Tasks</b> .....	216
	Lilong Cai	<i>Hong Kong Univ. of Science &amp; Tech.</i>
	G. Song	<i>Columbia University</i>

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**WA09 — Guilford**

**Criteria for Robust Stability - I**

<b>Chair</b>	Robert N.K. Loh	<i>Oakland Univ.</i>
<b>Cochair</b>	Panos J. Antsaklis	<i>Univ. of Notre Dame</i>

10:00 - 10:20	<b>Stability Robustness Bounds and Robust Stability for Linear Systems with Structured Uncertainty</b> .....	<b>221</b>
Yuguang Fang	Case Western Reserve Univ.	
Kenneth A. Loparo	Case Western Reserve Univ.	
10:20 - 10:40	<b>Theory and Application of Robust Stability Analysis on State Space using Stability Radii</b> .....	<b>226</b>
Yeong-Hwa Chang	Univ. of Texas, Austin	
Gary Wise	Univ. of Texas, Austin	
10:40 - 11:00	<b>Stability and Stabilizability of a Class of Systems with State Saturation and Parameter Uncertainties</b> .....	<b>231</b>
Anthony N. Michel	Univ. of Notre Dame	
Derong Liu	Univ. of Notre Dame	
Kaining Wang	Univ. of Notre Dame	
11:00 - 11:20	<b>On the Geometry and Stability of a Polytope Generated by a Finite Set of Polynomials</b> .....	<b>236</b>
L.R. Pujara	Wright State Univ.	
B.S. Bollepalli	Univ. of Wisconsin, Madison	
11:20 - 11:40	<b>Stability of Interval Matrices using the Distance to the Set of Unstable Matrices</b> .....	<b>238</b>
J.A. Rojas-Estrada	Univ. Autonoma de Nuevo Leon	
J. M. Collado	Univ. Autonoma de Nuevo Leon	
11:40 - 12:00	<b>An Improved Bound for Stability Robustness of Uncertain Generalized State-Space Systems</b> .....	<b>240</b>
Li Lee	National Sun Yat-Sen Univ.	
Chun-Hsiung Fang	National Sun Yat-Sen Univ.	

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**WA10 — Mt. Washington**  
**Applications of Filtering & Estimation**

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<b>Chair</b>	Farshad Khorrami	Polytechnic Univ.
<b>Cochair</b>	Oscar Crisalle	Univ. of Florida
10:00 - 10:20	<b>A Robust Discrete Estimator with Application to Fault Detection and Identification</b> .....	<b>242</b>
Mehrdad Saif	General Motors Research Labs	
10:20 - 10:40	<b>Deterministic EKF-Like Estimator for Spacecraft Attitude Estimation</b> .....	<b>247</b>
F.L. Markley	NASA Goddard Space Flight Center	
N. Berman	Ben Gurion Univ. of Negev	
U. Shaked	Tel Aviv Univ.	
10:40 - 11:00	<b>On Ubiquity of Yau Filters</b> .....	<b>252</b>
Jie Chen	Univ. of Illinois, Chicago	
11:00 - 11:20	<b>Accurate Estimation of Friction for Control</b> .....	<b>1188</b>
Terry G. Colhour	Univ. of Missouri-Columbia	
Satish S. Nair	Univ. of Missouri-Columbia	
11:20 - 11:40	<b>Improvement of Laser Pointing Performance using a Joint Observer-Based Adaptive Controller</b> .....	<b>255</b>
Quang M. Lam	Coleman Research Corp.	
Joe Hill	Coleman Research Corp.	
Dean Cooke	Coleman Research Corp.	
11:40 - 12:00	<b>On Fault-Tolerant Functional Observer</b> .....	<b>260</b>
Shousong Hu	Nanjing Univ. of Science & Tech.	
Zhiquan Wang	East China Inst. of Tech.	
Weili Hu	Nanjing Univ. of Science & Tech.	
Cunhai Fan	Nanjing Univ. of Science & Tech.	

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**WA11 — Kent**  
**Flexible Structures - I**

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<b>Chair</b>	Steven Banks	U.S. Army Armament Research
<b>Cochair</b>	Jie Huang	American GNC Corp

10:00 - 10:20  
**Robust Control of Flexible Space Structures** ..... \*  
Jin Lu *Odyssey Research Associates, Inc.*

10:20 - 10:40  
**Robust Control of Large Flexible Space Structures using a  
Coprime Factor Plant Description** ..... 265  
Benoit Boulet *Univ. of Toronto*  
Bruce A. Francis *Univ. of Toronto*  
Peter C. Hughes *Univ. of Toronto*  
Tony Hong *Univ. of Toronto*

10:40 - 11:00  
**Positivity Embedding for Noncolocated and Nonsquare Flexible  
Structures** ..... 267  
Francis C. Lee *Univ. of Southern California*  
Henryk Flashner *Univ. of Southern California*  
Michael G. Safonov *Univ. of Southern California*

11:00 - 11:20  
**Finite Element Model Based Robust Controllers for the  
Middeck Active Control Experiment (MACE)** ..... 272  
Jonathan P. How *Massachusetts Inst. of Tech.*  
Roger Glaese *Massachusetts Inst. of Tech.*  
Simon Grocott *Massachusetts Inst. of Tech.*  
D.W. Miller *Massachusetts Inst. of Tech.*

11:20 - 11:40  
**Nonlinear Adaptive Robust Control of Uncertain Flexible  
Spacecraft** ..... 278  
David Yong D. Song *NASA Center for Aerospace Research*  
T. L. Mitchell *NASA Center for Aerospace Research*

11:40 - 12:00  
**Robust Digital Control of Flexible Structures using the  
Combined Pole Placement / Sensitivity Function Shaping  
Method** ..... 283  
Ioan D. Landau *Laboratoire d'Automatique de Grenoble*  
Cristophe Cyrot  
Alina Voda *Laboratoire d'Automatique de Grenoble*  
Daniel Rey

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**WA12 — Pride of Baltimore  
Control in Manufacturing**

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**Chair** M.C. Zhou *New Jersey Institute of Technology*  
**Cochair**

10:00 - 10:20  
**A Procedure for Dynamic Sharing of Components in  
Multiple-Workcell Process Plants** ..... 289  
Clarence W. de Silva *Univ. of British Columbia*  
Jianhua Gu *Univ. of British Columbia*

10:20 - 10:40  
**Supervisory Control for Industrial Systems with Saturation  
Decisions** ..... 294  
C.J. Maday *North Carolina State Univ.*  
Sanghwa Jeong *North Carolina State Univ.*

10:40 - 11:00  
**Rule-Based Controller Design Algorithm for Discrete Event  
Manufacturing Systems** ..... 299  
O.C. Pastravanu *Univ. of Texas, Arlington*  
Frank L. Lewis *Univ. of Texas, Arlington*  
H.H. Huang *Univ. of Texas, Arlington*

11:00 - 11:20  
**Assembly Time Optimization for PCB Assembly** ..... 306  
Ratnesh Kumar *Univ. of Kentucky*  
Haomin Li *Univ. of Kentucky*

11:20 - 11:40  
**Optimal Control of Pull Manufacturing Systems** ..... \*  
James R. Perkins *Boston Univ.*  
P. R. Kumar *Univ. of Illinois, Urbana-Champaign*



11:40 - 12:00	<b>A Pacing Control Systems for a Steckel Mill</b> . . . . .	<b>311</b>
	Jack D. Katzberg	<i>Univ. of Regina</i>
	Qi Lu	<i>Univ. of Regina</i>

**WA13 — James**

**Control of Process and Industrial Systems**

<b>Chair</b>	Denis Dochain	<i>Cesame, Univ. Catholique de Louvain</i>
<b>Cochair</b>	Evanghelos Zafiriou	<i>Univ. of Maryland</i>
10:00 - 10:20	<b>Model-Based Adaptive Vision Control Ofweld Pool Area</b> . .	<b>313</b>
	Rado Kovacevic	<i>Univ. of Kentucky</i>
	Yu Ming Zhang	<i>Univ. of Kentucky</i>
10:20 - 10:40	<b>Control of the Fabrication of Long Slender Workpieces of Arbitrary Shape. Part I: Open-Loop Control of the Multi-Axis Bending Process</b> . . . . .	<b>318</b>
	Kim A. Stelson	<i>Univ. of Minnesota</i>
	Jack X. Luo	<i>Univ. of Minnesota</i>
	Joynt L. Daniel	<i>Univ. of Minnesota</i>
10:40 - 11:00	<b>Design of Ram Velocity Profiles for Isothermal Forging via Nonlinear Optimization</b> . . . . .	<b>323</b>
	Jordan Berg	<i>Wright-Patterson AFB</i>
	J. Adams	<i>Wright-Patterson AFB</i>
	James C. Malas III	<i>Wright-Patterson AFB</i>
	Siva S. Banda	<i>Wright-Patterson AFB</i>
11:00 - 11:20	<b>Monitoring Estimation and Predictive Control Based on Statistical Techniques</b> . . . . .	<b>328</b>
	N.A. Jaleel	<i>Univ. of Westminster</i>
	J.R. Leigh	<i>Univ. of Westminster</i>
11:20 - 11:40	<b>Control of Nonlinear Differential - Algebraic Process Systems</b> . . . . .	<b>330</b>
	Aditya Kumar	<i>Univ. of Minnesota</i>
	Prodromos Daoutidis	<i>Univ. of Minnesota</i>
11:40 - 12:00	<b>Design of Adaptive Linearizing Controllers for Fixed Bed Reactors</b> . . . . .	<b>335</b>
	Denis Dochain	<i>Cesame, Univ. Catholique de Louvain</i>
	N. Tali-Maamar	<i>Cesame, Univ. Catholique de Louvain</i>
	J.P. Babary	<i>Cesame, Univ. Catholique de Louvain</i>

