

# **11th IFAC Symposium on Dynamics and Control of Process Systems Including Biosystems (DYCOPS-CAB 2016)**

IFAC PapersOnline Volume 49, Issue 7

Trondheim, Norway  
6-8 June 2016

Part 1 of 2

## **Editors:**

**Bjarne Foss  
Ilse Smets  
Lars Imsland**

**Hector Budman  
Sigurd Skogestad**

ISBN: 978-1-5108-2864-3

**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© (2016) by Elsevier Limited  
All rights reserved.

Printed by Curran Associates, Inc. (2016)

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

Elsevier Limited  
360 Park Ave South  
New York, NY 10010

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## PART 1

<b>REACHABILITY-BASED FAULT DETECTION METHOD FOR UNCERTAIN CHEMICAL FLOW REACTORS</b> .....	1
<i>Aditya Tulsyan, Paul I. Barton</i>	
<b>BUILT-IN TEST DESIGN FOR FAULT DETECTION AND ISOLATION IN AN AIRCRAFT ENVIRONMENTAL CONTROL SYSTEM*</b> .....	7
<i>Kyle A. Palmer, William T. Hale, Lu Han, Clas A. Jacobson, George M. Bollas</i>	
<b>ISOLATION OF PLANT-WIDE FAULTS USING CAUSALITY DETECTION METHODS</b> .....	13
<i>Guilherme M. Garcia, Celso J. Munaro</i>	
<b>ENERGY-BASED VISUALISATION OF A COUNTER-FLOW HEAT EXCHANGER FOR THE PURPOSE OF FAULT IDENTIFICATION</b> .....	19
<i>Kenneth R. Uren, George Van Schoor</i>	
<b>DATA-DRIVEN PLANT-MODEL MISMATCH QUANTIFICATION IN INPUT-CONSTRAINED LINEAR MPC</b> .....	25
<i>Siyun Wang, Jodie M. Simkoff, Michael Baldea, Leo H. Chiang, Ivan Castillo, Rahul Bindlish, David B. Stanley</i>	
<b>A STABLE AND ROBUST NMPC STRATEGY WITH REDUCED MODELS AND NONUNIFORM GRIDS</b> .....	31
<i>Mingchao Yu, Lorenz T. Biegler</i>	
<b>A ROBUST NMPC SCHEME FOR SEMI-BATCH POLYMERIZATION REACTORS</b> .....	37
<i>Hong Jang, Jay H. Lee, Lorenz T. Biegler</i>	
<b>NEW ARCHITECTURES FOR HIERARCHICAL PREDICTIVE CONTROL</b> .....	43
<i>Victor M. Zavala</i>	
<b>STOCHASTIC MODEL PREDICTIVE CONTROL WITH INTEGRATED EXPERIMENT DESIGN FOR NONLINEAR SYSTEMS</b> .....	49
<i>Vinay A. Bavdekar, Ali Mesbah</i>	
<b>DRSM MODEL FOR THE OPTIMIZATION AND CONTROL OF BATCH PROCESSES</b> .....	55
<i>Zhenyu Wang, Nikolai Klebanov, Christos Georgakis</i>	
<b>BATCH-TO-BATCH OPTIMIZATION OF CHEMICAL PROCESSES IN THE PRESENCE OF MODEL-PLANT MISMATCH USING A VARIABLE SUBSET OF MODEL PARAMETERS</b> .....	61
<i>Rubin Hille, Hector M. Budman</i>	
<b>A NOVEL ALGORITHM FOR DESIGN OF MIXED ENERGY-INTEGRATED BATCH PROCESS NETWORKS*</b> .....	67
<i>Parikshit Shahane, Sujit S. Jogwar</i>	
<b>ON THE USE OF SHAPE CONSTRAINTS FOR STATE ESTIMATION IN REACTION SYSTEMS</b> .....	73
<i>Sriniketh Srinivasan, D. M. Darsha Kumar, Julien Billeter, Shankar Narasimhan, Dominique Bonvin</i>	
<b>NCO-TRACKING WITH CHANGING SET OF ACTIVE CONSTRAINTS USING MULTIPLE SOLUTION MODELS</b> .....	79
<i>Taher Ebrahim, Reinaldo Hernandez, Sankaranarayanan Subramanian, Marc Kalliski, Stefan Krämer, Sebastian Engell</i>	
<b>CASCADE OBSERVER DESIGN FOR A CLASS OF NONLINEAR UNCERTAIN SYSTEMS: APPLICATION TO BIOREACTOR</b> .....	85
<i>O. Hernández-González, T. Ménard, B. Targui, M. Farza, M. M'Saad, C.-M. Astorga-Zaragoza</i>	
<b>STAGED MICROBIAL FUEL CELLS WITH PERIODIC CONNECTION OF EXTERNAL RESISTANCE</b> .....	91
<i>Didac Recio-Garrido, Boris Tartakovsky, Michel Perrier</i>	
<b>MULTI-OBJECTIVE OPTIMAL CONTROL STUDY OF FED-BATCH BIO-REACTOR*</b> .....	97
<i>Narendra Patel, Nitin Padhiyar</i>	
<b>SMOOTH EXTREMUM-SEEKING CONTROL FOR FED-BATCH PROCESSES*</b> .....	103
<i>Jamilis Martín, Garelli Fabricio, De Battista Hernán</i>	
<b>GREEDY EXTREMUM SEEKING CONTROL WITH APPLICATIONS TO BIOCHEMICAL PROCESSES</b> .....	109
<i>Olle Trollberg, Elling W. Jacobsen</i>	
<b>DYNAMIC OPTIMIZATION OF FIXED BED CHEMICAL-LOOPING COMBUSTION SYSTEMS INTEGRATED IN THERMAL POWER PLANTS</b> .....	115
<i>Lu Han, George M. Bollas</i>	
<b>SUBSET MEASUREMENT SELECTION FOR GLOBALLY SELF-OPTIMIZING CONTROL OF TENNESSEE EASTMAN PROCESS*</b> .....	121
<i>Lingjian Ye, Yi Cao, Xiaofeng Yuan, Zhihuan Song</i>	
<b>OPTIMAL PID CONTROL OF DOUBLE INTEGRATING PROCESSES</b> .....	127
<i>Chriss Grimholt, Sigurd Skogestad</i>	
<b>ROBUST OPTIMIZATION OF WATER-FLOODING IN OIL RESERVOIRS USING RISK MANAGEMENT TOOLS</b> .....	133
<i>M. Mohsin Siraj, Paul M. J. Van Den Hof, Jan Dirk Jansen</i>	
<b>DUAL CONTROL AND INFORMATION GAIN IN CONTROLLING UNCERTAIN PROCESSES*</b> .....	139
<i>H. C. La, A. Potschka, J. P. Schlöder, H. G. Bock</i>	
<b>RUN-TO-RUN CONTROL WITH NONLINEARITY AND DELAY UNCERTAINTY</b> .....	145
<i>Charles-Henri Clerget, Jean-Philippe Grimaldi, Mériam Chèbre, Nicolas Petit</i>	

