

10th IFAC International Symposium on Dynamics and Control of Process Systems 2013

**Mumbai, India
18-20 December 2013**

Editors:

**M. A. Henson
Ravindra Gudi**

**G. Pannocchia
Sachin Patwardhan**

ISBN: 978-1-62993-726-7

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2013) by Elsevier Limited
All rights reserved.

Printed by Curran Associates, Inc. (2014)

For permission requests, please contact the publisher, Elsevier Limited
at the address below.

Elsevier Limited
The Boulevard, Langford Lane
Kidlington OX5 1GB, United Kingdom

Phone: +44 (0)1865 844640
Fax: +44 (0)1865 843912

Email: eurobkinfo@elsevier.com

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Robustness Analysis, Prediction and Estimation for Uncertain Biochemical Networks	1
<i>Stefan Streif, Kwang-Ki Kim, Philipp Runschinski, Masako Kishida, Dongying Shen, Rolf Findeisen, Richard D. Braatz</i>	
Iterative Controller Tuning by Real-Time Optimization	21
<i>Gene Bunin, Gregory Francois, Dominique Bonvin</i>	
Entropy-Based Stabilizing Feedback Law under Input Constraints of a CSTR	27
<i>Ngoc Ha Hoang, Denis Dochain</i>	
Using Dynsim[®] to Study the Implementation of Advanced Control in a Propylene/Propane Splitter	33
<i>Aldo I. Hinojosa, Darci Odloak</i>	
Real-Time Optimization When the Plant and the Model Have Different Inputs	39
<i>Sean Costello, Gregory Francois, Dominique Bonvin</i>	
Simultaneous Reduced Order Multi-Parametric Moving Horizon Estimation and Model Predictive Control	45
<i>Romain Stephane Claude Lambert, Ioana Nascu, Efstratios N. Pistikopoulos</i>	
Multi-Rate Dissipative Control of Large-Scale Systems	51
<i>Tippett Michael, Jie Bao</i>	
Set-Point Tracking Using Distributed MPC	57
<i>Markus J. Koegel, Rolf Findeisen</i>	
Spectroscopic Monitoring of Diesel Fuels Using Supervised Distance Preserving Projections	63
<i>Francesco Corona, Zhanxing Zhu, Amauri H. Souza Jr., Michela Mulas, Roberto Baratti</i>	
An MPC Approach to Dual Control	69
<i>Tor Aksel N. Heirung, B. Erik Ydstie, Bjarne Foss</i>	
Predictive Control of a Reactive Distillation Column Using Multi-Rate DAE EKF	75
<i>Jalesh Purohit, Sachin C. Patwardhan, Sanjay Mahajani</i>	
Interpolation-Based Off-Line MPC for LPV Systems	81
<i>Pornchai Bunroongsri, Soorathep Kheawhom</i>	
Economic Plantwide Control: Automated Controlled Variable Selection for a Reactor-Separator-Recycle Process	87
<i>Vladimiro Minasidis, Johannes Jaschke, Sigurd Skogestad</i>	
A Dual-Terminal Set Based Robust Tube MPC for Switched Systems	93
<i>K. Hariprasad, Sharad Bhartiya</i>	
Adaptive Predictive Control Using GOBF-ARX Models: An Experimental Case Study	99
<i>Muddu Madakyaru, Sachin C. Patwardhan</i>	
Optimal Design and Operation of Energy Systems under Uncertainty	105
<i>Paul Barton, Xiang Li</i>	
Superstructure Optimization of Biodiesel Production from Microalgal Biomass	111
<i>Muhammad Rizwan, Jay H. Lee, Rafiqul Gani</i>	
Graph-Theoretic Analysis of Complex Energy Integrated Networks	117
<i>Sujit Jogwar, Srinivas Rangarajan, Prodrimos Daoutidis</i>	
Nested Modifier-Adaptation for RTO in the Otto Williams Reactor	123
<i>Daniel Navia, Gloria Gutierrez, Cesar De Prada</i>	
On the Tuning of Predictive Controllers for Hybrid Fuel Cell Vehicle Applications	129
<i>Syed K. Ahmed, Donald J. Chmielewski</i>	
State of Charge Estimation in Li-Ion Batteries Using an Isothermal Pseudo Two-Dimensional Model	135
<i>R. Bhushan Gopaluni, Richard D. Braatz</i>	
Control Structure Selection of the Elevated Pressure Air Separation Unit in an IGCC Power Plant for Economical Operation	141
<i>Kosan Roh, Jay H. Lee</i>	
Lagrangian Relaxation Based Production Optimization of Tight-Formation Wells	147
<i>Brage Rugstad Knudsen, Bjarne Foss, Ignacio E. Grossmann, Vijay Gupta</i>	
Some Aspects of Industrial System Identification	153
<i>Alf J. Isaksson</i>	
A Comparison of Moving Horizon and Bayesian State Estimators with an Application to a pH Process	160
<i>Vinay Bavdekar, Bhushan Gopaluni, Sirish L. Shah</i>	
Maximum-Likelihood Parameter Estimation for Detecting Local Concentration from a Carbon Nanotube-Based Sensor	166
<i>Hong Jang, Jay H. Lee, Richard D. Braatz</i>	
Nonlinear Update Based Unscented Gaussian Sum Filter	172
<i>Krishna Kumar Kottakki, Mani Bhushan, Sharad Bhartiya</i>	
State and Parameter Estimation for a Grinding Mill Circuit from Operational Input-Output Data	178
<i>Johan Derik Le Roux, Ian Craig, Radhakant Padhi</i>	
Evaluation of Adaptive Extended Kalman Filter Algorithms for State Estimation in Presence of Model-Plant Mismatch	184
<i>Vinay Bavdekar, Bhushan Gopaluni, Sirish L. Shah</i>	
An Adaptive Basis Estimation Method for Compressed Sensing with Applications to Missing Data Reconstruction	190
<i>Satheesh Kumar Perepu, Arun K. Tangirala</i>	