**WA14 — Gibson**

**Quantitative Feedback Theory (QFT)**

<b>Chair</b>	Matt A. Franchek	<i>Purdue Univ.</i>
<b>Cochair</b>	Suhada Jayasuriya	<i>Texas A&amp;M Univ.</i>
10:00 - 10:20	<b>A New Approach to Multivariable Quantitative Feedback Theory: Theoretical and Experimental Results</b> . . . . .	<b>340</b>
	Yossi Chait	<i>Univ. of Massachusetts</i>
	Myoung Soo Park	<i>Univ. of Massachusetts</i>
	Maarten Steinbuch	<i>Philips Research Labs.</i>
10:20 - 10:40	<b>Alternative Approaches in Frequency Domain Design of Single Loop Feedback Systems with Plant Uncertainty</b> . . . . .	<b>345</b>
	Fredric Bailey	<i>Univ. of Minnesota</i>
	J. William Helton	<i>Univ. of California, San Diego</i>
	Orlando Merino	<i>Univ. of Rhode Island</i>
10:40 - 11:00	<b>Full Envelope Flight Control System Design using QFT</b> . . .	<b>350</b>
	Odell R. Reynolds	<i>Air Force Inst. of Tech.</i>
	Meir Pachter	<i>Air Force Inst. of Tech.</i>
	Constantine H. Houppis	<i>Air Force Inst. of Tech.</i>
11:00 - 11:20	<b>On the Robust Stability of Plant Families with Poles Crossing the Imaginary Axis: A New Small Gain Condition</b> . . . . .	<b>355</b>
	Suhada Jayasuriya	<i>Texas A&amp;M Univ.</i>
	Yongdong Zhao	<i>Texas A&amp;M Univ.</i>

11:20 - 11:40	<b>Feedforward Controllers and Tracking Accuracy in the Presence of Plant Uncertainties</b> .....	<b>360</b>
	Suhada Jayasuriya	Texas A&M Univ.
	Yongdong Zhao	Texas A&M Univ.
11:40 - 12:00	<b>Optimal Loop Transmission Functions in SISO Quantitative Feedback Theory</b> .....	<b>365</b>
	Osita D.I. Nwokah	Purdue Univ.
	Richard Eric Nordgren	Purdue Univ.

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**WA15 — St. George**

**Advances in Control Engineering Education**

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<b>Organizer</b>	Naim A. Kheir	Oakland Univ.
<b>Chair</b>	Naim A. Kheir	Oakland Univ.
<b>Cochair</b>		
10:00 - 10:20	<b>Teaching Microprocessors in the 90's and Beyond</b> .....	<b>374</b>
	Rahmat Shoureshi	Purdue Univ.
	Peter H. Meckl	Purdue Univ.
10:20 - 10:40	<b>An Integrated Process Control Laboratory</b> .....	<b>378</b>
	R. Russell Rhinehart	Texas Tech Univ.
10:40 - 11:00	<b>Autonomous Unmanned Ground Robotic Competition: An Advanced Multi-Disciplinary Control Project</b> .....	<b>383</b>
	Ka C. Cheok	Oakland Univ.
11:00 - 11:20	<b>The Development of an Educational Control Eng. Lab. in a Developing Country</b> .....	<b>388</b>
	S. A. Al-Bermani	Univ. of Jordan
	Yousef Al-Assaf	Univ. of Jordan
11:20 - 11:40	<b>Increased Roles of Linear Algebra in Control Education</b> ...	<b>393</b>
	Robert E. Skelton	Purdue Univ.
11:40 - 12:00	<b>An Interdisciplinary Video in Control Education</b> .....	<b>*</b>
	Wayne J. Book	Georgia Inst. of Technology

**Wednesday Mid-day Session**

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**WM01 — Salon A**

**Intelligent Vehicle and Highway Systems - II**

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<b>Chair</b>	Andy Packard	Univ. of California
<b>Cochair</b>	Petros A. Ioannou	Univ. of Southern California
1:30 - 1:50	<b>Longitudinal Control of the Lead Car of a Platoon</b> .....	<b>398</b>
	Datta N. Godbole	Univ. of California, Berkeley
	John Lygeros	Univ. of California, Berkeley
1:50 - 2:10	<b>Longitudinal Control of a Platoon of Vehicles with Multiple Saturating Nonlinearities</b> .....	<b>403</b>
	Armando A. Rodriguez	Arizona State Univ.
	Sean C. Warnick	
2:10 - 2:30	<b>Model Based Supervision of Lateral Vehicle Dynamics</b> ....	<b>408</b>
	M. Wurtenberger	Technical Univ. of Darmstadt
	Rolf Isermann	Technical Univ. of Darmstadt
2:30 - 2:50	<b>Lane Assignment on an Automated Highway</b> .....	<b>413</b>
	Deepa Ramaswamy	Univ. of Illinois, Urbana-Champaign
	Juraj V. Medanic	Univ. of Illinois, Urbana-Champaign
	William R. Perkins	Univ. of Illinois, Urbana-Champaign
	Rahim Benkhal	Univ. of Illinois, Urbana-Champaign

2:50 - 3:10	<b>Potential Benefits of Roadside Intelligence for Flow Control in a IVHS</b> .....	<b>418</b>
	Bobby S. Y. Rao	Univ. of California
	Pravin Varaiya	Univ. of California
3:10 - 3:30	<b>A Simulation Study for the Control of a Platoon of Vehicles</b> .....	<b>423</b>
	Jiann-shiou Yang	Univ. of Minnesota

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**WM02 — Salon B**

**Linear Matrix Inequalities in Control Theory - II**

<b>Organizer</b>	Michael G. Safonov	Univ. of Southern California
<b>Organizer</b>	Stephen P. Boyd	Stanford University
<b>Organizer</b>	V. Balakrishnan	Univ. of Maryland
<b>Organizer</b>	Eric Feron	Massachusetts Inst. of Tech.
<b>Chair</b>	Stephen P. Boyd	Stanford Univ.
<b>Cochair</b>	Eric Feron	Massachusetts Inst. of Tech.

1:30 - 1:50	<b>Quadratic Lyapunov Functions for Polynomial Systems using Linear-Fractional Representations</b> .....	<b>3563</b>
	L.M. El Ghaoui	ENSTA

1:50 - 2:10	<b>On Computation of Multivariable Stability Margin using Generalized Popov Multiplier - LMI Approach</b> .....	<b>425</b>
	Michael G. Safonov	Univ. of Southern California
	R.Y. Chiang	JPL
	J. Ly	Univ. of Southern California

2:10 - 2:30	<b>The <math>\rho</math> Performance Measure: A New Tool for Controller Design with Multiple Frequency Domain Specifications</b> .....	<b>430</b>
	Mario A. Rotea	Purdue Univ.
	R. Prasanth	Purdue Univ.

2:30 - 2:50	<b>Observed-Based Stabilization of Nonlinear Systems</b> .....	<b>436</b>
	Eric Feron	Massachusetts Inst. of Tech.

2:50 - 3:10	<b>Robust Constrained Model Predictive Control using Linear Matrix Inequalities</b> .....	<b>440</b>
	M.V. Kothare	California Inst. of Technology
	V. Balakrishnan	Univ. of Maryland
	Manfred Morari	California Inst. of Technology

3:10 - 3:30	<b>Optimal Realization of Finite Wordlength Digital Controllers</b> .....	<b>445</b>
	Mario A. Rotea	Purdue Univ.
	D. Williamson	Australian National Univ.

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**WM03 — Salon C**

**Multivariable Adaptive Control**

<b>Chair</b>	Anuradha M. Annaswamy	Massachusetts Inst. of Tech.
<b>Cochair</b>	Mrdjan Jankovic	Washington Univ.