<b>CONTROL OF INCOMPLETE SEPARATION IN SIMULATED MOVING BED CHROMATOGRAPHIC PROCESSES</b> .....	153
<i>Paul Sivarov, Alain Vande Wouwer, Ju Weon Lee, Andreas Seidel-Morgensten, Achim Kienle</i>	
<b>A CENTRALIZED/DECENTRALIZED CONTROL APPROACH FOR PERIODIC SYSTEMS WITH APPLICATION TO CHROMATOGRAPHIC SEPARATION PROCESSES</b> .....	159
<i>Maria M. Papathanasiou, Muxin Sun, Richard Oberdieck, Athanasios Mantalaris, Efstratios N. Pistikopoulos</i>	
<b>AN OPTIMIZATION-DRIVEN NOVEL OPERATION OF SIMULATED MOVING BED CHROMATOGRAPHIC SEPARATION</b> .....	165
<i>S. V. Vignesh, K Hariprasad, Pratik Athawale, Sharad Bhartiya</i>	
<b>ON THE SIGNIFICANCE OF THE NOISE MODEL FOR THE PERFORMANCE OF A LINEAR MPC IN CLOSED-LOOP OPERATION</b> .....	171
<i>Morten Hagdrup, Dimitri Boiroux, Zeinab Mahmoudi, Henrik Madsen, Niels Kjølstad Poulsen, Bjarne Poulsen, John Bagterp Jørgensen</i>	
<b>FAULT-TOLERANT NONLINEAR MPC USING PARTICLE FILTERING*</b> .....	177
<i>Laurentz E. Olivier, Ian K. Craig</i>	
<b>OPTIMAL BOUNDARY CONTROL OF A CONTACT THAWING PROCESS FOR FOODSTUFF</b> .....	183
<i>Christoph Josef Backi, John Leth, Jan Tommy Gravdahl</i>	
<b>SENSOR CONFIGURATION PROBLEM: APPLICATION TO A MEMBRANE SEPARATION UNIT*</b> .....	189
<i>Muhammed Bahadir Saltik, Leyla Özkan, Siep Weiland, Paul M. J. Van Den Hof</i>	
<b>CHEMICAL RECOGNITION USING THE TIME-DEPENDENT CELLULAR RESPONSE PROFILES*</b> .....	195
<i>Jiao Chen, Tianhong Pan, Haoran Li, Kaili Xu, Zhengming Li</i>	
<b>IN SILICO CELL CYCLE PREDICTOR FOR MAMMALIAN CELL CULTURE BIOREACTOR USING AGENT-BASED MODELING APPROACH</b> .....	200
<i>Elif S. Bayrak, Tony Wang, Matt Jerums, Myra Coufal, Chetan Goudar, Ali Cinar, Cenk Undey</i>	
<b>ON THE APPLICABILITY OF DETERMINISTIC APPROXIMATIONS TO MODEL GENETIC CIRCUITS*</b> .....	206
<i>M. Pájaro, A. A. Alonso</i>	
<b>MODEL DEVELOPMENT FOR PHOSPHATE RECOVERY FROM ACIDIC WASTEWATER</b> .....	212
<i>Mihaela Sbarciog, Alain Vande Wouwer</i>	
<b>OPTIMIZATION OF A MICROALGAE GROWTH PROCESS IN PHOTOBIOREACTORS</b> .....	218
<i>George Ifrim, Mariana Titica, Marian Barbu, Emil Ceanga, Sergiu Caraman</i>	
<b>UNMEASURED CONCENTRATIONS AND REACTION RATES ESTIMATION IN CSTRs</b> .....	224
<i>Fernando López-Caamal, Jaime A. Moreno</i>	
<b>DYNAMIC MICROORGANISM GROWTH MODELING FOR SHELF LIFE PREDICTION: APPLICATION TO COOKED AND BRINED SHRIMPS</b> .....	230
<i>Mamadou Aliou Diallo, Ph. Bogaerts</i>	
<b>PLANT GROWTH MODELLING:FROM EXPERIMENTAL DESIGN TO MODELLING-THEARABIDOPSIS EXPERIMENT*</b> .....	236
<i>D. Dochain, H. Maclean</i>	
<b>TIME-OPTIMAL CONTROL AND PARAMETER ESTIMATION OF DIAFILTRATION PROCESSES IN THE PRESENCE OF MEMBRANE FOULING</b> .....	242
<i>Martin Jelemenský, Martin Klauco, Radoslav Paulen, Joost Lauwers, Filip Logist, Jan Van Impe, Miroslav Fikar</i>	
<b>NONLINEAR MODEL PREDICTIVE CONTROLLER FOR KICK ATTENUATION IN MANAGED PRESSURE DRILLING*</b> .....	248
<i>Anirudh Nandan, Syed Imtiaz</i>	
<b>ROBUST CONTROL FOR A MULTI-STAGE EVAPORATION PLANT IN THE PRESENCE OF UNCERTAINTIES</b> .....	254
<i>Philipp Nguyen, Robert Tenno</i>	
<b>DUAL MODE MPC FOR A CONCENTRATED SOLAR THERMAL POWER PLANT</b> .....	260
<i>A. Alsharkawi, J. A. Rossiter</i>	
<b>DUAL MPC WITH REINFORCEMENT LEARNING</b> .....	266
<i>Juan E. Morinelly, B. Erik Ydstie</i>	
<b>ENERGY MANAGEMENT OF A MICROGRID VIA PARAMETRIC PROGRAMMING</b> .....	272
<i>Eva C. Umeozor, Milana Trifkovic</i>	
<b>CONTROL OF AN EXOTHERMIC PACKED-BED TUBULAR REACTOR</b> .....	278
<i>Israael Nájera, Jesús Álvarez, Roberto Baratti, Cesar Gutiérrez</i>	
<b>PID CONTROLLER TUNING FOR UNSTABLE PROCESSES USING A MULTI-OBJECTIVE OPTIMISATION DESIGN PROCEDURE</b> .....	284
<i>G. Reynoso-Meza, J. Carrillo-Ahumada, Y. Boada, J. Picó</i>	
<b>NUMERICAL OPTIMAL CONTROL MIXING COLLOCATION WITH SINGLE SHOOTING: A CASE STUDY</b> .....	290
<i>Anders Albert, Lars Imsland, Joakim Haugen</i>	
<b>ROBUST AUTOMATIC WELL CHOKE CONTROL – PHYSICAL CONSTRAINT BASED OPERATION</b> .....	296
<i>Pål Kittilsen, Kjetil Fjalestad, Ingvild Løvik Sperle, Robert Aasheim</i>	
<b>CONTROL OF REVERSIBLE DEGRADATION MECHANISMS IN FUEL CELLS: MITIGATION OF CO CONTAMINATION</b> .....	302
<i>Johannes Tjømmås, Federico Zenith, Ivar J. Halvorsen, Merle Klages, Joachim Scholta</i>	
<b>EVALUATION OF EXPERIMENT DESIGNS FOR MIMO IDENTIFICATION BY CROSS-VALIDATION</b> .....	308
<i>Kurt E. Hågglom</i>	