Dynamic Maximization of Oxygen Yield in an Elevated-Pressure Air Separation Unit Using Multiple Model Predictive Control	196
<i>Priyadarshi Mahapatra, Stephen E. Zitney, B. Wayne Bequette</i>	
Convergence Results for Continuous Crystallizers	203
<i>Juan Du, B. Erik Ydstie</i>	
On the Numerical Solution of Discounted Economic NMPC on Infinite Horizons	209
<i>Lynn Wurth, Inga Janina Wolf, Wolfgang Marquardt</i>	
Coordination of Distributed Model Predictive Controllers Using Price-Driven Coordination and Sensitivity Analysis	215
<i>Ruben Marti, Daniel Sarabia, Daniel Navia, Cesar De Prada</i>	
Computationally Efficient Globally Linearizing Control of a CSTR Using Nonlinear Black Box Models	221
<i>Shraddha S. Deshpande, Sachin C. Patwardhan</i>	
Control and Optimization Challenges in Liquid-Loaded Shale Gas Wells	227
<i>Niket Kaisare, Arun Gupta, Vinay Kariwala, Nareshkumar N. Nandola, John W. Green, Giulia R. Seikel, Peter Somdecerff</i>	
Closed-Loop Model Identification and PID/PI Tuning for Robust Anti-Slug Control	233
<i>Esmail Jahanshahi, Sigurd Skogestad</i>	
PID versus MPC Performance for SISO Dead-Time Dominant Processes	241
<i>Yusuf Abubakar Sha'Aban, Barry Lennox, David Lauri</i>	
Model Predictive Control of a Paste Thickener in Coal Handling and Preparation Plants	247
<i>Ridwan Setiawan, Chee Keong Tan, Jie Bao, Goetz Bickert</i>	
A Comparison of Control Techniques for Dairy Falling Film Evaporators	253
<i>Adriaan Haasbroek, Lidia Auret, W. H. Steyn</i>	
On-Line Implementation of Decoupled Input-Output Linearizing Controller in Baker's Yeast Fermentation	259
<i>Viki Chopda, Anurag Rathore, James Gomes</i>	
Optimal PID-Control on First Order Plus Time Delay Systems & Verification of the SIMC Rules	265
<i>Chriss Grimholt, Sigurd Skogestad</i>	
A New PDF Modelling Algorithm and Predictive Controller Design	271
<i>Jinfang Zhang, Hong Yue, Jinlin Zhou</i>	
Real-Time Performance Assessment of Inferential Sensors	277
<i>Shima Khatibisepehr, Biao Huang, Swanand Khare, Ramesh Kadali</i>	
Application of Multiway Principal Component Analysis for Identification of Process Improvements in Pharmaceutical Manufacture	283
<i>Matthew Molloy, Elaine Barbara Martin</i>	
The Application of Nonlinear Partial Least Square to Batch Processes	289
<i>Lipeng Yan, Barry Lennox</i>	
Integrating Flux Balance Analysis into Microalgae Growth Kinetics for Dynamic Simulation	295
<i>Dong Hwi Jeong, Jong Min Lee</i>	
Online Estimation and Adaptive Temperature Control of Polymerization Reactor	301
<i>D. Vasanthi, B. Pranavamoorthy, N. Pappa</i>	
Model Predictive Control of Flow and Pressure in Underbalanced Drilling	307
<i>Torbjorn Pedersen, John-Morten Godhavn</i>	
Identification of Pseudo-State Space Models for Batch Processes Using Multivariate Statistical Methods	313
<i>Eduardo Benedicto Lopez-Montero, Ognjen Marjanovic</i>	
Nonlinear System Identification with Multiple and Correlated Scheduling Variables	319
<i>Lei Chen, Biao Huang, Fei Liu</i>	
A New Cluster Validity Index for Fuzzy Clustering	325
<i>Sreeram Joopudi, Suraj Rathi, Shankar Narasimhan, Raghunathan Rengaswamy</i>	
Multivariate Image and Texture Analysis for Film-Coated Tablets Elegance Assessment	331
<i>Matteo Ottavian, Massimiliano Barolo, Salvador Garcia-Munoz</i>	
Integral Sliding Mode Control for GMAW Systems	337
<i>Manas Kumar Bera, Bijan Bandyopadhyay, Arun Kumar Paul</i>	
Integrated Product Blending Optimization for Oil Refinery Operations	343
<i>Amit Purohit, Tukaram Suryawanshi</i>	
MATLAB Interfacing: Real-Time Implementation of a Fuzzy Logic Controller	349
<i>Besta Chandra Shekar, Kastala Anil Kumar, Ginuga Prabhaker Reddy, Vadeghar Ramesh Kumar</i>	
Robust MPC Based on Polyhedral Invariant Sets for LPV Systems	355
<i>Soorathep Kheawhom, Pornchai Bumroongsri</i>	
Correntropy-Based Kernel Learning for Nonlinear System Identification with Unknown Noise: An Industrial Case Study	361
<i>Yi Liu, Junghui Chen</i>	
Continuous Time Identification in Laplace Domain	367
<i>Phanindra Jampana, Ketan P Detroja</i>	
A Modeling Framework for Conventional and Heat Integrated Distillation Columns	373
<i>Thomas Bisgaard, Jakob Kjobsted Huusom, Jens Abildskov</i>	
Sensor Fault Accommodation Strategies in Multi-Rate Sampled-Data Control of Particulate Processes	379
<i>Trina Napasindayao, Nael H. El-Farra</i>	
Synthesis of the PID Controller Using Desired Closed-Loop Response	385
<i>Md Nishat Anwar, Sommath Pan</i>	

