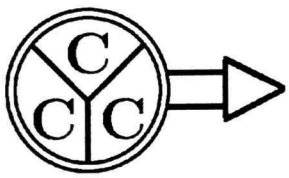
The 19th Chinese Control Conference

6 – 8 December 2000
Hong Kong, China

Proceedings of CCC 2000
Volume 1 of 2

CCC 2000
The Nineteenth Chinese Control Conference



6 – 8 December 2000
Sheraton Hong Kong

Proceedings
Volume 1 of 2

Editors: Hua-Shu Qin, Lei Guo, Wei Huo
Da-Zhong Zheng, Ji-Feng Zhang, C.W. Chan
J. Lam, K.L. Mak, D.W.C. Ho

Organizers:

Chinese Association of Automation

Control, Automation and Instrumentation Division, Hong Kong Institution of Engineers

Foreword

The year 2000 marks a new phase in the world's development, as it does also for the Chinese Control Conference. This year, as we celebrate the new millennium, the 19th Chinese Control Conference is being held in Hong Kong, the first time the Chinese Control Conference has been held outside the mainland. The conference is organised jointly by the Chinese Association of Automation (CAA) and the Control, Automation and Instrumentation (CAI) Division of the Hong Kong Institution of Engineers. It aims at providing a venue for academics and professionals in the area of systems and control to share their ideas, experiences and achievements, and to facilitate the transfer of advanced control technology to industries.

The response to the announcement of the 19th Chinese Control Conference was excellent. A total of 297 papers were received from the mainland, Hong Kong and the international community. After careful consideration by the Programme Committee, 160 papers were selected for oral presentation or poster presentation: 4 plenary papers will also be included and 3 papers nominated for the Guan Zhao Zhi Award will be presented during the conference. In the first two days of the conference, there will also be an exhibition of current automation and control equipment. A Round-Table Panel discussion with practitioners from industries and equipment manufacturers on "Future Trends in Automation and Control" will be held on the third day of the conference. This is to be followed by another panel discussion on future directions in the development of control theory and its applications.

The 19th Chinese Control Conference indeed marks an important step in its move towards internationalization, since colleagues from the mainland, Hong Kong, and overseas have joined hands in contributing efforts to both the Organizing Committee and the Programme Committee. We extend our sincere thanks to all members of these two committees for their excellent work in making the conference a success. Our special thanks go to Dr. C.W. Chan, the Co-chairman of the Organising Committee: his enthusiasm has made it possible for the conference to be successfully launched in Hong Kong under favourable sponsorship. We would also like to take this opportunity to extend our thanks here to the various sponsors for their generous support of the 19th Chinese Control Conference.

Finally, we look forward to making the Chinese Control Conference an even greater success in the new millennium, and we thank you again for your support and participation.

Professor K.L. Mak
The University of Hong Kong

Professor Lei Guo
Chinese Academy of Sciences

The 19th Chinese Control Conference
6-8 December 2000, Hong Kong

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- Chinese Association of Automation
- Control, Automation and Instrumentation Division, Hong Kong Institution of Engineers

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Ying-Ping Zheng, *China*
Yi-Sheng Zhong, *China*
Kemin Zhou, *United States*

CCC 2000 WEDNESDAY 6 DECEMBER SESSIONS

Opening Ceremony: 9:00 – 9:15 Ballroom

Plenary Lecture I: 9:15 – 10:00 Ballroom

TITLE: 现代集成制造系统及其系统和控制问题

System and Control Problems in Contemporary Integrated Manufacturing Systems

吴澄，清华大学

Cheng Wu, Tsinghua University

Plenary Lecture II: 10:00 – 10:45 Ballroom

TITLE: Information and Complexity in Control Systems

Le Yi Wang, Wayne State University

Track	1	2	3	4
Room	Sung I	Sung II	Ming I	Ming II
Wed 11:00 to 12:20	WA1 DEDS, Hybrid Systems (I)	WA2 Modeling, Identification and Adaptive Control (I)	WA3 Stochastic Systems and Control	WA4 Nonlinear Systems (I)
Wed 13:30 to 15:10	WM1 DEDS, Hybrid Systems (II)	WM2 Modeling, Identification and Adaptive Control (II)	WM3 Distributed Parameter Systems (I)	WM4 Short-listed Papers for Award
Wed 15:30 to 16:50	WP1 DEDS, Hybrid Systems (III)	WP2 Modeling, Identification and Adaptive Control (III)	WP3 Distributed Parameter Systems (II)	WP4 Nonlinear Systems (II)