<b>ENERGY-BASED VISUALISATION OF AN AXIAL-FLOW COMPRESSOR SYSTEM FOR THE PURPOSES OF FAULT DETECTION AND DIAGNOSIS</b> .....	314
<i>L. B. Fouché, K. R. Uren, G. Van Schoor</i>	
<b>FUNDAMENTAL MODELING AND EXPERIMENTAL INVESTIGATION OF POLYMER WASHING PROCESS*</b> .....	320
<i>Sang Hwan Son, Dong Hwi Jeong, Hyun Woog Ryu, Joong Jin Han, Jong Min Lee</i>	
<b>DYNAMIC MODELLING AND SENSITIVITY ANALYSIS INTEGRATED LNT-PSCR SYSTEM</b> .....	326
<i>Yeonsoo Kim, Changho Jung, Chang Hwan Kim, Yong-Wha Kim, Jong Min Lee</i>	
<b>AGILE CONTROL OF CO<sub>2</sub> CAPTURE TECHNOLOGY FOR MAXIMUM NET OPERATING REVENUE</b> .....	332
<i>Norhuda Abdul Manaf, Abdul Qadir, Ali Abbas</i>	
<b>HANDLING OF VARIABLE WIRELESS LATENCY AND UPDATING FREQUENCY IN PI CONTROLLERS</b> .....	336
<i>Ivar J. Halvorsen</i>	
<b>DESIGN OF A DATA-DRIVEN CONTROLLER FOR A SPIRAL HEAT EXCHANGER</b> .....	342
<i>Shin Wakitani, Mingcong Deng, Toru Yamamoto</i>	
<b>ACTIVE COMPRESSOR SURGE CONTROL SYSTEM BY USING PISTON ACTUATION: IMPLEMENTATION AND EXPERIMENTAL RESULTS*</b> .....	347
<i>Nur Uddin, Jan Tommy Gravdahl</i>	
<b>ENERGY-BASED FAULT DETECTION FOR AN AUTOTHERMAL REFORMER</b> .....	353
<i>Henri-Jean Marais, George Van Schoor, Kenneth R. Uren</i>	
<b>SENSITIVITY BASED OPTIMIZATION OF THE TRI-REFORMING BASED CO<sub>2</sub> VALORIZATION PROCESS</b> .....	359
<i>Abhishek Dwivedi, Ravindra Gudi, Pratim Biswas</i>	
<b>EFFECT OF SAMPLING RATE ON THE DIVERGENCE OF THE EXTENDED KALMAN FILTER FOR A CONTINUOUS POLYMERIZATION REACTOR IN COMPARISON WITH PARTICLE FILTERING*</b> .....	365
<i>Reza Hashemi, Sebastian Engell</i>	
<b>PRACTICAL USE OF SAVITZKY-GOLAY FILTERING-BASED ENSEMBLE ONLINE SVR</b> .....	371
<i>Hiromasa Kaneko, Takuya Matsumoto, Shigeki Ootakara, Kimito Funatsu</i>	
<b>VARIABILITY REDUCTION ESTIMATION FOR SISO SYSTEMS THROUGH UNMEASURED DISTURBANCE ESTIMATION</b> .....	377
<i>Maria A. F. Lima, Jorge O. Trierweiler, Marcelo Farenzena</i>	
<b>VARIABLE ELIMINATION-BASED CONTRIBUTION FOR ACCURATE FAULT IDENTIFICATION*</b> .....	383
<i>Yusuke Satoyama, Koichi Fujiwara, Manabu Kano</i>	
<b>REDUCING WEAR OF STICKY PNEUMATIC CONTROL VALVES USING COMPENSATION PULSES WITH VARIABLE AMPLITUDE</b> .....	389
<i>Celso J. Munaro, Gabriel B. De Castro, Filipe Amorim Da Silva, Oscar F. B. Angarita, Marcos Vinicios Gomes Cypriano</i>	
<b>FAULT DETECTION FOR SIMULATED VALVE FAULTS IN A HIGH PRESSURE LEACHING PROCESS</b> .....	394
<i>Jason Miskin, Brian Lindner, Lidia Auret, Christie Dorfling, Steven Bradshaw</i>	
<b>SPLINE FLUID MODELS FOR OPTIMIZATION</b> .....	400
<i>Esmail Jahanshahi, Bjarne Grimstad, Bjarne Foss</i>	
<b>CLOSED-LOOP FORMULATION FOR NONLINEAR DYNAMIC REAL-TIME OPTIMIZATION*</b> .....	406
<i>Mohammad Zamry Jamaludin, Christopher L. E. Swartz</i>	
<b>REAL-TIME OPTIMIZATION BASED ON ADAPTATION OF SURROGATE MODELS</b> .....	412
<i>Martand Singhal, Alejandro G. Marchetti, Timm Faulwasser, Dominique Bonvin</i>	
<b>NULL-SPACE METHOD FOR OPTIMAL OPERATION OF TRANSIENT PROCESSES</b> .....	418
<i>Vinicius De Oliveira, Johannes Jäschke, Sigurd Skogestad</i>	
<b>PERFORMANCE IMPROVEMENT OF EXTREMUM SEEKING CONTROL USING RECURSIVE LEAST SQUARE ESTIMATION WITH FORGETTING FACTOR</b> .....	424
<i>M. Chioua, B. Srinivasan, M. Guay, M. Perrier</i>	
<b>MARKOV DECISION PROCESS BASED TIME-VARYING OPTIMAL CONTROL FOR COLLOIDAL SELF-ASSEMBLY</b> .....	430
<i>Xun Tang, Michael A. Bevan, Martha A. Grover</i>	
<b>DISTRIBUTIONAL UNCERTAINTY ANALYSIS IN TRANSIENT HETEROGENEOUS MULTISCALE CATALYTIC FLOW REACTORS</b> .....	436
<i>Donovan R. G. Chaffart, Luis A. Ricardez-Sandoval</i>	
<b>MATHEMATICAL MODELING AND ANALYSIS OF CARBON NANOTUBE PHOTOVOLTAIC SYSTEMS*</b> .....	442
<i>Joel A. Paulson, Mark C. Molaro, Darin O. Bellisario, Michael S. Strano, Richard D. Braatz</i>	
<b>DYNAMIC DIMENSION REDUCTION FOR THIN-FILM DEPOSITION REACTION NETWORK MODELS</b> .....	448
<i>Raymond A. Adomaitis</i>	
<b>A TRANSFER ENTROPY METHOD TO QUANTIFY CAUSALITY IN STOCHASTIC NONLINEAR SYSTEMS*</b> .....	454
<i>Jiaqi Gao, Aditya Tulsyan, Fan Yang, Bhushan Gopaluni</i>	
<b>FROM MFA TO FBA: LEGITIMATING OBJECTIVE FUNCTION AND LINEAR CONSTRAINTS</b> .....	460
<i>Ph. Bogaerts, K. Mhallem Gziri, A. Richelle</i>	
<b>APPLICATION OF DYNAMIC METABOLIC FLUX CONVEX ANALYSIS TO CHO-DXB11 CELL FED-BATCH CULTURES</b> .....	466
<i>Softa Fernandes, Julien Robitaille, Georges Bastin, Mario Jolicoeur, Alain Vande Wouwer</i>	
<b>NEW ITERATIVE APPROACH (ISNCA) FOR CONSTRAINED MATRIX FACTORIZATION METHODS</b> .....	472
<i>Nadav Bar, Naresh D. Jayavelu</i>	