A Distillate Composition Estimator for an Industrial Multicomponent IC4-NC4 Splitter with Experimental Temperature Measurements	391
<i>Marcella Porru, Jesus Alvarez, Roberto Baratti</i>	
Combined Neural Network and Particle Filter State Estimation with Application to a Run-Of-Mine Ore Mill	397
<i>Myrin Naidoo, Laurentz Eugene Olivier, Ian Craig</i>	
Dynamic Compensation of Static Estimators from Loss Method	403
<i>Maryam Ghadrhan, Ivar J. Halvorsen, Sigurd Skogestad</i>	
Digital Image Processing Based Flow Regime Identification of Gas/Liquid Two - Phase Flow	409
<i>C. Shanthi, N. Pappa, Suganya J. Aswini</i>	
Adaptive Anti-Over-Fitting Soft Sensing Method Based on Local Learning	415
<i>Weiming Shao, Xuemin Tian, Honglong Chen</i>	
Improved Stable, Optimal Production in Gas Lift Wells: Exploiting Additional Degrees of Freedom	421
<i>Vishwa A. Mukhtyar, Yogendra Shastri, Ravindra Gudi</i>	
Automatic Loop Shaping in QFT Using Hybrid Optimization and Consistency Technique	427
<i>R. Jeyasenthil, P. S. V. Nataraj</i>	
Impact of Delay on Robust Stable Optimization of a CSTR with Recycle Stream	433
<i>Darya Kastsian, Martin Monnigmann</i>	
Short-Term Scheduling of Diesel Blending and Distribution	439
<i>Diovanina Dimas, Valeria V. Murata, Sergio M. S. Neiro</i>	
Linear Machine: A Novel Approach to Point Location Problem	445
<i>Astha Airan, Sharad Bhartiya, Mani Bhushan</i>	
Using Process Data for Finding Self-optimizing Controlled Variables	451
<i>Johannes Jaschke, Sigurd Skogestad</i>	
Optimal Operating Strategies for SMBC	457
<i>Pratik Athawale, K. Hariprasad, Siram Vinod, Sharad Bhartiya</i>	
Dynamic Online Optimization of a House Heating System in a Fluctuating Energy Price Scenario	463
<i>Vinicius De Oliveira, Johannes Jaschke, Sigurd Skogestad</i>	
Discrete-Time Sliding Mode Tracking Control for NMP Systems Using Reduced Order Switching Function	469
<i>Machhindranath Patil, Bijnan Bandyopadhyay</i>	
Soft Constrained Based MPC for Robust Control of a Cement Grinding Circuit	475
<i>Guru Prasath, M. Chidambaram, Bodil Recke, John Bagterp Jorgensen</i>	
On MIMO PID Control of the Quadruple-Tank Process Via ILMIs Approaches : Minimum and Non-Minimum Case Studies	481
<i>Wajdi Belhaj, O. Boubaker</i>	
Input-Output Linearizing Control of a Thermal Cracking Furnace Described by a Coupled PDE-ODE System	487
<i>Atthasit Tawai, Chanin Panjapornpon</i>	
Real Time Implementation of Multimodel Based PID and Fuzzy Controller for Injection Molding Machine	493
<i>S. Kanagalakshmi, D. Manamalli, M. Mohamed Rafiq</i>	
A Survey on Sensitivity-Based Nonlinear Model Predictive Control	499
<i>Lorenz T. Biegler</i>	
Iterative Learning Modelling and Control of Batch Fermentation Processes	511
<i>Carlos Alberto Duran-Villalobos, Barry Lennox</i>	
Quality-Related Inner-Phase Evolution Analysis and Quality Prediction for Uneven Batch Processes	517
<i>Luping Zhao, Chunhui Zhao, Furong Gao</i>	
Linear and Nonlinear State Estimation in the Czochralski Process	523
<i>Parsa Rahmanpour, John Atle Bones, Morten Hovd, Jan Tommy Gravdahl</i>	
Control of Particle Size Distribution in Emulsion Polymerization Using Mid-Course Correction under Structural Plant-Model Mismatch	529
<i>Alireza Hosseini, Milad Oshaghi, Sebastian Engell</i>	
Scheduling Incorporating Waste Management Using Decomposition Approaches	535
<i>Deepak Vadera, Ravindra Gudi</i>	
A Robust Algorithm for Run-To-Run Optimization of Batch Processes	541
<i>Jasdeep Mandur, Hector M. Budman</i>	
Identification of Integrating Processes with Time Delay	547
<i>Salim Ahmed, Chris Cox, Syed Intiaz</i>	
Robust Plant Friendly Optimal Input Design	553
<i>Abhishankar Kumar, Sridharakumar Narasimhan</i>	
A Grey-Box Model for Spray Drying Plants	559
<i>Lars Norbert Petersen, Niels Kjolstad Poulsen, Henrik Niemann, Christer Utzen, John Bagterp Jorgensen</i>	
On the Estimation of Time-Varying Parameters in Continuous-Time Nonlinear Systems	565
<i>Sridhar Ungarala, Kalyani Miriyala, Tomas B. Co</i>	
Observer and Model Predictive Control for On-Line Parameter Identification in Nonlinear Systems	571
<i>Jun Qian, Pascal Dufour, Madiha Nadri</i>	
A Moving Horizon Approach to Multivariable Input Design in General Linear Systems with Constraints	577
<i>Rohit Patwardhan, Bhushan Gopaluni</i>	
Minimum Mean Squared Prediction Error Criterion Based Improved Independent Component Analysis Method for Process Monitoring	583
<i>Lianfang Cai, Xuemin Tian, Yuping Cao</i>	
Advanced Diagnosis of Control Loops: Experimentation on Pilot Plant and Validation on Industrial Scale	589
<i>Riccardo Bacci Di Capaci, Claudio Scali, Daniela Pestonesi, Evaldo Bartaloni</i>	