CCC 2000 THURSDAY 7 DECEMBER SESSIONS

Plenary Lecture III: 9:00 – 9:45 Ballroom

TITLE: Generating Chaos by Feedback Control for Engineering Applications

Guanrong Chen, City University of Hong Kong

Plenary Lecture IV: 9:45 – 10:30 Ballroom

TITLE: Design and Stability Issues for Systems with Actuator Saturation

C.W. Chan, The University of Hong Kong

Track	1	2	3	4	5
Room	Sung I	Sung II	Ming I	Ming II	
Thu 10:50 to 12:10	TA1 Linear Systems (I)	TA2 Neural Networks, Fuzzy Control (I)	TA3 Nonlinear Systems (III)	TA4 Signal Processing (I)	PT1 Dynamic Systems (Theory and Applications) (Poster)
Thu 13:30 to 15:10	TM1 Linear Systems (II)	TM2 Variable Structure Control	TM3 Robustness and Robust Control (I)	TM4 Signal Processing (II)	PT2 Manufacturing and Robotic Systems (Poster)
Thu 15:30 to 16:50	TP1 Linear Systems (III)	TP2 Neural Networks, Fuzzy Control (II)	TP3 Robustness and Robust Control (II)	TP4 Nonlinear Systems (IV)	PT3 Neural Networks, Fuzzy Logic and Intelligent Control (Poster)
Thu 19:00	Banquet (Elite City Seafood Restaurant)				

CCC 2000 FRIDAY 8 DECEMBER SESSIONS

Track	1	2	3	4	5	
Room	Sung I	Sung II	Ming I	Ming II	Tang I & II	
Fri 9:00 to 10:40	FA1 Intelligent Control	FA2 Robustness and Robust Control (III)	FA3 Manufacturing Systems and Robotics	FA4 Industrial and Process Control	Fri 9:00 to 10:00	FA7 Industrial Applications of Automation
Fri 11:00 to 12:20	FA5 PID Control	FA6 Fault Diagnosis			Fri 10:20 to 12:20	Round-Table Discussion: Future Trend in Automation and Control
Fri 14:00 to 16:00	Panel Discussion (Ballroom) Challenges for Control in the New Century: Theory and Practice					
Fri 16:20 to 16:50	Closing Ceremony and Prize Presentation (Ballroom)					

19th Chinese Control Conference

6 DEC 2000 (Wed)

Ballroom

Plenary Lecture I (Page 1)
09:15 - 10:00

现代集成制造系统及其系统和控制问题

System and Control Problems in Contemporary Integrated Manufacturing Systems

吴澄
清华大学
Wu, Cheng
Tsinghua University

Plenary Lecture II (Page 4)
10:00 - 10:45
Information and Complexity in Control Systems
Wang, Le Yi
Wayne State Univ.

Sung I

WA1
DEDS、混杂系统(一)
DEDS, Hybrid Systems (I)
Chair: Zheng, Da-Zhong — Tsinghua Univ.
Co-Chair: Chen, Wende — Chinese Acad. of Scis.

11:00 WA1-1 (Page 28)
Robust Control for a Class of DEDS
Zhao, Qianchuan — Tsinghua Univ.
Zheng, Da-Zhong — Tsinghua Univ.

11:20 WA1-2 (Page 33)
An Application of Hierarchical Hybrid Control Theory to Automotive Powertrain Systems
Caines, Peter E. — McGill Univ.
Shaikh, M. Shahid — McGill Univ.

11:40 WA1-3 (Page 38)
M/G/1排队系统的性能灵敏度分析
殷保群 — 中国科学技术大学
奚宏生 — 中国科学技术大学

12:00 WA1-4 (Page 43)
Reachability and Controllable Sequences of Extended Timed Event Graphs
Chen, Wende — Chinese Acad. of Scis.
Zhuo, Zhibing — Chinese Acad. of Scis.