1:30 - 1:50	<b>Simple Multivariable Adaptive Control with Application to Flexible Structures</b> .....	<b>450</b>
	R. Bakker	Massachusetts Inst. of Tech.
	Anuradha M. Annaswamy	Massachusetts Inst. of Tech.

1:50 - 2:10	<b>Adaptive and Non-Adaptive "Pole-Placement" Control of Multivariable Linear Time-Varying Plants</b> .....	<b>455</b>
	Suttipan Limanond	Arizona State Univ.
	Kostas S. Tsakalis	Arizona State Univ.

2:10 - 2:30	<b>Multivariable MRACS for Systems with Rectangular Transfer Matrix using Coprime Factorisation Approach</b> .....	<b>460</b>
	Akira Inoue	Okayama Univ.
	Shiro Masuda	Okayama Univ.
	Valeri T. Kroumov	Okayama Univ.
	Kenji Sugimoto	Okayama Univ.

2:30 - 2:50	<b>Convergence Rate Analysis of a Multivariable Recursive Least Squares Parameter Estimator</b> .....	465
Jeffrey Windsor	North Carolina State Univ.	
Larry Silverberg	North Carolina State Univ.	
Gordon K.F. Lee	North Carolina State Univ.	
2:50 - 3:10	<b>A State-Space Approach to the Multivariable Continuous-Time Self-Tuning Control</b> .....	470
Min-Shin Chen	National Taiwan Univ.	
Yi-Hsiang Huang		
3:10 - 3:30	<b>A New Multivariable Robust Self-Tuning Decoupling Implicit Algorithm</b> .....	475
Z. Ma	Northeastern Univ.- China	
T. Y. Chai	Northeastern Univ.- China	

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**WM04 — Salon D**

**Batch Reactor Optimization and Control**

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<b>Organiser</b>	Srinivas Palanki	Florida State Univ.
<b>Chair</b>	Srinivas Palanki	Florida State Univ.
<b>Cochair</b>	David R. Vinson	Air Products & Chemicals, Inc.
1:30 - 1:50	<b>State Estimation Model Based Algorithm for On-Line Optimization and Control of Batch Processes</b> .....	480
Gangadhar Gattu	Univ. of Maryland	
Evangelos Zafriou	Univ. of Maryland	
1:50 - 2:10	<b>Online Optimization for Batch Processes Given Uncertain Estimates</b> .....	485
Peter Terwiesch	ETH Zurich	
2:10 - 2:30	<b>An Approach to Optimization and Control of Batch Processes</b> .....	490
Masoud Soroush	Drexel Univ.	
Sairam Valluri	Drexel Univ.	
2:30 - 2:50	<b>Structured Target Factor Analysis for the Stoichiometric Modeling of Batch Reactors</b> .....	495
J. Fotopoulos	Lehigh Univ.	
Christos Georgakis	Lehigh Univ.	
H.G. Stenger	Lehigh Univ.	
2:50 - 3:10	<b>Model-Based Monitoring and Control of Batch Pulp Digester</b> .....	500
A.K. Datta	Auburn Univ.	
V. Srinivasan	Auburn Univ.	
J. H. Lee	Auburn Univ.	
A. Krishnagopalan	Auburn Univ.	
3:10 - 3:30	<b>Shrinking Horizon Model Predictive Control Applied to Autoclave Curing of Composite Laminate Materials</b> ...	505
M. M. Thomas	Washington Univ.	
J.L. Kardos	Washington Univ.	
B. Joseph	Washington Univ.	

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**WM05 — Salon E**

**Identification - II**

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<b>Chair</b>	William R. Cluett	Univ. of Toronto
<b>Cochair</b>	Robert L. Kosut	Integrated Systems, Inc.
1:30 - 1:50	<b>An Algorithm for Structural and Parameter Identification of MIMO Systems</b> .....	510
Ioan D. Landau	Laboratoire d'Automatique de Grenoble	
Duong Hoai Nghia		
1:50 - 2:10	<b>Q-Markov Cover Identification using Pseudo Random Binary Signals</b> .....	515
Guoming Zhu	Purdue Univ.	
Robert E. Skelton	Purdue Univ.	
Pingkang Li	Purdue Univ.	

2:10 - 2:30	<b>Lattice Algorithms for Recursive Identification of General Model Structures</b> . . . . .	520
Alexander C. van der Klauw		<i>Delft Univ. of Technology</i>
A. Polat		<i>Delft Univ. of Technology</i>
P. P. J. van den Bosch		<i>Eindhoven Univ. of Technology</i>
2:30 - 2:50	<b>Parameter Estimation by Data Reconstruction</b> . . . . .	525
Gert-Wim van der Linden		<i>Delft Univ. of Technology</i>
2:50 - 3:10	<b>On the Connection Between Maximum Likelihood Sensitivity Analysis and Nuisance Parameter Analysis</b> . . . . .	530
James C. Spall		<i>Johns Hopkins Univ.</i>
Daniel C. Chin		<i>Johns Hopkins Univ.</i>
3:10 - 3:30	<b>A More Efficient Way to Estimate Step Response Coefficients using the FSF Model</b> . . . . .	532
L. Wang		<i>Univ. of Toronto</i>
William R. Cluett		<i>Univ. of Toronto</i>

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**WM06 — Salon F**  
**Nonlinear Control - I**

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<b>Chair</b>	Bernard Friedland	<i>New Jersey Institute of Technology</i>
<b>Cochair</b>	C. D. Johnson	<i>Univ. of Alabama, Huntsville</i>
1:30 - 1:50	<b>Global Asymptotic Stabilization of the Spinning Top</b> . . . . .	536
Chih-Jian Wan		<i>Univ. of Michigan</i>
Vincent T. Coppola		<i>Univ. of Michigan</i>
Dennis S. Bernstein		<i>Univ. of Michigan</i>
1:50 - 2:10	<b>Global Asymptotic Stabilization of a Spinning Top with Torque Actuators using Stereographic Projection</b> . . . . .	541
Chih-Jian Wan		<i>Univ. of Michigan</i>
Dennis S. Bernstein		<i>Univ. of Michigan</i>
Vincent T. Coppola		<i>Univ. of Michigan</i>
Panagiotis Tsiotras		<i>Purdue Univ.</i>
2:10 - 2:30	<b>Apparatus for Empirical Determination of Dynamic Friction</b> . . . . .	546
Avraham		<i>Technion Inst. of Tech.</i>
B. Frieland		<i>New Jersey Institute of Technology</i>
A. Aly		<i>New Jersey Institute of Technology</i>
R. Semenoek		<i>New Jersey Institute of Technology</i>
2:30 - 2:50	<b>A Local Minimal Realization Algorithm for SISO Nonlinear Systems</b> . . . . .	551
P. Liu		<i>Shanghai Jiao Tong Univ.</i>
Claude H. Moog		<i>Universite de Nantes</i>
2:50 - 3:10	<b>Chaotic Dynamics in a PD-Controlled Pendulum</b> . . . . .	553
Joaquin Alvarez		<i>CICESE</i>
3:10 - 3:30	<b>Stability Analysis of Linearizing Controllers for a Class of Perturbed Nonlinear Discrete-Time Systems</b> . . . . .	558
Cesar Cruz		<i>CINVESTAV-IPN</i>
Joaquin Alvarez		<i>CICESE</i>

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**WM07 — Federal Hill**  
**Fuzzy Control - Robotics Applications**

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<b>Chair</b>	Edwin K.P. Chong	<i>Purdue Univ.</i>
<b>Cochair</b>	Anthony P. Tzes	<i>Polytechnic Univ.</i>
1:30 - 1:50	<b>Learning Control for a Two-Link Flexible Mechanism</b> . . . . .	563
Vivek G. Moudgal		<i>Ohio State Univ.</i>
Waihon A. Kwong		<i>Ohio State Univ.</i>
Kevin Passino		<i>Ohio State Univ.</i>
Stephen Yurkovich		<i>Ohio State Univ.</i>

1:50 - 2:10	<b>Fuzzy Control of a Flexible Link Manipulator</b> .....	<b>568</b>
J.X. Lee		Carleton Univ.
George Vukovich		Canadian Space Agency
Jurek Sasiadek		Carleton Univ.
2:10 - 2:30	<b>An Adaptive Fuzzy Based Controller and its Application to Smart Structures</b> .....	<b>575</b>
Issam J. Zeinoun		Polytechnic Univ.
Farshad Khorrami		Polytechnic Univ.
2:30 - 2:50	<b>A Fuzzy Expert Organizer/Robust Control Strategy for Moving Base Robotic Assembly Operations</b> .....	<b>580</b>
Changman Son		Georgia Institute of Technology
George J. Vachtsevanos		Georgia Institute of Technology
2:50 - 3:10	<b>Modeling and Fuzzy Logic Control of a Multi-Degree-of-Freedom Reaction Compensating System</b> .....	<b>585</b>
Yueh-Jaw Lin		Univ. of Akron
Y. Lu		Univ. of Akron
B. Choi		NASA Lewis Research Center
3:10 - 3:30	<b>The Application of Fuzzy Logic Control to Speed Control of a DC Servo Motor System</b> .....	<b>590</b>
Ying Chih Lin		Chung-Cheng Institute of Technology