<b>EVENT-BASED SELECTIVE CONTROL STRATEGY FOR RACEWAY REACTOR: A SIMULATION STUDY*</b> .....	478
<i>A. Pawłowski, I. Frenández, J. L. Guzmán, M. Berenguel, F. G. Ación, S. Dormido</i>	
<b>DEVELOPMENT OF A MOVING WINDOW MAXIMUM LIKELIHOOD PARAMETER ESTIMATOR AND ITS APPLICATION ON IDEAL REACTIVE DISTILLATION SYSTEM</b> .....	484
<i>Jayaram Valluru, Jalesh L. Purohit, Sachin C. Patwardhan, Lorenz T. Biegler</i>	
<b>SIMULATION STUDY OF THE PARTICLE FILTER AND THE EKF FOR STATE ESTIMATION OF A LARGE-SCALE DAE-SYSTEM WITH MULTI-RATE SAMPLING<sup>1</sup></b> .....	490
<i>Daniel Haßkerl, Momin Arshad, Reza Hashemi, Sankaranarayanan Subramanian, Sebastian Engell</i>	
<b>SYSTEMATIC OBSERVABILITY AND DETECTABILITY ANALYSIS OF INDUSTRIAL BATCH CRYSTALLIZERS*</b> .....	496
<i>Marcella Porru, Leyla Özkan</i>	
<b>SPARSE SAMPLE REGRESSION BASED JUST-IN-TIME MODELING (SSR-JIT): BEYOND LOCALLY WEIGHTED APPROACH*</b> .....	502
<i>Taku Uchimaru, Manabu Kano</i>	
<b>ON-LINE FULL PROBABILITY DISTRIBUTION IDENTIFICATION OF ARX MODEL PARAMETERS BASED ON BAYESIAN APPROACH</b> .....	508
<i>Amir Hosein Valadkhani, Aminollah Khormali, Mahdi Aliyari Shoorehdeli, Hamid Khaloozadeh, Alireza Fatehi</i>	
<b>IMPLEMENTATION OF ADVANCED CONTROL IN THE PROCESS INDUSTRY WITHOUT THE USE OF MPC</b> .....	514
<i>Krister Forsman</i>	
<b>PARSIMONIOUS COOPERATIVE DISTRIBUTED MPC FOR TRACKING PIECE-WISE CONSTANT SETPOINTS</b> .....	520
<i>Matteo Razzanelli, Gabriele Pannocchia</i>	
<b>CONTROL LOOP PERFORMANCE MONITORING – ABB’S EXPERIENCE OVER TWO DECADES</b> .....	526
<i>Kevin D. Starr, Heiko Petersen, Margret Bauer</i>	
<b>VINYL ACETATE MONOMER (VAM) PLANT MODEL: A NEW BENCHMARK PROBLEM FOR CONTROL AND OPERATION STUDY</b> .....	533
<i>Yuta Machida, Shigeki Ootakara, Hiroya Seki, Yoshihiro Hashimoto, Manabu Kano, Yasuhiro Miyake, Naoto Anzai, Masayoshi Sawai, Takashi Katsuno, Toshiaki Omata</i>	
<b>OPERATION OF AN INNOVATIVE WWTP WITH ENVIRONMENTAL OBJECTIVES. A MODEL-BASED ANALYSIS</b> .....	539
<i>Miguel Mauricio-Iglesias, Juan M. Garrido, Juan M. Lema</i>	
<b>MODELLING AND ROBUSTNESS ANALYSIS OF MODEL PREDICTIVE CONTROL FOR ELECTRICAL SUBMERSIBLE PUMP LIFTED HEAVY OIL WELLS</b> .....	544
<i>Dinesh Krishnamoorthy, Elvira M. Bergheim, Alexey Pavlov, Morten Fredriksen, Kjetil Fjalestad</i>	
<b>IMPLEMENTING MID RANGING IN A DCS ENVIRONMENT</b> .....	550
<i>Nicholas Alsop</i>	
<b>ROBUSTNESS ANALYSIS AND TUNING FOR PRESSURE CONTROL IN MANAGED PRESSURE DRILLING</b> .....	556
<i>Qin Li, Mina Kamel</i>	
<b>NONLINEAR MPC FOR GRADE TRANSITIONS IN AN INDUSTRIAL LDPE TUBULAR REACTOR</b> .....	562
<i>Staffan Skälén, Fredrik Josefsson, Joakim Ihrström</i>	
<b>ECONOMIC MODEL PREDICTIVE CONTROL (EMPC) OF AN INDUSTRIAL DIESEL HYDROPROCESSING PLANT</b> .....	568
<i>Erdal Aydin, Yaman Arkun, Gamze Is</i>	
<b>ASYMPTOTIC TRACKING OF PERIODIC OPERATION BASED ON CONTROL CONTRACTION METRICS*</b> .....	574
<i>Ruigang Wang, Jie Bao</i>	
<b>ON THE EQUIVALENCE OF STORAGE FUNCTIONS IN CONTROLLED THERMODYNAMIC SYSTEMS</b> .....	579
<i>N. Ha Hoang, Denis Dochain</i>	
<b>GEOMETRIC-DISSIPATIVE CONTROL OF EXOTHERMIC CONTINUOUS REACTORS</b> .....	585
<i>Jesús Álvarez, Hugo Franco</i>	
<b>LOW-ORDER FEEDBACK-FEEDFORWARD CONTROLLER FOR DEAD-TIME PROCESSES WITH MEASURABLE DISTURBANCES</b> .....	591
<i>Carlos Rodríguez, Julio E. Normey-Rico, José L. Guzmán, Manuel Berenguel, Sebastián Dormido</i>	
<b>DISTRIBUTED NONLINEAR MODEL PREDICTIVE CONTROL BY SEQUENTIAL LINEARIZATION AND ACCELERATED GRADIENT METHOD</b> .....	597
<i>Alexandra Grancharova, Tor A. Johansen, Valeria Petrova</i>	