Sung II

WA2
建模、辨识、自适应控制 (一)
Modeling, Identification and Adaptive Control (I)
Chair: Guo, L. — Chinese Acad. of Scis.
Co-Chair: 丛爽 (Cong, Shuang) — 中国科学技术大学

11:00 WA2-1 (Page 49)
A Characterization of Adaptive Stabilizability of LTV Systems with Hidden Markovian Jumps
Xue, F. — Chinese Acad. of Scis.
Guo, L. — Chinese Acad. of Scis.

11:20 WA2-2 (Page 54)
离散型非线性自适应反馈控制
丛爽 — 中国科学技术大学
谢亮亮 — 中国科学院

11:40 WA2-3 (Page 59)
具有不确定未知界的相似组合系统的指数实用稳定分散自适应输出反馈控制
张育力 — 东北大学
刘粉林 — 东北大学
赵军 — 东北大学

12:00 WA2-4 (Page 64)
鲁棒变结构模型参考自适应控制器：控制增益切换方法
林岩 — 北京航空航天大学
毛剑琴 — 北京航空航天大学

Ming I

WA3
随机系统与控制
Stochastic Systems and Control
Chair: Yong, Jiongmin — Fudan Univ.
Co-Chair: Mao, Xuerong — Univ. of Strathclyde

11:00 WA3-1 (Page 70)
Existence of Optimal Portfolios via Stochastic Control and Backward Stochastic Differential Equations
Yong, Jiongmin — Fudan Univ.

11:20 WA3-2 (Page 76)
Robustness of Stability of Stochastic Differential Delay Equations with Markovian Switching
Mao, Xuerong — Univ. of Strathclyde

11:40 WA3-3 (Page 81)
Three-Rate State-Space Models for Stochastic Multivariable Continuous-Time Control Systems and their Simulation
Astrov, Igor — Tallinn Technical Univ.
Em, Juri — Tallinn Technical Univ.
Rüstern, Ennu — Tallinn Technical Univ.

12:00 WA3-4 (Page 86)
A Subspace State-Space Identification of Closed-loop Systems based on Stochastic Realization
Huang, Dongliang — Kyoto Univ.
Katayama, Tohru — Kyoto Univ.

Ming II

WA4
非线性系统 (一)
Nonlinear Systems (I)
Chair: Cheng, Daizhan — Chinese Acad. of Scis.
Co-Chair: Hong, Yiguang — Chinese Acad. of Scis.

11:00 WA4-1 (Page 91)
Stabilization of Nonlinear Systems with Oscillatory Center
Cheng, Daizhan — Chinese Acad. of Scis.
Spurgeon, Sarah — Univ. of Leicester

11:20 WA4-2 (Page 97)
A Geometric Approach for a Class of Output Feedback Regulation Problems with Symmetry
Lum, Kai-Yew — DSO National Lab.

7 DEC 2000 (Thu)

Ballroom

Plenary Lecture III (Page 14)
09:00 - 09:45

Generating Chaos by Feedback Control for Engineering Applications

Chen, Guanrong
City Univ. of Hong Kong

Plenary Lecture IV (Page 20)
09:45 - 10:30

Design and Stability Issues for Systems with Actuator Saturation

Chan, C. W.
Univ. of Hong Kong

Sung I

TA1
线性系统 (一)
Linear Systems (I)
Chair: 赵军 (Zhao, Jun) 东北大学
Co-Chair: Lu, Guoping Nantong Inst. of Tech.

10:50 TA1-1 (Page 267)
线性开关系统稳定性的一个代数条件
赵军 东北大学

11:10 TA1-2 (Page 271)
Strict Positive Realness for Linear Systems with Multiple Time-delays
Lu, Guoping Nantong Inst. of Tech.
Shen, Shide Nantong Inst. of Tech.
Zhai, Qiliang Nantong Teachers' College

11:30 TA1-3 (Page 276)
连续分片线性函数的紧凑表示
李星野 清华大学
王书宁 清华大学
王万宾 清华大学

11:50 TA1-4 (Page 281)
采样系统L_1稳定控制器研究
吴俊 浙江大学
褚健 浙江大学
胡剑波 浙江大学

Sung II

TA2
神经网络、模糊控制 (一)
Neural Networks, Fuzzy Control (I)
Chair: Chen, Wei Ji Univ. of Macao
Co-Chair: 慕春棣 (Mu, Chundi) 清华大学

