

Contents

INVITED PAPERS

Opening Session

- Business Process Control: The Outer Loop 1
Lowell B. Koppel
- Influence of Computers and Information Technology on Process Operations and
Business Processes—A Case Study 7
J. Patrick Kennedy and Osvaldo Bascur

Modeling and Identification

- Nonlinear Model Reduction for Optimization Based Control of Transient
Chemical Processes 12
Wolfgang Marquardt
- Model Requirements for Next Generation Integrated MPC and Dynamic Optimization . . . 43
Ton C. Backx
- Recent Advances and Challenges in Process Identification 55
Sten Bay Jørgensen and Jay H. Lee

Life Sciences

- Controlled Biological Processes and Computational Genomics 75
James S. Schwaber, Francis J. Doyle III and Daniel E. Zak
- Stochastic and Deterministic Control in Two Bacterial Cellular Networks 81
Adam Arkin
- Computer-Aided Design of Metabolic Networks 82
Klaus Mauch, Stefan Buziol, Joachim Schmid and Matthias Reuss

Control Theory

- Neuro-Dynamic Programming: An Overview 92
Dimitri P. Bertsekas
- The Behavioral Approach to Modeling and Control of Dynamical Systems 97
Jan C. Willems
- Input to State Stability and Related Notions 109
Eduardo D. Sontag

Hybrid Systems

- Hybrid Systems in Process Control: Challenges, Methods and Limits 121
Stefan Kowalewski
- Hybrid System Analysis and Control via Mixed Integer Optimization 136
Manfred Morari
- Discrete Optimization Methods and their Role in the Integration of Planning
and Scheduling 150
Ignacio E. Grossmann, Susara A. van den Heever and Iiro Harjankoski

Controller Performance Monitoring and Maintenance

- Increasing Customer Value of Industrial Control Performance Monitoring—
Honeywell’s Experience 169
Lane Desborough and Randy Miller
- Multivariate Controller Performance Analysis: Methods, Applications and Challenges 190
Sirish L. Shah, Rohit Patwardhan and Biao Huang
- Recent Developments in Controller Performance Monitoring and Assessment Techniques . . 208
Thomas J. Harris and Christopher T. Seppala

Chemical Reactors/Separators

- Simultaneous Design and Control Optimization under Uncertainty in
Reaction/Separation Systems 223
Efstratios N. Pistikopoulos and Vassilis Sakizlis
- Optimal Operation and Control of Simulated Moving Bed Chromatography: A
Model-Based Approach 239
Karsten-U. Klatt, Guido Dünnebier, Felix Hanisch and Sebastian Engell
- Dynamic Optimization in the Batch Chemical Industry 255
D. Bonvin, B. Srinivasan and D. Ruppen

Modeling and Control of Complex Products

- Dynamics and Control of Cell Populations in Continuous Bioreactors 274
Prodromos Daoutidis and Michael A. Henson
- Control of Product Quality in Polymerization Processes 290
Francis J. Doyle III, Masoud Soroush and Cajetan Cordeiro
- Particle Size and Shape Control in Crystallization Processes 307
Richard D. Braatz and Shinji Hasebe

Closing Session

- Linking Control Strategy Design and Model Predictive Control 328
James J. Downs
- Evolution of an Industrial Nonlinear Model Predictive Controller 342
Robert E. Young, R. Donald Bartusiak and Robert W. Fontaine
- Emerging Technologies for Enterprise Optimization in the Process Industries 352
Rudolf Kulhavý, Joseph Lu and Tariq Samad

CONTRIBUTED PAPERS

- A Definition for Plantwide Controllability 364
Surya Kiran Chodavarapu and Alex Zheng
- Nonlinear Process Control: Novel Controller Designs for Chemical Processes
with Uncertainty and Constraints 369
Nael H. El-Farra and Panagiotis D. Christofides
- Efficient Nonlinear Model Predictive Control 374
Rolf Findeisen, Frank Allgöwer, Moritz Diehl, H. Georg Bock, Johannes P. Schlöder and
Zoltan Nagy
- Controller Design for Ventricular Assist Devices 379
Guruprasad A. Giridharan and Mikhail Skliar
- Assessment of Performance for Single Loop Control Systems 384
Hsiao-Ping Huang and Jyh-Cheng Jeng

Feedback Control of Stable, Non-minimum-phase, Nonlinear Processes	389
Joshua M. Kanter, Warren D. Seider and Masoud Soroush	
Self-optimizing Control of a Large-scale Plant: The Tennessee Eastman Process	393
Truls Larsson, Sigurd Skogestad and Kristin Hestetun	
Robust Passivity Analysis and Design for Chemical Processes	398
Huaizhong Li, Peter L. Lee and Parisa A. Bahri	
On-line Optimization of a Crude Unit Heat Exchanger Network	403
Tore Lid, Stig Strand and Sigurd Skogestad	
Analysis of a Class of Statistical Techniques for Estimating the Economic Benefit from Improved Process Control	408
Kenneth R. Muske and Conner S. Finegan	
Connection between Model Predictive Control and Anti-Windup Control Schemes	413
Michael Nikolaou and Mohan R. Cherukuri	
Efficient Nonlinear Model Predictive Control: Exploiting the Volterra-Laguerre Model Structure	418
Robert S. Parker	
Partial Differential Equation Model Based Control: Application to a Bleaching Reactor	423
Stéphane Renou, Michel Perrier, Denis Dochain and Sylvain Gendron	
Steady State Multiplicity and Stability in a Reactive Flash	428
Iván E. Rodríguez, Alex Zheng and Michael F. Malone	
Feasible Real-time Nonlinear Model Predictive Control	433
Matthew J. Tenny, James B. Rawlings and Rahul Bindlish	
Industrial Experience with State-Space Model Predictive Control	438
Ernest F. Vogel and James J. Downs	
A Computationally Efficient Formulation of Robust Model Predictive Control using Linear Matrix Inequalities	443
Zhaoyang Wan and Mayuresh V. Kothare	
Time Series Reconstruction from Quantized Measurements	448
M. Wang, S. Saleem and N. F. Thornhill	
Author Index	453
Subject Index	455