## PART 2

<b>SEGMENTATION AND QUANTITATIVE ANALYSIS OF NORMAL AND APOPTOTIC CELLS FROM FLUORESCENCE MICROSCOPY IMAGES</b> .....	603
<i>Yuncheng Du, Hector M. Budman, Thomas A. Duever</i>	
<b>ON-LINE MONITORING OF SUBSTRATES AND BIOMASS USING NEAR-INFRARED SPECTROSCOPY AND MODEL-BASED STATE ESTIMATION FOR ENZYME PRODUCTION BY <i>S. CEREVISIAE</i></b> .....	609
<i>Dominik Krämer, Rudibert King</i>	

<b>DYNAMIC SIMULATION AND VISUALISATION OF FERMENTATION: EFFECT OF PROCESS CONDITIONS ON BEER QUALITY</b> .....	615
<i>Alistair D. Rodman, Dimitrios I. Gerogiorgis</i>	
<b>EFFICIENT GENERATION OF MODELS OF FED-BATCH FERMENTATIONS FOR PROCESS DESIGN AND CONTROL</b> .....	621
<i>Lukas Hebing, Tobias Neymann, Tobias Thüte, Alexander Jockwer, Sebastian Engell</i>	
<b>MODELLING THE PRODUCTION OF SOLUBLE HYDROGENASE IN RALSTONIA EUTROPHA BY ON-LINE OPTIMAL EXPERIMENTAL DESIGN*</b> .....	627
<i>Flavia Neddermeyer, Volker Marhold, Christoph Menzel, Dominik Krämer, Rudibert King</i>	
<b>ADVANCED MODELING AND CONTROL OF A SOLID SORBENT-BASED CO<sub>2</sub> CAPTURE PROCESS</b> .....	633
<i>Benjamin P. Omell, Jinliang Ma, Priyadarshi Mahapatra, Mingzhao Yu, Andrew Lee, Debangsu Bhattacharyya, Stephen E. Zimey, Lorenz T. Biegler, David C. Miller</i>	
<b>DYNAMIC DATA RECONCILIATION AND MODEL VALIDATION OF A MEA-BASED CO<sub>2</sub> CAPTURE SYSTEM USING PILOT PLANT DATA</b> .....	639
<i>Anderson S. Chinen, Joshua C. Morgan, Benjamin P. Omell, Debangsu Bhattacharyya, David C. Miller</i>	
<b>DYNAMIC SIMULATION AND ANALYSIS OF A PILOT-SCALE CO<sub>2</sub> POST-COMBUSTION CAPTURE UNIT USING PIPERAZINE AND MEA</b> .....	645
<i>Jozsef Gaspar, Luis Ricardez-Sandoval, John Bagterp Jorgensen, Philip Loldrup Fosbøl</i>	
<b>NEW PERFORMANCE INDICATORS FOR EVALUATION OF ADSORBENTS FOR CO<sub>2</sub> CAPTURE WITH PSA PROCESSES</b> .....	651
<i>Seongbin Ga, Hong Jang, Jay H. Lee</i>	
<b>A SEQUENTIAL METHOD FOR DETERMINING OPTIMAL STRIPPER PRESSURE AND TERMINAL PRESSURE IN CO<sub>2</sub> CAPTURE AND LIQUEFACTION PROCESS USING MEA</b> .....	657
<i>Taekyoon Park, Jaehan Bae, Chang Jun Lee, Jong Min Lee</i>	
<b>BI-LEVEL DEMAND RESPONSE GAME WITH INFORMATION SHARING AMONG CONSUMERS*</b> .....	663
<i>Zhaohui Zhang, Ruilong Deng, Tao Yuan, S. Joe Qin</i>	
<b>A PATTERN-BASED METHOD FOR SCHEDULING OF ENERGY-INTEGRATED BATCH PROCESS NETWORKS*</b> .....	669
<i>Shrikant Mete, Sujit S. Jogwar</i>	
<b>PRODUCTION SCHEDULING OF AN AIR SEPARATION PLANT</b> .....	675
<i>Shamik Misra, Mangesh Kapadi, Ravindra D. Gudi, R. Srihari</i>	