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**WM08 — Fells Point**

**Robust & Adaptive Control of Robots**

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**Chair** Kelly A. Korzeniowski *U.S. Naval Academy*  
**Cochair** Brian Armstrong-Helouvy *Univ. of Wisconsin, Milwaukee*

1:30 - 1:50	<b>A QFT Controller Design Implementation for a Worm Gear Driven Manipulator Joint</b> .....	<b>595</b>
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D.C. May *Texas A&M Univ.*  
Suhada Jayasuriya *Texas A&M Univ.*

1:50 - 2:10	<b>PID Control in the Presence of Static Friction: Exact and Describing Function Analysis</b> .....	<b>597</b>
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Brian Armstrong-Helouvy *Univ. of Wisconsin, Milwaukee*  
Bimal Amin *Univ. of Wisconsin, Milwaukee*

2:10 - 2:30	<b>Sampled-Data Robot Adaptive Control with Stabilizing Compensation</b> .....	<b>602</b>
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Gabriel D. Warshaw *Carleton Univ.*  
Howard M. Schwartz *Carleton Univ.*

2:30 - 2:50	<b>Stability Analysis of Neural Networks Based Adaptive Controllers for Robot Manipulators</b> .....	<b>609</b>
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Daniel Patino *Univ. Nacional de San Juan, Argentina*  
Ricardo Carelli *Univ. Nacional de San Juan, Argentina*  
Benjamin Kuchen *Univ. Nacional de San Juan, Argentina*

2:50 - 3:10	<b>New Results on Adaptive Compliance Control for Dexterous Manipulators</b> .....	<b>614</b>
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Richard Colbaugh *New Mexico State Univ.*  
Kristin Glass *New Mexico State Univ.*  
Homayoun Seraji *Jet Propulsion Laboratory*

3:10 - 3:30	<b>Stiffness Analysis and Control of Multi-Fingered Robot Hands</b> .....	<b>621</b>
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W.K. Chung *Pohang Inst. of Science & Tech.*  
H.R. Choi  
Y. Youm

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**WM09 — Guilford**

**Criteria for Robust Stability - II**

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**Chair** B. Ross Barmish *Univ. of Wisconsin, Madison*  
**Cochair** Naim A. Kheir *Oakland Univ.*

1:30 - 1:50	<b>A General Theory for Analysis and Design of Robust Pole Clustering in Subregions of the Complex Plane</b> . . . . .	<b>627</b>
	Sheng-Guo Wang	<i>Univ. of Houston</i>
	L.S. Shieh	<i>Univ. of Houston</i>
2:10 - 2:30	<b>Strong Stabilizability of Systems with Multiaffine Uncertainties and Numerator Denominator Coupling</b> . . . . .	<b>637</b>
	Ganapathy Chockalingam	<i>Univ. of Iowa</i>
	Soura Dasgupta	<i>Univ. of Iowa</i>
2:30 - 2:50	<b>A Simple Test to Determine the Stability of an Interval Matrix</b> . . . . .	<b>642</b>
	J. J. D. Delgado-Romero	<i>Univ. Autonoma de Nuevo Leon</i>
	J.A. Rojas-Estrada	<i>Univ. Autonoma de Nuevo Leon</i>
	J. M. Collado	<i>Univ. Autonoma de Nuevo Leon</i>
2:50 - 3:10	<b>A Simple Algorithm for Robust Stability Test Under Structured and Unstructured Perturbations</b> . . . . .	<b>644</b>
	Yu-Ping Tian	<i>Southeast Univ.</i>
3:10 - 3:30	<b>Finite Test of Robust Strict Positive Realness</b> . . . . .	<b>649</b>
	Lin Xie	<i>Univ. of Newcastle</i>
	Minyue Fu	<i>Univ. of Newcastle</i>

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**WM10 — Mt. Washington**  
**Linear Estimation**

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<b>Chair</b>	Mohammad Jamshidi	<i>Univ. of New Mexico</i>
<b>Cochair</b>	J. Steve Gibson	<i>Univ. of California, Los Angeles</i>
1:30 - 1:50	<b>Minimax Estimation of Linear Systems in the Presence of Noise</b> . . . . .	<b>654</b>
	J. Steve Gibson	<i>Univ. of California, Los Angeles</i>
	G. H. Lee	<i>Univ. of California, Los Angeles</i>
1:50 - 2:10	<b>Robust Estimation for Discrete-Time Linear Systems</b> . . . . .	<b>656</b>
	Rami S. Mangoubi	<i>Draper Lab/MIT</i>
	Brent D. Appleby	<i>Draper Lab</i>
	George C. Verghese	<i>Massachusetts Inst. of Tech.</i>
2:10 - 2:30	<b>Divergence of the Discrete-Time Kalman Filter Under Incorrect Noise Covariances for Linear Periodic Systems</b> . . . . .	<b>1190</b>
	Suwanchai Sangsuk-iam	<i>Thammasat Univ.</i>
2:30 - 2:50	<b>Parity Space Method: A Continuous Time Approach</b> . . . . .	<b>662</b>
	A. V. Medvedev	<i>Lulea Univ. of Tech.</i>
2:50 - 3:10	<b>Estimation of Unknown Inputs for Linear Systems</b> . . . . .	<b>1195</b>
	Didier Maquin	<i>Univ. de Nancy</i>
	Besma Gaddouna	<i>Univ. de Nancy</i>
	Jose Ragot	<i>Univ. de Nancy</i>
3:10 - 3:30	<b>General-Structured Unknown Input Observers</b> . . . . .	<b>666</b>
	Shao-Kung Chang	<i>National Chiao Tung Univ.</i>
	Wen-Tong You	<i>National Chiao Tung Univ.</i>
	Pau-Lo Hsu	<i>National Chiao Tung Univ.</i>

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**WM11 — Kent**  
**Flexible Structures - II**

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<b>Chair</b>	Jonathan P. How	<i>Massachusetts Inst. of Tech.</i>
<b>Cochair</b>	James L. Beck	<i>California Instit. of Tech.</i>
1:30 - 1:50	<b>Positive Real Controller Design with <math>H_{\infty}</math> Performance Norm Bound</b> . . . . .	<b>671</b>
	Xin Chen	<i>Rensselaer Polytechnic Inst.</i>
	John T. Wen	<i>Rensselaer Polytechnic Inst.</i>
1:50 - 2:10	<b>A Vibration Isolation System using Active PZT Brackets</b> . .	<b>676</b>
	Eric T. Falangas	<i>Aerospace Corporation</i>

2:10 - 2:30	<b>Robust Time-Delay Control of Multimode Systems</b> . . . . .	681
	Tarunraj Singh	State Univ. of New York
	S.R. Vadali	
2:30 - 2:50	<b>Hierarchical HAC-infinity / LAC Vibration Suppression for a Flexible Space Telescope: SPICE</b> . . . . .	686
	Armando A. Rodriguez	Arizona State Univ.
	Delano R. Carter	Honeywell Satellite Systems
2:50 - 3:10	<b>Feedback Control of Overhead Cranes Swing with Variable Rope Length</b> . . . . .	691
	Kamal A.F. Moustafa	KFUPM Noc 3046
3:10 - 3:30	<b>On the Robust Control of Aeroelastic Vehicles</b> . . . . .	696
	Ille Stiharu-Alexe	Ecole Poly. de Montreal
	Jules O'Shea	Ecole Poly. de Montreal
	Carmen Stiharu-Alexe	Universite de Montreal

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**WM12 — Pride of Baltimore**  
**Discrete Event Systems in Manufacturing**

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	<b>Chair</b> Ratnesh Kumar	Univ. of Kentucky
	<b>Cochair</b> Archana S. Sathaye	Digital Equipment Corp.
1:30 - 1:50	<b>Time Templates for Discrete Event Fault Monitoring in Manufacturing Systems</b> . . . . .	701
	L. E. Holloway	Univ. of Kentucky
	Sujeet Chand	Rockwell International
1:50 - 2:10	<b>Optimal Deadlock Avoidance for a Class of Manufacturing Systems using Petri Nets</b> . . . . .	707
	Robert P. Judd	Ohio Univ.
2:10 - 2:30	<b>Comparison of Two Concepts of the Controlling Devices Applied to the Flexible Cell</b> . . . . .	712
	N. Rafii	LNGI
	N. Graton	LNGI
	G. Coeurdeuil	LNGI
2:30 - 2:50	<b>Determination of Optimal Campaign for Batch Chemical Plants by Minimax Algebra Model</b> . . . . .	717
	Quanshi Xia	Imperial College
	Sandro Macchietto	Imperial College
2:50 - 3:10	<b>Deadlock Avoidance in Manufacturing Systems of Parallel Mutual Exclusion</b> . . . . .	722
	Zhonghu Yuan	Northeastern Univ.
	Wendong Xiao	Northeastern Univ.
	Xinhe Xu	Northeastern Univ.
3:10 - 3:30	<b>Optimization Production Scheduling of Multi-Stage Interrelated Discrete System via Synthetic Knowledge</b> . . . . .	724
	Jinrong Zhou	East China Univ. of Science & Tech.
	Dao Huang	East China Univ. of Science & Tech.
	Weisun Jiang	East China Univ. of Science & Tech.