Structural Problem Reduction for Set-Based Fault Diagnosis	595
<i>Anton Savchenko, Philipp Rumschinski, Stefan Streif, Rolf Findeisen</i>	
MPC Performance Monitoring of a Rigorously Simulated Industrial Process	601
<i>Gabriele Pannocchia, Michele Bottai, Andrea De Luca</i>	
Fault Detection and Diagnosis of Air-Conditioning Systems Using Residuals	607
<i>Mahendra Kumar, Indra Narayan Kar</i>	
Uneven Length Batch Process Monitoring Using Function Space Correspondence Analysis	613
<i>Ela Arora, Ketan P Detroja</i>	
Use of Time-Varying Oil Price in Short-Term Production Optimization for a Reservoir	619
<i>Mansoureh Jesmani, Bjarne Foss</i>	
A Framework for Fault Diagnosis in Managed Pressure Drilling Applied to Flow-Loop Data	625
<i>Anders Willersrud, Lars Inslund, Alexey Pavlov, Glenn-Ole Kaasa</i>	
Bayesian Identification of Non-Linear State Space Models: Part II Error Analysis	631
<i>Aditya Tulsyan, Biao Huang, Bhushan Gopaluni, J. Fraser Forbes</i>	
Parameter Estimation for Physiologically Based Pharmacokinetics Model Using Bayesian Inference	637
<i>Dae Shik Kim, Jong Hwan Sung, Jong Min Lee</i>	
Analytical Design of Centralized PI Controller for High Dimensional Multivariable Systems	643
<i>Qiang Chen, Xiaoli Luan, Fei Liu</i>	
Extraction of Pure Component Spectra from Mixture Spectra Containing a Known Diluent	649
<i>Abhishek Krishnamoorthy Baikadi, Sreeja S, Mandeep Kaur, Guhan Jayaraman, Shankar Narasimhan</i>	
Swing up and Stabilization Control of a Rotary Inverted Pendulum	654
<i>Navin John Mathew, Koteswara Rao Kandula, Sivakumaran Natarajan</i>	
Derivative-Free Estimator Based Non-Linear Model Predictive Control of a Boiler-Turbine Unit	660
<i>S. Kapil Arasu, J. Prakash, Vinay Prasad</i>	
Subspace Identification of Unstable Systems by MON4SID Algorithm	666
<i>C. Sankar Rao, M. Chidambaram</i>	
Why Risk-Based Multivariate Fault Detection and Diagnosis?	672
<i>Omid Zadakbar, Syed Intiaz, Faisal I Khan</i>	
Dynamic Bayesian Network Based Networked Process Monitoring for Fault Propagation Identification and Root Cause Diagnosis of Complex Dynamic Processes	678
<i>Junichi Mori, Jie Yu</i>	
Towards Model Predictive Control on Anaerobic Digestion Process	684
<i>Grace Oppong, Matthew McEwan, Gary Montague, Elaine Martin</i>	
Branch and Bound Algorithm for Optimal Sensor Network Design	690
<i>Govind Menon, Nabil Magbool Jan, Sridharakumar Narasimhan</i>	
Online Partially Model-Free Solution of Two-Player Zero Sum Differential Games	696