<b>MOVING HORIZON SCHEDULING OF AN AIR SEPARATION UNIT UNDER FAST-CHANGING ENERGY PRICES</b> .....	681
<i>Richard Pattison, Cara R. Touretzky, Ted Johansson, Michael Baldea, Ilro Harjunkoski</i>	
<b>KPIS AS THE INTERFACE BETWEEN SCHEDULING AND CONTROL</b> .....	687
<i>Margret Bauer, Matthieu Lucke, Charlotta Johnsson, Ilro Harjunkoski, Jan C. Schlake</i>	
<b>USE OF SPARSE PRINCIPAL COMPONENT ANALYSIS (SPCA) FOR FAULT DETECTION</b> .....	693
<i>Shriram Gajjar, Murat Kulahci, Ahmet Palazoglu</i>	
<b>STABILITY EVALUATION BASED NON-STEADY VARIABLE IDENTIFICATION FOR ONLINE FAULT PROGNOSIS</b> .....	699
<i>C. H. Zhao, Wei Wang, F. R. Gao</i>	
<b>FAULT DETECTION OF MULTIMODE PROCESSES USING CONCURRENT PROJECTION TO LATENT STRUCTURES</b> .....	705
<i>Ying Zheng, S. Joe Qin, Tianyou Chai</i>	
<b>A MODEL-BASED FRAMEWORK FOR FAULT ESTIMATION AND ACCOMMODATION APPLIED TO DISTRIBUTED ENERGY RESOURCES</b> .....	711
<i>James T. Allen, Nael H. El-Farra</i>	
<b>A DATA-DRIVEN FAULT DETECTION METHOD BASED ON DISSIPATIVE TRAJECTORIES</b> .....	717
<i>Qingyang Lei, Muhammad Tajammal Munir, Jie Bao, Brent Young</i>	
<b>CAUSAL ANALYSIS FOR ALARM FLOOD REDUCTION</b> .....	723
<i>Vicent Rodrigo, Moncef Chioua, Tore Hagglund, Martin Hollender</i>	
<b>COMPARISON OF STABILIZING CONTROL STRUCTURES FOR DIVIDING WALL COLUMNS</b> .....	729
<i>Xing Qian, Shengkun Jia, Sigurd Skogestad, Xigang Yuan</i>	
<b>INTEGRATED PROCESS DESIGN AND CONTROL OF MULTI-ELEMENT REACTIVE DISTILLATION PROCESSES</b> .....	735
<i>Seyed Soheil Mansouri, Mauricio Sales-Cruz, Jakob Kjøbsted Huusom, Rafiqul Gani</i>	
<b>CONTROL SYSTEM DESIGN FOR FURNACES WITH MULTIPLE PARALLEL PASSES</b> .....	741
<i>Aryan Kumar Ojasvi, Nitin Kaistha</i>	
<b>OPTIMAL OPERATION AND STABILISING CONTROL OF THE CONCENTRIC HEAT-INTEGRATED DISTILLATION COLUMN</b> .....	747
<i>Thomas Bisgaard, Sigurd Skogestad, Jakob Kjøbsted Huusom, Jens Abildskov</i>	
<b>HYBRID ONLINE SENSOR ERROR DETECTION AND FUNCTIONAL REDUNDANCY FOR ARTIFICIAL PANCREAS CONTROL SYSTEMS</b> .....	753
<i>Jianyuan Feng, Kamuran Tursoy, Sediqeh Samadi, Iman Hajizadeh, Ali Cinar</i>	
<b>MODEL IDENTIFICATION USING CONTINUOUS GLUCOSE MONITORING DATA FOR TYPE 1 DIABETES*</b> .....	759
<i>Dimitri Boiroux, Morten Hagdrup, Zeinab Mahmoudi, Niels Kjølstad Poulsen, Henrik Madsen, John Bagterp Jørgensen</i>	
<b>THE ARTIFICIAL PANCREAS: A DYNAMIC CHALLENGE</b> .....	765
<i>Øyvind Stavdahl, Anders L. Fougner, Konstanze Kölle, Sverre Chr. Christiansen, Reinold Ellingsen, Sven M. Carlsen</i>	