10:50 TA2-1 (Page 286)
Fuzzy Control of Double Stages Inverted Pendulum System
Lei, Kam Kin Univ. of Macao
Chen, Wei Ji Univ. of Macao

11:10 TA2-2 (Page 289)
水下自航器纵向运动的神经网络稳定自适应控制
施阳 清华大学
慕春棣 清华大学
严卫生 西北工业大学
李俊 西北工业大学
徐德民 西北工业大学

11:30 TA2-3 (Page 293)
模糊推理的Zadeh型全蕴涵三I算法
宋士吉 东南大学
冯纯伯 东南大学
费树岷 东南大学
孙长银 东南大学

11:50 TA2-4 (Page 297)
Hopfield神经网络的平衡态结构分析
李玉鉴 北京邮电大学

Ming I

TA3
非线性系统 (三)
Nonlinear Systems (III)
Chair: Chen, Guanrong City Univ. of Hong Kong
Co-Chair: 曾建平 (Zeng Jianping) 北京航空航天大学

10:50 TA3-1 (Page 301)
Chaotifying Minimum Phase Systems via Time-Delay Feedback Control
Wang, Xiao Fan City Univ. of Hong Kong
Chen, Guanrong City Univ. of Hong Kong
Man, Kim F. City Univ. of Hong Kong

11:10 TA3-2 (Page 306)
Nonlinear Control and State Space Adjustments
De Souza, J. F. UBI

11:30 TA3-3 (Page 311)
混沌系统的参数脉冲控制
唐芳 北京航空航天大学
邱琦 北京航空航天大学

11:50 TA3-4 (Page 314)
一般H_∞控制问题降阶控制器的存在性
曾建平 北京航空航天大学
张力军 北京航空航天大学

Ming II

TA4
信号处理 (一)
Signal Processing (I)
Chair: Zhang, Cishen Univ. of Melbourne
Co-Chair: 罗安 (Luo, An) 中南工业大学

10:50 TA4-1 (Page 320)
Mixed H_2/H_∞ Deconvolution of Uncertain Periodic FIR Channels
Wang, Song Univ. of Melbourne
Xie, Lihua NTU
Zhang, Cishen Univ. of Melbourne

11:10 TA4-2 (Page 325)
Roundoff Noise Analysis and Minimization of a Modified Delta Direct-form IIR Structure
Wong, Ngai Univ. of Hong Kong
Ng, Tung-Sang Univ. of Hong Kong

PT1
动态系统（理论与应用）
Dynamic Systems (Theory and Applications)
Chair: Choi, S. H Univ. of Hong Kong
Co-Chair: Yuan, Jing Hong Kong Poly. Univ.

Sung I

TM1
线性系统（二）
Linear Systems (II)
Chair: Zhang, Ji-Feng Chinese Acad. of Scis.
Co-Chair: 张森 (Zhang, Lin) 清华大学

Sung II

TM2
变结构控制
Variable Structure Control
Chair: 霍伟 (Huo, Wei) 北京航空航天大学
Co-Chair: 胡跃明 (Hu, Yueming) 华南理工大学

13:30 TM2-1 (Page 359)
一类非线性不确定系统的“棒－棒”控制算法
朱进国 北京航空航天大学
霍伟 北京航空航天大学

13:50 TM2-2 (Page 364)
基于非线性系统高阶滑模的变结构控制
胡跃明 华南理工大学
晁红敏 华南理工大学

14:10 TM2-3 (Page 370)
Application of Variable Structure Control and Neural Networks in Plant
Mkrttchian, Vardan SEUA
Lazaryan, Anri SEUA
Tsintsadze, Aleko GTU
Iashvili, Genady GTU

14:30 TM2-4 (Page 375)
Sliding Mode Control for Linear Uncertain Systems
Zhang, J. R. Univ. de Picardie Jules
Rachid, A. Univ. de Picardie Jules
Xu, S. J. Harbin Inst. of Tech.