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**WM13 — James**  
**Performance and Stability of Linear Control Systems**

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	<b>Chair</b> Mohamed Darouach	Univ. de Nancy
	<b>Cochair</b> Denis Mustafa	Univ. of Oxford
1:30 - 1:50	<b>A Robust <math>H_{\infty}</math> Estimator Design for Linear Uncertain System</b> . . . . .	3568
	Y.X. Yao	Centre de Recherche Public-HT
	Mohamed Darouach	Univ. de Nancy
	J. Schaefers	Centre de Recherche Public-HT



1:50 - 2:10	<b>Stability and Performance Robustness of Uncertain Time - Varying Systems</b> .....	729
Farouk Zanaty		Spar Aerospace Ltd.
Robert N.K. Loh		Oakland Univ.
Mohamed A. Zohdy		Oakland Univ.
2:10 - 2:30	<b>Well-Defined Series and Parallel D-Spectra for Linear Time-Varying Systems</b> .....	734
J. Jim Zhu		Louisiana State Univ.
2:30 - 2:50	<b>Pole Placement in a Specified Circular Region via Bilinear Transformation</b> .....	739
Abdul-Amir A. Abdul-Wahab		The State of Kuwait
2:50 - 3:10	<b>An LMI Approach to Peak-to-Peak Gain Minimization: Filtering and Control</b> .....	742
K. Nagpal		Univ. of Iowa
J. Abedor		Univ. of California, Berkeley
Kameshwar Poolla		Univ. of California, Berkeley
3:10 - 3:30	<b>Perturbation Bounds for Root-Clustering in a Circular Region of Linear Continuous Systems</b> .....	747
Abdul-Amir A. Abdul-Wahab		The State of Kuwait
Mohamed A. Zohdy		Oakland Univ.

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**WM14 — Gibson**  
**Discrete-Time Systems**

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<b>Chair</b>	Gene F. Franklin	Stanford Univ.
<b>Cochair</b>	Daniel Y. Abramovitch	Hewlett-Packard Laboratories
1:30 - 1:50	<b>A Discrete-Time Learning Control Algorithm</b> .....	749
Samer S. Saab		Univ. of Pittsburgh
1:50 - 2:10	<b>Frequency Domain Performance Bounds for Discrete Linear Repetitive Processes</b> .....	754
Eric Rogers		Univ. of Southampton
David H. Owens		Univ. of Exeter
2:10 - 2:30	<b>Robust Pole Placement in Discrete-Time Systems</b> .....	756
Marek Solak		Inst. of Electrical Engg. - Poland
2:30 - 2:50	<b>Dynamics of Controlled Linear Discrete Time Systems with a Dead-Zone Nonlinearity</b> .....	761
Jose Alvarez-Ramirez		Univ. Autonoma Metropolitana-Iztapalapa
2:50 - 3:10	<b>Output Feedback Boundary Covariance Assignment for Stochastic Descriptor Systems</b> .....	766
Engin Yaz		Univ. of Arkansas
Samir M. Kherat		Purdue Univ.
3:10 - 3:30	<b>Order Selection for ARMA Parametric Spectrum Estimation</b> .....	768
Rado Kovacevic		Univ. of Kentucky
Yu Ming Zhang		Univ. of Kentucky

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**WM15 — St. George**  
**Control of Uncertain Systems**

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<b>Chair</b>	Pramod P. Khargonekar	Univ. of Michigan
<b>Cochair</b>	Ye-Hwa Chen	Georgia Institute of Technology
1:30 - 1:50	<b>Robust Regulation in the Presence of Norm-Bounded Uncertainty</b> .....	773
J. Abedor		Univ. of California, Berkeley
K. Nagpal		Univ. of Iowa
P.P. Khargonekar		Univ. of Michigan
Kameshwar Poolla		Univ. of California, Berkeley

1:50 - 2:10	<b>A Simple Design Method for Robust Linear Discrete-Time Regulators Under Symmetrical Constraints</b> .....	778
Andrea Neves de Carvalho		<i>DT/FEE/UNICAMP</i>
Basilio E. A. Milani		<i>DT/FEE/UNICAMP</i>
2:10 - 2:30	<b>One-Step Fixed-Lag Smoothers for Markovian Switching Systems</b> .....	782
R.E. Helmick		<i>Naval Surface Warfare Center</i>
W.D. Blair		<i>Naval Surface Warfare Center</i>
S.A. Hoffman		<i>Naval Surface Warfare Center</i>
2:30 - 2:50	<b><math>H_\infty</math> Control of Reheat-Fan Engine</b> .....	787
Ryo Watanabe		<i>Waseda Univ.</i>
Masahiro Kurosaki	<i>Ishikawajima-Harima Heavy Industries Co</i>	
Kenko Uchida		<i>Waseda Univ.</i>
Etsujiro Shimemura		<i>Waseda Univ.</i>
Masayuki Fujita	<i>Japan Advanced Inst. of Science and Tech</i>	
2:50 - 3:10	<b>Robust Steady-State Tracking</b> .....	791
Mustafa H. Khammash		<i>Iowa State Univ.</i>
3:10 - 3:30	<b>Robust Control Design for a Class of Mismatched Uncertain Nonlinear Systems</b> .....	796
Ye-Hwa Chen		<i>Georgia Institute of Technology</i>

<b>Wednesday Afternoon Session</b>
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**WP01 — Salon A**

**Vehicle Network and Control**

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<b>Chair</b>	Juergen Ackermann	<i>DLR</i>
<b>Cochair</b>	Datta N. Godbole	<i>Univ. of California, Berkeley</i>
4:00 - 4:20	<b>An Interface Between Continuous and Discrete-Event Controllers for Vehicle Automation</b> .....	801
John Lygeros		<i>Univ. of California, Berkeley</i>
Datta N. Godbole		<i>Univ. of California, Berkeley</i>
4:20 - 4:40	<b>Design of Radial Basis Function-based Controller for Autonomous Parking of Wheeled Vehicles</b> .....	806
Dimitry M. Gorinevsky		<i>Univ. of Toronto</i>
A. Kapitanovsky		<i>Univ. of Toronto</i>
A.A. Goldenberg		<i>Univ. of Toronto</i>
4:40 - 5:00	<b>Closed Loop Control of Systems Over a Communication Network with Queues</b> .....	811
Hin-Ching H. Chan		<i>Ohio State Univ.</i>
Umit Ozguner		<i>Ohio State Univ.</i>
5:00 - 5:20	<b>Nonstandard Control Inputs in the Integrated Design of Vehicles</b> .....	816
Konur Alp Unyelioglu		<i>Ohio State Univ.</i>
Umit Ozguner		<i>Ohio State Univ.</i>
Timbre Hissong		
Jim Winkelman		<i>Ford Motor Company</i>
5:20 - 5:40	<b>Application of Least Squares Lattice Algorithm to Active Noise Control for Automobile</b> .....	821
Hisashi Sano		<i>Utsunomiya Univ.</i>
Shuichi Adachi		<i>Utsunomiya Univ.</i>
Hideki Kasuya		

5:40 - 6:00

**Modeling and Sensitivity Analysis of an ABS Hydraulic Modulator** ..... 826  
S.F. Rezeka *Alexandria Univ.*

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**WP02 — Salon B**

**LMI's in Control: Computational Aspects and Applications**

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**Organizer** Pascal M. Gahinet *INRIA*  
**Chair** Pascal M. Gahinet *INRIA*  
**Cochair** Eric Feron *Massachusetts Inst. of Tech.*

4:00 - 4:20

**A Second-Order Interior Point Method for Solving Linear Matrix Inequality Problems** ..... 831  
M.K.H. Fan *Georgia Tech.*  
B. Nekoie *Georgia Tech.*

4:20 - 4:40

**Optimizing Eigenvalues of Symmetric Definite Pencils** ..... 836  
J. P. Haeberly *Fordham Univ.*  
M. L. Overton *New York Univ.*