<b>RETROSPECTIVE OPTIMIZATION OF DAILY INSULIN THERAPY PARAMETERS: CONTROL SUBJECT TO A REGENERATIVE DISTURBANCE PROCESS*</b> .....	773
<i>Stephen D. Patek, Dayu Lv, Enrique Campos-Nanez, Marc Breton</i>	
<b>SHAPING THE MPC COST FUNCTION FOR SUPERIOR AUTOMATED GLUCOSE CONTROL</b> .....	779
<i>Joon Bok Lee, Ravi Gondhalekar, Eyal Dassau, Francis J. Doyle III</i>	
<b>AN AUTOMATIC DENOISING METHOD WITH ESTIMATION OF NOISE LEVEL AND DETECTION OF NOISE VARIABILITY IN CONTINUOUS GLUCOSE MONITORING</b> .....	785
<i>Hong Zhao, Chunhui Zhao</i>	
<b>DYNAMIC FLUX BALANCE ANALYSIS OF THE METABOLISM OF MICROALGAE UNDER A DIURNAL LIGHT CYCLE</b> .....	791
<i>C. Baroukh, J. P. Steyer, O. Bernard, B. Chachuat</i>	
<b>A SET-BASED OPTIMAL CONTROL APPROACH FOR PHARMACOKINETIC/PHARMACODYNAMIC DRUG DOSAGE DESIGN</b> .....	797
<i>Sergio Lucia, Monica Schliemann-Bullinger, Rolf Findeisen, Eric Bullinger</i>	
<b>A TWO-LOOP OPTIMIZATION STRATEGY FOR MULTI-OBJECTIVE OPTIMAL EXPERIMENTAL DESIGN</b> .....	803
<i>Hui Yu, Hong Yue, Peter Halling</i>	
<b>EXPLORING DESIGN PRINCIPLES OF GENE REGULATORY NETWORKS VIA PARETO OPTIMALITY*</b> .....	809
<i>Irene Otero-Muras, Julio R. Banga</i>	
<b>ROBUST TARGET IDENTIFICATION FOR DRUG DISCOVERY</b> .....	815
<i>Elling W. Jacobsen, Torbjörn E. M. Nordling</i>	
<b>OPTIMIZATION ALTERNATIVES FOR ROBUST MODEL-BASED DESIGN OF SYNTHETIC BIOLOGICAL CIRCUITS*</b> .....	821
<i>Y. Boada, J. L. Pitarch, A. Vignoni, G. Reynoso-Meza, J. Picó</i>	
<b>OPTIMAL HEALTH-AWARE CHARGING PROTOCOL FOR LITHIUM-ION BATTERIES: A FAST MODEL PREDICTIVE CONTROL APPROACH</b> .....	827
<i>M. Torchio, L. Magni, R. D. Braatz, D. M. Raimondo</i>	
<b>ECONOMIC DISPATCH FOR MICROGRIDS WITH CONSTRAINED EXTERNAL POWER EXCHANGE</b> .....	833
<i>Michael Zachar, Prodrimos Daoutidis</i>	
<b>SIMULATION AND DESIGN METHODS FOR MULTIPHASE MULTISTREAM HEAT EXCHANGERS*</b> .....	839
<i>Harry A. J. Watson, Paul I. Barton</i>	
<b>SELF-OPTIMIZING CONTROL OF A TWO-STAGE REFRIGERATION CYCLE</b> .....	845
<i>Adriaen Verheyleweghen, Johannes Jäschke</i>	
<b>MODIFIER-ADAPTATION APPROACH TO DEAL WITH STRUCTURAL AND PARAMETRIC UNCERTAINTY</b> .....	851
<i>T. Rodriguez-Blanco, D. Sarabia, C. De Prada</i>	
<b>ECONOMIC OPTIMIZATION OF SAWMILL RESIDUES COLLECTION FOR BIOENERGY CONVERSION</b> .....	857
<i>David S. Zamar, Bhushan Gopaluni, Shahab Sokhansanj, Mahmood Ebadian</i>	
<b>OUTPUT ERROR MODEL IDENTIFICATION AGAINST UNEXPECTED LOAD DISTURBANCE</b> .....	863
<i>Shijian Dong, Tao Liu, Fengwei Chen</i>	
<b>DYNAMICS OF NONLINEAR CHEMICAL PROCESS WITH MULTIPLICATIVE STOCHASTIC NOISE</b> .....	869
<i>Roberto Baratti, Stefania Tronci, Alexander Schaum, Jesus Alvarez</i>	
<b>GAS PHASE TRAIN IN UPSTREAM OIL &amp; GAS FIELDS: PART-I MODEL DEVELOPMENT</b> .....	875
<i>Y. H. Al-Naumani, J. A. Rossiter, S. J. Bahlawi</i>	
<b>DISCRETE-TIME OPTIMAL CONTROL OF ELECTRIC HOT WATER TANK</b> .....	882
<i>Nathanael Beeker, Paul Malisani, Nicolas Petit</i>	
<b>ONLINE OPTIMAL EXPERIMENT DESIGN: REDUCTION OF THE NUMBER OF VARIABLES*</b> .....	889
<i>Roberto Lemoine-Nava, Sebastian F. Walter, Stefan Körkel, Sebastian Engell</i>	
<b>MODELLING AND DESIGN OF CARBON DIOXIDE ABSORPTION IN ROTATING PACKED BED AND PACKED COLUMN</b> .....	895
<i>Matt Thiels, David S. H. Wong, Cheng-Hsiu Yu, Jia-Lin Kang, Shi Shang Jang, Chung-San Tan</i>	
<b>ROBUST CONTROL OF A SUPERMARKET REFRIGERATION SYSTEM USING MULTI-STAGE NMPC</b> .....	901
<i>Sankaranarayanan Subramanian, Adeel Ahmad, Sebastian Engell</i>	
<b>ROBUST DYNAMIC OPTIMIZATION OF A SEMI-BATCH EMULSION POLYMERIZATION PROCESS WITH PARAMETRIC UNCERTAINTIES-A HEURISTIC APPROACH -</b> .....	907
<i>Jennifer Puschke, Alexander Mitsos</i>	
<b>NEURAL NLMPC SCHEMES FOR THE CONTROL OF THE ACTIVATED SLUDGE PROCESS</b> .....	913
<i>Alejandro Golder, Silvana R. Revollar, Rosalba Lamanna, Pastora Vega</i>	
<b>ROBUST PID AUTO-TUNING FOR THE QUADRUPLE TANK SYSTEM</b> .....	919
<i>Clara M. Ionescu, Anca Maxim, Cosmin Copot, Robin De Keyser</i>	
<b>OPEN LOOP OPTIMAL OPERATION AND SENSITIVITY ANALYSIS OF A CONTINUOUS BIOBUTANOL FERMENTATION PROCESS WITH EX-SITU ADSORPTION RECOVERY</b> .....	925
<i>Boeun Kim, Hong Jang, Jay H. Lee</i>	
<b>A TWO-LAYER STRUCTURE FOR STABILIZATION AND OPTIMIZATION OF AN OIL GATHERING NETWORK*</b> .....	931
<i>Andres Cudas, Esmail Jahanshahi, Bjarne Foss</i>	
<b>A MULTI-SCALE MODEL OF THE WHOLE HUMAN BODY BASED ON DYNAMIC PARSIMONIOUS FLUX BALANCE ANALYSIS</b> .....	937
<i>Masood Khaksar Toroghi, William R Cluett, Radhakrishnan Mahadevan</i>	