14:50 TM2-5 (Page 380)
基于邻区域搜索的分片线性函数的最优化方法
高林 清华大学
王书宁 清华大学
王伟 清华大学

Ming I

TM3
鲁棒分析与控制（一）
Robustness and Robust Control (I)
Chair: 黄琳 (Huang, Lin) 北京大学
Co-Chair: Lee, Francis C. HKIVE

13:30 TM3-1 (Page 384)
混合不确定系统的鲁棒性能
安森建 北京理工大学
黄琳 北京大学

13:50 TM3-2 (Page 390)
μ-analysis for Robust Control in Spacecraft with Large Appendages
Lee, Francis C. HKIVE

14:10 TM3-3 (Page 394)
Delta算子系统圆形区域极点配置的鲁棒性
张端金 郑州大学
吴捷 华南理工大学
王忠勇 郑州大学

14:30 TM3-4 (Page 398)
控制器与对象同时摄动的鲁棒控制问题：离散系统
段志生 北京大学
黄琳 北京大学
王龙 北京大学

14:50 TM3-5 (Page 404)
Robustness Analysis for Singular and Impulsive Delay Systems with Time-Varying Uncertainties
Guan, Zhi-Hong Huazhong Univ. of Sci. & Tech.
Liao, Rui-Quan Huazhong Univ. of Sci. & Tech.
Sun, De-Bao Huazhong Univ. of Sci. & Tech.
Lam, James Univ. of Hong Kong

Ming II

TM4
信号处理（二）
Signal Processing (II)
Chair: Ho, Daniel W. C. City Univ. of Hong Kong
Co-Chair: 毛剑琴(Mao, Jianqin) 北京航空航天大学

13:30 TM4-1 (Page 410)
A Training and Pruning Algorithm for Wavelet Neural Networks
Xu, Jinhua City Univ. of Hong Kong
Ho, Daniel W. C. City Univ. of Hong Kong
Zhou, Ding-Xuan City Univ. of Hong Kong

13:50 TM4-2 (Page 415)
Numerical Implementation Considerations in Applying the QFT Stability Theorem
Wu, Wei Texas A&M Univ.
Jayasuriya, Suhada Texas A&M Univ.

14:10 TM4-3 (Page 420)
A Modified Simulated Annealing Algorithm for Optimal Vibration Control of Flexible Structures
Zhang, Hongwei Univ. of Manchester
Lennox, Barry Univ. of Manchester
Goulding, Peter R. City Univ. of Hong Kong
Leung, Andrew Y. T. City Univ. of Hong Kong

14:30 TM4-4 (Page 425)
小波技术在信号处理中的一种应用
李合生 北京航空航天大学
毛剑琴 北京航空航天大学
张富堂 中国工程物理研究院

14:50 TM4-5 (Page 430)
基于不同邻域函数的模拟退火算法性能研究
王凌 清华大学
郑大钟 清华大学

PT2
制造与机器人系统
Manufacturing and Robotic Systems
Chair: Fung, Eric H. K. Hong Kong Poly. Univ.
Co-Chair: 宋靖雁 (Song, Jingyan) 清华大学

13:30-15:10 PT2-1 (Page 710)
A Survey of EDICT Supervisory Control Method
Li, Y. M. THMI
Wang, M. Z. THMI
Jones, A. H. Univ. of Salford

13:30-15:10 PT2-2 (Page 715)
基于LPV方法的机器人鲁棒H_∞控制
虞忠伟 同济大学
胡东 同济大学
陈辉堂 同济大学

Sung I

TP1
线性系统（三）
Linear Systems (III)
Chair: 郁文生 (Yu, Wensheng) 中国科学院
Co-Chair: Liu, Kang-Zhi Chiba Univ.

Sung II

TP2
神经网络、模糊控制（二）
Neural Networks, Fuzzy Control (II)
Chair: Huang, Jie Chinese Univ. of Hong Kong
Co-Chair: 刘士荣 (Liu, Shirong) 宁波大学

Ming I

TP3
鲁棒分析与控制（二）
Robustness and Robust Control (II)
Chair: Wang, Long Peking Univ.
Co-Chair: Tam, Hei Ka Univ. of Hong Kong

Ming II

TP4
非线性系统 (四)
Nonlinear Systems (IV)
Chair: Chan, W. C. — Univ. of Hong Kong
Co-Chair: Chen, Pengnian — China Inst. of Metrology

PT3
神经网络、模糊与智能控制
Neural Networks, Fuzzy Logic, and Intelligent Control
Chair: 柴天佑 (Cai, Tianyou) — 东北大学
Co-Chair: 孙秀霞 (Sun, Xiuxia) — 空军工程大学

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8 DEC 2000 (Fri)

Sung I

FA1
智能控制
Intelligent Control
Chair: Xi, Yugeng — Shanghai Jiaotong Univ.
Co-Chair: Yeung, L. F. — City Univ. of Hong Kong

09:00 FA1-1 (Page 512)
Satisfactory Optimization Control in Fuzzy Dynamic Environment for Complex Systems
Xi, Yugeng — Shanghai Jiaotong Univ.
Li, Shaoyuan — Shanghai Jiaotong Univ.