<i>P. Praveen, Bhasin Shubhendu</i>	
Confirmation of Theoretical Results Regarding Control Theoretic Cyber Attacks on Controllers	702
<i>Hemangi Gawand, Anup Bhattacharjee, Kallol Roy</i>	
Self-Optimising Control of Sewer Systems	708
<i>Miguel Mauricio-Iglesias, Ignacio Montero-Castro, Ane Loft Mollerup, Gurkan Sin</i>	
On the Way to Autonomous Model Predictive Control: A Distillation Column Simulation Study	713
<i>Mariette Annergren, David Kauwen, Christian A. Larsson, Marcus Gerardus Potters, Quang N. Tran, Leyla Ozkan</i>	
Projective Integration with an Adaptive Projection Horizon	721
<i>Max Fahrenkopf, James Schneider, B. Erik Ydstie</i>	
Optimizing Control of a Continuous Polymerization Reactor	726
<i>Reza Hashemi, Daniel Kohlmann, Sebastian Engell</i>	
Automatic Identification and Controller Synthesis for Fluid Level Control Using Soft Sensing	732
<i>Sebastian Leonow, Martin Monnigmann</i>	
Achieving Target Emulsion Drop Size Distributions Using Population Balance Equation Models of High Pressure Homogenization	738
<i>Shashank Maindankar, Michael A. Henson</i>	
Design of Inner and Outer Gray-Box Models to Predict Molten Steel Temperature in Tundish	744
<i>Iftikhar Ahmad, Manabu Kano, Shinji Hasebe, Hiroshi Kitada, Noboru Murata</i>	
Processing History Dependent Control Parameter Estimation in Multi-Step Batch Processes	750
<i>Ye Seul Sim, Joohyun Shin, Hana Lee, Jay H. Lee</i>	
Reformulating Real-Time Optimal Feedback Based on Model Uncertainty	756
<i>Vamsi Krishna Kamaraju, Min-Sen Chiu, B. Srinivasan</i>	
Optimal Control of Beer Filtration Process	762
<i>Smaranda Podar Cristea, Rogelio Mazaeda, Cesar De Prada</i>	
Rejection of Periodic Disturbances Based on Adaptive Repetitive Model Predictive Control	768
<i>Jingyi Lu, Dewei Li, Zhixing Cao, Furong Gao</i>	
Bayesian Identification of Non-Linear State-Space Models: Part I Input Design	774
<i>Aditya Tulsyan, Swanand Khare, Biao Huang, Bhushan Gopaluni, J. Fraser Forbes</i>	
Two Dimensional Recursive Least Squares for Batch Processes System Identification	780
<i>Zhixing Cao, Yi Yang, Jingyi Lu, Furong Gao</i>	
Model Order Reduction of Hyperbolic Systems Using Method of Characteristics and Differential Transform	785
<i>Sudhakar Munusamy, Sridharakumar Narasimhan, Niket Kaisare</i>	
Identification Experiments for the Optimizing Control of Multiple Recycle Processes	791
<i>Hiroya Seki, Mohammad Shamsuzzoha</i>	