4:40 - 5:00

**The Projective Method for Solving Linear Matrix Inequalities** ..... 840  
A. Nemiroskii *CEMI*  
Pascal M. Gahinet *INRIA*

5:00 - 5:20

**Designing Reduced-Order Output Feedback Controllers using a Potential Reduction Method** ..... 845  
J. David *ESAT*  
Bart De Moor *Katholieke Univ. Leuven*

5:20 - 5:40

**Bilinear Matrix Inequality Properties and Computational Methods** ..... 850  
K.C. Goh *Univ. of Southern California*  
L. Turan *Univ. of Southern California*  
Michael G. Safonov *Univ. of Southern California*  
G.P. Papavassilopoulos *Univ. of Southern California*  
J.H. Ly *Univ. of Southern California*

5:40 - 6:00

**Self-scheduled  $H_{\infty}$  Control of Linear Parameters-Varying Systems** ..... 856  
Pierre Apkarian *ONERA/CERT*  
Pascal M. Gahinet *INRIA*  
G. Becker *Univ. of California, Berkeley*

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**WP03 — Salon C**

**Nonlinear Adaptive Control**

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**Chair** Er-Wei Bai *Univ. of Iowa*  
**Cochair** Sandor M. Veres *Univ. of Birmingham*

4:00 - 4:20

**Adaptive Nonlinear Output-Feedback Schemes with Marino-Tomei Controller** ..... 861  
Miroslav Krstic *Univ. of California, Santa Barbara*  
Petar V. Kokotovic *Univ. of California, Santa Barbara*

4:20 - 4:40

**A Discrete-Time Adaptive Nonlinear System** ..... 867  
Ioannis Kanellakopoulos *UCLA*

4:40 - 5:00

**Discrete-Time Adaptive Control of Systems with Unknown Output Hysteresis** ..... 870  
Gang Tao *Univ. of Virginia*  
Petar V. Kokotovic *Univ. of California*

5:00 - 5:20

**Adaptive Nonlinear Output Feedback Tracking with a Reduced Order High-Gain Observer** ..... 875  
Mrdjan Jankovic *Washington Univ.*

5:20 - 5:40

**Adaptive Control of Linearisable Discrete-Time System** ... 880  
Fu-Chuang Chen *National Chiao Tung Univ.*  
Wen-Chung Tsao *National Chiao Tung Univ.*

5:40 - 6:00

**A Model Reaching Learning Control Scheme for a Class of Nonlinear Systems** ..... 882  
 C.C. Cheah *Nanyang Technological Univ.*  
 Dan Wei Wang *Nanyang Technological Univ.*

**WP04 — Salon D**

**Modeling and Control in Microelectronics Processing**

**Organizer** Thomas A. Badgwell *Univ. of Texas at Austin*  
**Chair** Thomas A. Badgwell *Univ. of Texas at Austin*  
**Cochair** B. Wayne Bequette *Rensselaer Polytechnic Inst.*

4:00 - 4:20

**Model-Predictive Control of the Czochralski Crystallization Process** ..... \*

Roberto Irizarry-Rivera *Univ. of Pennsylvania*  
 Warren D. Seider *Univ of Pennsylvania*

4:20 - 4:40

**Model-Based Control of Rapid Thermal Processes** ..... 887

Terence Breedijk *The Univ. of Texas*  
 Thomas F. Edgar *Univ. of Texas, Austin*  
 I. Trachtenberg *The Univ. of Texas*

4:40 - 5:00

**Application of Feed-forward and Adaptive Feedback Control to Semiconductor Device Manufacturing** ..... 892

K.D. Stoddard *Arizona State Univ.*  
 P. Crouch *Arizona State Univ.*  
 M. Kozicki *Arizona State Univ.*  
 Kostas S. Tsakalis *Arizona State Univ.*

5:00 - 5:20

**Plasma Etch Endpoint via Interferometric Imaging** ..... 897

Duane Boning *Massachusetts Inst. of Technology*  
 Jonathan Claman *Massachusetts Inst. of Technology*  
 Timothy Dalton *Massachusetts Inst. of Technology*  
 Ka Shun Wong *Massachusetts Inst. of Technology*  
 Herbert Sawin *Massachusetts Inst. of Technology*

5:20 - 5:40

**Identification and Robust Control of a Reactive Ion Etcher** ..... 902

T. L. Vincent *Univ. of Michigan*  
 P.P. Khargonekar *Univ. of Michigan*  
 J.S. Freudenberg *Univ. of Michigan*  
 J. W. Grizzle *Univ. of Michigan*

5:40 - 6:00

**RTP Multivariable Temperature Controller Development** .. 907

Curtis Elia *Integrated Systems Inc.*

**WP05 — Salon E**

**Applications of Identification**

**Chair** Ioan D. Landau *Laboratoire d'Automatique de Grenoble*  
**Cochair** S. Thapliyal *Univ. of Notre Dame*

4:00 - 4:20

**Compact Representation of Multiple Input/Multiple Output(MIMO) Algorithms with Applications to Helicopter Flight Data** ..... 912

J.K. Sridhar *Delft Univ. of Technology*  
 J.A. Mulder *Delft Univ. of Technology*  
 W.H.J.J. Van Staveren *Delft Univ. of Technology*

4:20 - 4:40

**Tuned  $L_1$  Identification From Impulse Response Data: Application to a Fluid Dynamics Problem** ..... 918

Pablo A. Parrilo *Univ. of Buenos Aires*  
 Ricardo S. Sanchez Pena *Facultad de Ingenieria, UBA*  
 Cecilia G. Galarza *Univ. of Buenos Aires*

4:40 - 5:00

**Observer Models for Real-Time Traffic Control** ..... 923

Martin Wirth *ETH*  
 Urban A. Brunner *ETH*

5:00 - 5:20

**Identification of Roll Motions of Ships in Close Turns for Control Under Heel Constraints** ..... 927

Philippe Fabiani *CEGELEC-CGA*

5:20 - 5:40	<b>Identification and Inversion of Gas Transport Processes in Buildings</b> .....	929
	Clifford C. Federspiel	<i>Johnson Controls</i>
5:40 - 6:00	<b>Change Detection in Dynamic Characteristics of a Structural System</b> .....	937
	Th.D. Popescu	<i>Research Inst. for Informatics</i>

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**WP06 — Salon F**  
**Stabilization of Nonlinear Systems**

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<b>Chair</b>	Ali Saberi	<i>Washington State Univ.</i>
<b>Cochair</b>	Degang Chen	<i>Iowa State Univ.</i>
4:00 - 4:20	<b>A State-Space Approach to Parameterization of Stabilizing Controllers for Nonlinear Systems</b> .....	942
	Wei-Min Lu	<i>California Institute of Tech.</i>
4:20 - 4:40	<b>Semi-Global Stabilizability of Linear Null Controllable Systems with Input Nonlinearities</b> .....	947
	Andrew R. Teel	<i>Univ. of Minnesota</i>
4:40 - 5:00	<b>Simultaneous Stabilization of a Family of SISO Nonlinear Systems via Output Feedback Control</b> .....	952
	Ali Saberi	<i>Washington State Univ.</i>
	Zongli Lin	<i>Washington State Univ.</i>
5:00 - 5:20	<b>A Nonlinear Application of a Lyapunov Technique for Assuring Global Performance Bounds</b> .....	954
	A. Helmersson	<i>Linkoping Univ.</i>
5:20 - 5:40	<b>Robust Semi-Global Stabilization of Minimum-Phase Input-Output Linearizable Systems via Partial State and Output Feedback</b> .....	959
	Zongli Lin	<i>Washington State Univ.</i>
	Ali Saberi	<i>Washington State Univ.</i>
5:40 - 6:00	<b>Stabilization of a Class of Nonlinear Systems using Backstepping</b> .....	964
	An-Chyau Huang	<i>Univ. of California, Berkeley</i>
	David M. Auslander	<i>Univ. of California, Berkeley</i>

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**WP07 — Federal Hill**  
**Fuzzy Control - Process Control Applications**

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<b>Chair</b>	Oscar Crisalle	<i>Univ. of Florida</i>
<b>Cochair</b>	G. G. Yen	<i>The USAF Phillips Laboratory</i>
4:00 - 4:20	<b>Lyapunov Stability Analysis of Systems using the Fuzzy-PID Controller</b> .....	966
	J. Douglas Birdwell	<i>Univ. of Tennessee</i>
	Yongmei Wang	<i>Cornell Univ.</i>
4:20 - 4:40	<b>Fuzzy Evaluation and Expert System in Classical Control System Design</b> .....	1198
	Chi-Hsu Wang	<i>Griffith Univ.</i>
	Wei-Yen Wang	<i>National Taiwan Inst. of Tech.</i>
	Tsu-Tien Lee	<i>National Taiwan Inst. of Tech.</i>
4:40 - 5:00	<b>Process Fault Diagnosis using Fuzzy Neural Networks</b> .....	971
	J. Zhang	<i>Univ. of Newcastle</i>
	A. Julian Morris	<i>Univ. of Newcastle</i>
5:00 - 5:20	<b>Design of Fuzzy Logic Systems for Nonlinear Process Identification</b> .....	976
	Jindrich Liska	<i>Clemson Univ.</i>
	Stephen S. Melsheimer	<i>Clemson Univ.</i>