09:20 FA1-2 (Page 518)
Predictive Control Based on Fuzzy Goals and Fuzzy Constraints
Li, Shaoyuan — Shanghai Jiaotong Univ.
Xi, Yugeng — Shanghai Jiaotong Univ.

09:40 FA1-3 (Page 523)
一种新型的非线性规划神经网络
黄远灿 — 北京理工大学
付梦印 — 北京理工大学
王庆林 — 中国科学院

10:00 FA1-4 (Page 528)
一种改进遗传算法及其在原料采购优化中的应用
桂卫华 — 中南工业大学
黄泰松 — 中南工业大学
阳春华 — 中南工业大学

10:20 FA1-5 (Page 532)
Input-Output Variable Block Assignement Problem with Genetic Algorithm
Yeung, L. F. — City Univ. of Hong Kong
Chan, K. Y. — City Univ. of Hong Kong
Wu, Angus — City Univ. of Hong Kong

Sung II

FA2
鲁棒分析与控制（三）
Robustness and Robust Control (III)
Chair: Zhong, Yi-Sheng — Tsinghua Univ.
Co-Chair: 吴敏 (Wu, Min) — 中南工业大学

09:00 FA2-1 (Page 537)
Robust Stabilization of a Class of Nonlinear Time-varying Uncertain Systems with Multiple Delays
Zhong, Yi-Sheng — Tsinghua Univ.

09:20 FA2-2 (Page 543)
Randomized Algorithms for Optimal Robust Performance Controller Design
Song, Chunlei — Peking Univ.
Wang, Long — Peking Univ.
Huang, Lin — Peking Univ.

09:40 FA2-3 (Page 549)
有结构不确定性的关联大系统分散H_∞输出反馈控制
陈宁 — 中南工业大学
桂卫华 — 中南工业大学
吴敏 — 中南工业大学

10:00 FA2-4 (Page 553)
Further Results on Robust Nonlinear H_∞ Control
Lu, Guoping — Nantong Inst. of Tech.
Ho, Daniel W. C. — City Univ. of Hong Kong
Yeung, L. F. — City Univ. of Hong Kong

10:20 FA2-5 (Page 558)
Associative Memory-based Robotic Manipulator Intelligent Control System
Xu, Ning-Shou — Beijing Polytechnic Univ.
Wang, Jun-Song — Beijing Polytechnic Univ.
Feng, Weining — Univ. of Houston-Downtown

Ming I

FA3
制造系统、机器人
Manufacturing Systems and Robotics
Chair: 谭民 (Tan, Min) — 中国科学院
Co-Chair: Zhu, Yunmin — Sichuan Univ.

09:00 FA3-1 (Page 564)
Thermal Design for the Reliability of Robot Controller Box
Huang, Yong — Chinese Acad. of Scis.
Tan, Min — Chinese Acad. of Scis.

09:20 FA3-2 (Page 569)
空间机器人捕获目标的鲁棒自适应控制
吴宏鑫 — 北京控制工程研究所
王昊瀛 — 北京控制工程研究所

09:40 FA3-3 (Page 575)
欠驱动机构控制的一种非光滑设计方法
侯增广 — 中国科学院
谭民 — 中国科学院
韩京清 — 中国科学院

10:00 FA3-4 (Page 579)
On the Equivalence Classes of Fusion Rules for Distributed Multisensor Decision Systems
Zhu, Yunmin — Sichuan Univ.
You, Zhisheng — Sichuan Univ.