Modeling and Control of Coal Mill	797
<i>Pradeebha Parameswaran, Pappa Natarajan, Vasanthi Damodaran</i>	
Simulation and Control of the Oxidation of Sulfur Dioxide in a Micro-Structured Reactor	803
<i>Sven Wegerhoff, Sebastian Engell</i>	
Optimal Feature Selection for SVM Based Fault Diagnosis in Power Transformers	809
<i>Mahak Mittal, Mani Bhushan, Shubhangi Patil, Sushil Chaudhari</i>	
Alarm Allocation for Event-Based Process Alarm Systems	815
<i>Kosmapatabendige Pradeep Shiran Dalpatadu, Salim Ahmed, Faisal I Khan</i>	
Sensor Network Design for Efficient Fault Diagnosis and Signed Digraph Update	821
<i>Suryanarayana Kolluri, Ishan Bajaj, Mani Bhushan</i>	
A Hybrid Method for Process Fault Detection and Diagnosis.....	827
<i>Md Raihan Mallick, Syed Imtiaz</i>	
Why Some APC Applications Lose Performance Over Time and How You Can Avoid It	833
<i>Isadora S. Moreira, Gustavo A. Neumann, Artur T. M. Oliveira</i>	
Certifying Robustness of Separating Inputs and Outputs in Active Fault Diagnosis for Uncertain Nonlinear Systems.....	837
<i>Stefan Streif, Daniel Hast, Richard D. Braatz, Rolf Findeisen</i>	
Author Index	