5:20 - 5:40

**Some Experiments with a Fuzzy Precompensated PD Controller** ..... 981

Jong-Hwan Kim *Korea Advanced Inst. of Sci. & Tech.*  
S.-W. Lee *Korea Advanced Inst. of Sci. & Tech.*  
Edwin K.P. Chong *Purdue Univ.*

5:40 - 6:00

**A Multivariable Self-Learning Fuzzy Control Algorithm for a Dyeing Process** ..... 983

Gordon K.F. Lee *North Carolina State Univ.*

**WP08 — Fells Point**

**Experimental Studies of Robot Control**

**Chair** Brian Armstrong-Helouvry *Univ. of Wisconsin, Milwaukee*  
**Cochair** Kristin Glass *New Mexico State Univ.*

4:00 - 4:20

**Experiments in Exponential Stabilization of a Mobile Robot Towing a Trailer** ..... 988

Robert T. M'Closkey *California Inst. of Tech.*  
Richard M. Murray *California Inst. of Tech.*

4:20 - 4:40

**Robot Control System for Window Cleaning** ..... 994

Mohammad Farsi *Univ. of Newcastle Upon Tyne*  
Karl Ratcliff *Univ. of Newcastle Upon Tyne*  
P.J. Johnson  
C.R. Allen  
Karam Z. Karam *Univ. of Newcastle Upon Tyne*  
R. Pawson

4:40 - 5:00

**A Comparative Study on Simulations Vs Experiments of SMCPE** ..... 996

Nejat Olgac *Univ. of Connecticut*  
Jairo T. Maura

5:00 - 5:20

**Experiments of Feedforward Control on a Conventional Industrial Manipulator** ..... 1001

F. Caccavale *Univ. degli Studi di Napoli Federico II*  
Pasquale Chiacchio *Univ. degli Studi di Napoli Federico II*

5:40 - 6:00

**Hydraulic Actuator Analysis for Industrial Robot Multivariable Control** ..... 1003

S.R. Habibi *Univ. of Toronto*  
R.J. Richards  
A.A. Goldenberg *Univ. of Toronto*

**WP09 — Guilford**

**Criteria for Robust Stability - III**

**Chair** Takehiro Mori *Kyoto Institute of Technology*  
**Cochair** Mohammed Sami Fadali *Univ. of Nevada*

4:00 - 4:20

**Robust Performance Design via Simultaneous Polynomial Stabilization** ..... 1008

Theodore E. Djaferis *Univ. of Massachusetts*

4:20 - 4:40

**Stability of Lur'e Systems with Interval Plants and General Sector-Type Nonlinearities** ..... 1013

Takehiro Mori *Kyoto Institute of Technology*  
Tsuayoshi Nishimura *Kyoto Institute of Technology*  
Y. Kuroe *Kyoto Institute of Technology*  
Hideki Kokame *Osaka Institute of Technology*

4:40 - 5:00

**Stability of Interval Plants Under Nonlinear Feedback** ... 1018

Horacio J. Marquez *Univ. of New Brunswick*  
Chris P. Diduch *Univ. of New Brunswick*

5:00 - 5:20

**Absolute Stability Criteria for Multiple Slope-Restricted Monotonic Nonlinearities** ..... 1020

Wassim M. Haddad *Florida Inst. of Tech.*  
Vikram Kapila *Florida Inst. of Tech.*

5:20 - 5:40

**A Paraboloidal Multivariable Nyquist Exclusion Criterion for Multiple-Block-Structured Real Parameter Uncertainty** ..... 1022

Wassim M. Haddad *Florida Inst. of Tech.*  
Dennis S. Bernstein *Univ. of Michigan*

5:40 - 6:00

**Asymptotic Stability Independent of Delays: Simple Necessary and Sufficient Conditions** ..... 1027

Jie Chen *Georgia Institute of Technology*  
Haniph A. Latchman *Univ. of Florida*

**WP10 — Mt. Washington**  
**Estimation and Tracking**

**Chair** M. Kam *Drexel Univ.*  
**Cochair** Kwang H. Kim *The Mitre Corporation*

4:00 - 4:20

**"No-Escape" Firing Envelopes Revisited** ..... 1032

J. Shinar *TECHNION-Israel Institute of Technology*  
R. Tabak *TECHNION-Israel Institute of Technology*

4:20 - 4:40

**Development of Track to Track Fusion Algorithms** ..... 1037

Kwang H. Kim *The Mitre Corporation*

4:40 - 5:00

**On Sensor Track Fusion** ..... 1042

Ali T. Alouani *Tennessee Technological Univ.*  
T.R. Rice *Naval Surface Warfare Center*  
R.E. Helmick *Naval Surface Warfare Center*

5:00 - 5:20

**Multitarget Tracking using Dominant Probability Data Association** ..... 1047

Q. Pan *Northwestern Polytechnical Univ.*  
H. Zhang *Northwestern Polytechnical Univ.*  
Y. Xiang *Northwestern Polytechnical Univ.*

5:20 - 5:40

**Velocity Tracking Control for a Wound Field DC Motor Without Velocity Measurements** ..... 1051

Timothy Burg *Clemson Univ.*  
Darren M. Dawson *Clemson Univ.*

5:40 - 6:00

**Two-Level JPDANN and NN-JPDA Tracking Algorithms** ..... 1057

Lang Hong *Wright State Univ.*

**WP11 — Kent**

**Structural Control for Dynamic Hazard Mitigation**

**Organizer** B.F. Spencer *Univ. of Notre Dame*  
**Chair** B.F. Spencer *Univ. of Notre Dame*  
**Cochair** M. K. Sain *Univ. of Notre Dame*

4:00 - 4:20

**Structural Control Design: A Reliability-Based Approach** ..... 1062

B.F. Spencer *Univ. of Notre Dame*  
D. C. Kaspari *Univ. of Notre Dame*  
M. K. Sain *Univ. of Notre Dame*

4:20 - 4:40

**Application of Hybrid Mass Damper with Convertible Active and Passive Modes using Hydraulic Actuator to High-Rise Building** ..... 1067

Takafumi Fujita *Univ. of Tokyo*

4:40 - 5:00

**Building Seismic Response Attenuation using Robust Control and Architectural Cladding** ..... 1073

C. C. Hsu *Georgia Institute of Technology*  
A. J. Calise *Georgia Institute of Technology*  
G. D. Sweriduk *Georgia Institute of Technology*  
B. J. Goodno *Georgia Institute of Technology*  
J. I. Craig *Georgia Institute of Technology*

5:00 - 5:20	<b>Semiactive Control of Civil Engineering Structures Under Dynamic Loading</b> .....	1078
	William N. Patten	Univ. of Oklahoma
	Ronald L. Sack	Univ. of Oklahoma
5:20 - 5:40	<b>Control of Seismic-Excited Buildings using Active Variable Stiffness Systems</b> .....	1083
	J. N. Yang	Univ. of California
	Z. Li	Univ. of California
	J. C. Wu	Univ. of California
5:40 - 6:00	<b>International Full-Scale Test Facility for Structural Control</b> .....	3581
	James L. Beck	California Institute of Technology
	W. D. Iwan	California Institute of Technology
	J. C. Chen	Hong Kong Univ. of Science and Technology

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**WP12 — Pride of Baltimore**

**Discrete Event Systems - Theory & Applications**

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	<b>Chair</b> L. E. Holloway	Univ. of Kentucky
	<b>Cochair</b> Semyon M. Meerkov	Univ. of Michigan
4:00 - 4:20	<b>Non-Blocking Supervisory Control of Nondeterministic Systems via Prioritized Synchronization</b> .....	1089
	Ratnesh Kumar	Univ. of Kentucky
	Mark Shayman	Univ. of Maryland
4:20 - 4:40	<b>Application of Supervisor Synthesis for Controlled Time Petri Nets to Real-Time Database Systems</b> .....	1094
	Archana S. Sathaye	Digital Equipment Corp.
	Bruce H. Krogh	Carnegie Mellon Univ.
4:40 - 5:00	<b>Decentralized Supervisory Predicate Control of Discrete Event Dynamical Systems</b> .....	1099
	Alireza Haji-Valizadeh	Case Western Reserve Univ.
	Kenneth A. Loparo	Case Western Reserve Univ.
5:00 - 5:20	<b>Feedback Control of Congestion in Store-and-Forward Networks: The Case of Multiple Congested Nodes</b> .....	1104
	Lofti M. Benmohamed	Univ. of Michigan
	Semyon M. Meerkov	Univ. of Michigan
5:20 - 5:40	<b>Discrete-Event Control of Combat Dynamics in the C-2 Setting</b> .....	1109
	Shashi Phoha	Pennsylvania State Univ.
	Saurabh Sircar	Pennsylvania State Univ.
	Asok Ray	Pennsylvania State Univ.
	Israel Mayk	U.S. Army CECOM
5:40 - 6:00	<b>Dynamical Supervision for a Class of Discrete Event Systems with Concurrent Events</b> .....	1111
	Zhiming Wu	Shanghai Jiao Tong Univ.
	Li-ya Wang	Shanghai Jiao Tong Univ.
	Zhi-ping Jiang	Shanghai Jiao Tong Univ.