10:20 FA3-5 (Page 584)
Robust Nonlinear Control of Rigid Robots Driven by Induction Motors
Guerrero-Ramirez, Gerardo — CENIDET
Tang, Yu — DEPFI-UNAM

Ming II

FA4
工业与过程控制
Industrial and Process Control
Chair: 万百五 (Wan, Baiwu) — 西安交通大学
Co-Chair: 赖晓平 (Lai, Xiaoping) — 山东大学

09:00 FA4-1 (Page 589)
工业生产的产品质量模型和质量控制模型及其应用
万百五 — 西安交通大学

09:20 FA4-2 (Page 595)
Practical Application of Principal Component Analysis
Wang, X. — Univ. of Manchester
Lennox, B. — Univ. of Manchester
Goulding, P. R. — Univ. of Manchester
Leung, A. Y. T. — City Univ. of Hong Kong

Sung I

FA5
PID控制
PID Control

Chair: 胡包钢 (Hu, Baogang) 中国科学院
Co-Chair: 沈德耀 (Shen, Deyao) 中南工业大学

Sung II

FA6
故障诊断
Fault Diagnosis

Chair: 周东华 (Zhou, Donghua) 清华大学
Co-Chair: 魏晨 (Wei, Chen) 北京航空航天大学

Tang I & II

FA7
Industrial Applications of Automation

Chair: Sze, W. S. Univ. of Hong Kong

现代集成制造系统及其系统和控制问题

（详细摘要）

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1. 引言

现代集成制造系统（Contemporary Integrated Manufacturing Systems）是信息时代的先进生产系统，它将信息技术、现代管理技术和制造技术综合应用于企业产品全生命周期（从市场需求分析到最终报废处理）的各个阶段。通过信息集成、过程优化及资源优化，实现物流、信息流、价值流的集成和优化运行，达到人（组织、管理）、经营和技术三要素的集成。以加强企业新产品开发的 T、Q、C、S、E（清洁生产）、K（自主创新），从而提高企业的市场应变能力和竞争能力。

这是一种普遍存在的系统：凡是人造物，都离不开设计、制造及相应的管理。

这是一种对国家经济、安全至关重要的系统。

这是一种复杂的人机大系统，提出了大量的尚待解决的新问题，包括理论问题。

863 计划实施以来，每年约 3000 人的研究与实践，对如何解决这是系统的设计与优化问题作了大量的工作，取得了明显的效果，但其相关理论，还处于初始阶段。

2. 系统的复杂性

功能的复杂性：系统包含了产品从规划设计到最终交付用户使用的一切活动。如产品设计开发过程、加工制造过程、经营管理过程（包括销售及服务）等。不仅有物流的活动，还有大量的人的活动。

对象的复杂性：相当一部分过程和活动，很难完全用一般的动力学系统模型、离散事件系统模型及混杂系统模型来描述。

随机性：影响系统性能的随机因素大量、经常存在：市场、原材料零部件的供应、合同、价格、设备的损坏，人员的流动等等。

目标/约束的多样性：企业市场竞争力的提高，表现在多个方面，如 T、Q、C、S、K、E 等等。

解决这样的复杂系统的理论进展还大大落后于实际应用的需求。

3. 复杂问题求解的基本框架——多层面的综合集成及综合管（理）控（制）

复杂问题的求解一般不能只限于某一个层面。综合集成、综合管控是一种可行的解决方案。

基本框架：

管理层面（包括生产组织模式）。理念与模式、定性

方法论层面，宏观技术，多数仍为定性

实现技术层面，中观及微观的实现

数学等理论工具层面，微观的理论分析、综合

3.1 管理（包括生产组织模式）

有大量的先进的管理理念，如集成制造；（推式）计划的生产组织；精良生产与“拉式”生产组织；经营过程重组；协作生产的组织模式（不是“小而全”“大而全”）等等。

这些理念与计划经济的生产模式和管理方法是对立的。

管理层面对企业的影响是至关重要的。

3.2 方法论

体系结构的概念（系统结构）；开放系统的概念→标准化；企业建模的方法论，如功能模型、信息模型、决策模型、组织模型、资源模型、动态模型等等。

方法论不在数学层次解决问题，但重要的在于将问题纳入一个正确的方向。多数情况下，方法论主要还在定性阶段，但对某些问题，如大型软件开发采用功能模型便十分有效，对数据库系统的设计与实现，信息模型是主要工具。

3.3 实现技术

解决如何建立一个现代集成制造系统。