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**WP13 — James**

**Reduced Order  $H_{\infty}$  Design**

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	<b>Chair</b> Mustafa H. Khammash	Iowa State Univ.
	<b>Cochair</b> Juraj V. Medanic	Univ. of Illinois, Urbana-Champaign
4:00 - 4:20	<b>Balanced <math>H_{\infty}</math> and <math>H_2</math> Controllers</b> .....	1116
	Wodek Gawronski	California Inst. of Technology
	Kyong B. Lim	NASA Langley Research Center
4:20 - 4:40	<b>Reduced-Order <math>H_{\infty}</math> Controller Design and Separation Principle</b> .....	1123
	Jyh-Ching Juang	National Cheng Kung Univ.
	Hsi-Han Yeh	Wright Patterson Air Force Base
	Siva S. Banda	Wright Patterson Air Force Base



4:40 - 5:00	<b>Reduced Order Mixed <math>H_2/H_\infty</math> Optimization with a Singular <math>H_\infty</math> Constraint</b> .....	<b>1128</b>
David E. Walker	Air Force Inst. of Tech./Engg.	
D. Brett Ridgely	Air Force Inst. of Tech./Engg.	
5:00 - 5:20	<b>An Algorithm and Data Structure for Approximately Computing Nonlinear <math>H_\infty</math> Control Laws</b> .....	<b>1133</b>
Jie Huang	American GNC Corp	
Ching-Fang Lin	American GNC Corp.	
5:20 - 5:40	<b>Reduced-Order <math>H_\infty</math> Compensator Design for Nonstandard Problems</b> .....	<b>1138</b>
Xianggang Yu	Washington State Univ.	
Chin Shung Hsu	Washington State Univ.	
5:40 - 6:00	<b>Reduced Order <math>H_\infty</math> Compensator Design for an Inverted Pendulum Control Problem</b> .....	<b>1143</b>
Eric Campbell	Washington State Univ.	
Chin Shung Hsu	Washington State Univ.	
Xianggang Yu	Washington State Univ.	

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**WP14 — Gibson**

**Discrete-Time Control Synthesis**

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<b>Chair</b> R.H. Middleton	Univ. of Newcastle	
<b>Cochair</b> Paul Van Dooren	Univ. of Illinois	
4:00 - 4:20	<b>Discrete-Time Mixed-Norm <math>H_2/H_\infty</math> Controller Synthesis</b> ..	<b>1148</b>
Larry D. Davis	Harris Corp.	
Emmanuel G. Collins, Jr.	Harris Corp.	
Wassim M. Haddad	Florida Inst. of Tech.	
4:20 - 4:40	<b>A Solution to the Discrete-Time ARE</b> .....	<b>1153</b>
Enrique Barbieri	Tulane Univ.	
4:40 - 5:00	<b>A Generalized Eigenvalue Problem for Solving the Discrete-Time Riccati Equation with Singular Dynamics and Singular Measurement Noise</b> .....	<b>1155</b>
Scot. L. Osburn	Univ. of Michigan	
Dennis S. Bernstein	Univ. of Michigan	
5:00 - 5:20	<b>Closed Loop <math>L_1</math> Scaling for Fixed-Point Digital Control Implementation</b> .....	<b>1157</b>
Maarten Steinbuch	Philips Research Labs.	
Gerrit Schootstra	Philips Research Labs.	
Hoon-Toh Goh	National Univ. of Singapore	
Okko H. Bosgra	Delft Univ. of Technology	
5:20 - 5:40	<b>Numerical Synthesis and Analysis of Robust Discrete Time Feedback Control for Nonlinear Systems with Parametric Uncertainties</b> .....	<b>1162</b>
Masayoshi Tomizuka	Univ. of California at Berkeley	
Richard Scott Paden	Univ. of California at Berkeley	
5:40 - 6:00	<b>On Finding Stabilizing State Feedback Gains for a Discrete-Time Periodic System</b> .....	<b>1167</b>
J. Sreedhar	Univ. of Illinois	
Paul Van Dooren	Univ. of Illinois	

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**WP15 — St. George**

**Variable Structures**

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<b>Chair</b> Raymond A. DeCarlo	Purdue Univ.	
<b>Cochair</b> Sergej V. Drakunov	Ohio State Univ.	
4:00 - 4:20	<b>Constructing Discontinuity Planes for Variable Structure Systems - A Lyapunov Approach</b> .....	<b>1169</b>
Wu-Chung Su	Ohio State Univ.	
Sergej V. Drakunov	Ohio State Univ.	
Umit Ozguner	Ohio State Univ.	

4:20 - 4:40

**Control of Systems Partially Known: Variable Structure**

**Approach** ..... 1174  
Hachemi Mechli ..... *Tektrend International Inc.*  
D. Robert Hay ..... *Tektrend International Inc.*

4:40 - 5:00

**Smooth Robust Adaptive Sliding Mode Control of Manipulators with Guaranteed Transient Performance** ..... 1176

Masayoshi Tomizuka ..... *Univ. of California at Berkeley*  
Bin Yao ..... *Univ. of California at Berkeley*

5:00 - 5:20

**Sliding Mode Controller for Active Vibration Control of Flexible Rotor** ..... \*

Lai Yip Cheung ..... *Univ. of Bath*  
A.R. Daniels ..... *Univ. of Bath*  
R.W. Dunn ..... *Univ. of Bath*  
T. Berry ..... *Westinghouse, Chippenham*

5:20 - 5:40

**Lyapunov Control Design for Stabilizing State Trajectories to a Manifold** ..... 1181

Raymond A. DeCarlo ..... *Purdue Univ.*  
Sergej V. Drakunov ..... *Ohio State Univ.*

5:40 - 6:00

**Stabilization of Power System using Variable Structure Output Feedback Control** ..... 1183

Reyad M. El-Khazali ..... *Mu'tah Univ.*  
Gerald Heydt ..... *Purdue Univ.*  
Raymond A. DeCarlo ..... *Purdue Univ.*

**Thursday Morning Session**

**Plenary Session II**

**Chair** Hassan Khalil ..... *Michigan State Univ.*  
**Cochair** Jeff Kantor ..... *Univ. of Notre Dame*

8:30 - 9:30

**$\mathcal{L}_1$  Robust Control: Theory, Computation and Design** ..... \*

Munther Dahleh ..... *Massachusetts Institute of Technology*

**TA01 — Salon A**

**Advanced Vehicle Control**

**Organiser** Giorgio Rizzoni ..... *Ohio State Univ.*  
**Chair** Dong-Il Dan Cho ..... *Seoul National Univ.*  
**Cochair** Giorgio Rizzoni ..... *Ohio State Univ.*

10:00 - 10:20

**Lane Change Maneuver of Automobiles for the Intelligent Vehicle and Highway System (IVHS)** ..... 3586

Masayoshi Tomizuka ..... *Univ. of California at Berkeley*  
W. Chee ..... *Univ. of California at Berkeley*

10:20 - 10:40

**Combined Lateral and Longitudinal Control of Vehicles for Intelligent Highway Systems** ..... 1205

Hung A. Pham ..... *Univ. of California, Berkeley*  
J. Karl Hedrick ..... *Univ. of California, Berkeley*  
Masayoshi Tomizuka ..... *Univ. of California*

10:40 - 11:00

**Theory and Experiments of Tire Blow-Out Effects and Hazard Reduction Control for Automated Vehicle Lateral Control System** ..... 1207

Masayoshi Tomizuka ..... *Univ. of California*  
Satyajit N Patwardhan ..... *Univ. of California*  
Wei-bin Zhang ..... *Univ. of California*  
P. Devlin ..... *PATH*

11:00 - 11:20

**Torque Regulation with the General Motors ABS VI Electric Brake System** ..... 1210

J.K. Hurtik ..... *Ohio State Univ.*  
Stephen Yurkovich ..... *Ohio State Univ.*  
Kevin Passino ..... *Ohio State Univ.*  
D. Littlejohn ..... *Delco Chassis Div., General Motors*