<b>STABILITY OF MULTI-PHASE SYSTEMS EVOLVING ON AN EQUILIBRIUM MANIFOLD*</b> .....	943
<i>B. Erik Ydstie</i>	
<b>DYNAMIC TIME TO SURGE COMPUTATION FOR ELECTRIC DRIVEN GAS COMPRESSORS DURING VOLTAGE DIPS</b> .....	949
<i>Andrea Cortinovis, Mehmet Mercangöz, Tor Olav Stava, Sture Van De Moortel, Erling Lunde</i>	
<b>POINTWISE INNOVATION-BASED STATE OBSERVATION OF EXOTHERMIC TUBULAR REACTORS</b> .....	955
<i>A. Schaum, J. Alvarez, T. Meurer, J. A. Moreno</i>	
<b>CONTROL OF A SOLAR FURNACE USING MPC WITH INTEGRAL ACTION</b> .....	961
<i>Bertinho A. Costa, João M. Lemos, Emmanuel Guillot</i>	
<b>STATE ESTIMATION AND MODEL PREDICTIVE CONTROL FOR THE SYSTEMS WITH UNIFORM NOISE</b> .....	967
<i>Lenka Pavelková, Kvetoslav Belda</i>	
<b>VFA ROBUST CONTROL OF AN ANAEROBIC DIGESTION PILOT PLANT: EXPERIMENTAL IMPLEMENTATION</b> .....	973
<i>J. P. García-Sandoval, H. O. Méndez-Acosta, V. González-Alvarez, A. Schaum, J. Alvarez</i>	
<b>MODEL PERFORMANCE ASSESSMENT OF A PREDICTIVE CONTROLLER FOR PROPYLENE/PROPANE SEPARATION</b> .....	978
<i>Érica R. P. Claro, Viviane Botelho, Jorge Otávio Trierweiler, Marcelo Farenzena</i>	
<b>‘STATE DÉJÀ VU’ INTER-AGENT LEARNING ADAPTIVE CONTROL FRAMEWORK</b> .....	984
<i>Hongyi Qu, Ridong Zhang, Furong Gao</i>	
<b>MACHINE LEARNING-BASED FRAMEWORK FOR MULTI-CLASS DIAGNOSIS OF NEURODEGENERATIVE DISEASES: A STUDY ON PARKINSON’S DISEASE</b> .....	990
<i>Gurpreet Singh, Meet Vadera, Lakshminarayanan Samavedham, Erle Chuen-Hian Lim</i>	
<b>HYDROCYCLONE CUT-SIZE ESTIMATION USING ARTIFICIAL NEURAL NETWORKS</b> .....	996
<i>S. Van Loggenberg, G Van Schoor, K. R. Uren, A. F. Van Der Merwe</i>	
<b>PARAMETER ESTIMATION AND MODEL ORDER IDENTIFICATION OF LTI SYSTEMS</b> .....	1002
<i>Santhosh Kumar Varanasi, Phanindra Jampana</i>	
<b>IDENTIFICATION OF WIENER MODELS IN THE PRESENCE OF ARIMA PROCESS NOISE</b> .....	1008
<i>Ibrahim Aljamaan, David T. Westwick, Michael Foley</i>	
<b>IDENTIFICATION OF LINEAR DYNAMIC SYSTEMS USING DYNAMIC ITERATIVE PRINCIPAL COMPONENT ANALYSIS*</b> .....	1014
<i>Deepak Maurya, Arun K. Tangirala, Shankar Narasimhan</i>	
<b>AN ADAPTIVE NON-LINEARITY DETECTION ALGORITHM FOR PROCESS CONTROL LOOPS*</b> .....	1020
<i>Muhammad Faisal Aftab, Morten Hovd, Norden E. Huang, Selvanathan Sivalingam</i>	
<b>PROCESS DISCOVERY OF OPERATOR ACTIONS IN RESPONSE TO UNIVARIATE ALARMS*</b> .....	1026
<i>Wenkai Hu, Ahmad W. Al-Dabbagh, Tongwen Chen, Sirish L. Shah</i>	
<b>MIXTURE PROBABILISTIC PCA FOR PROCESS MONITORING - COLLAPSED VARIATIONAL BAYESIAN APPROACH</b> .....	1032
<i>Rahul Raveendran, Biao Huang</i>	
<b>A REVISED TECHNIQUE OF STICTION COMPENSATION FOR CONTROL VALVES</b> .....	1038
<i>Riccardo Bacci Di Capaci, Claudio Scali, Biao Huang</i>	
<b>CONCURRENT CANONICAL CORRELATION ANALYSIS MODELING FOR QUALITY-RELEVANT MONITORING</b> .....	1044
<i>Qinqin Zhu, Qiang Liu, S. Joe Qin</i>	
<b>PARAMETER IDENTIFICATION OF A DYNAMIC MODEL OF CULTURES OF MICROALGAE SCENEDESMUS OBLIQUUS- AN EXPERIMENTAL STUDY</b> .....	1050
<i>Jean-Sébastien Deschênes, Alain Vande Wouwer</i>	
<b>DESIGN OF A ROBUST LIPSCHITZ OBSERVER-APPLICATION TO MONITORING OF CULTURE OF MICRO-ALGAE SCENEDESMUS OBLIQUUS</b> .....	1056
<i>Christian Feudjio, Philippe Bogaerts, Jean-Sebastien Deschenes, Alain Vande Wouwer</i>	
<b>OPTIMAL OPERATION OF ALGAL PONDS ACCOUNTING FOR FUTURE METEOROLOGY</b> .....	1062
<i>Riccardo De-Luca, Quentin Béchet, Fabrizio Bezzo, Olivier Bernard</i>	
<b>THE PHOTOINHIBITAT: OPERATING MICROALGAE CULTURE UNDER PHOTOINHIBITION FOR STRAIN SELECTION*</b> .....	1068
<i>Francis Mairet, Olivier Bernard</i>	
<b>A BACTERIOSTATIC CONTROL APPROACH FOR MIXOTROPHIC CULTURES OF MICROALGAE</b> .....	1074
<i>Jean-Sébastien Deschênes</i>	
<b>REFERENCE TRACKING USING A NON-COOPERATIVE DISTRIBUTED MODEL PREDICTIVE CONTROL ALGORITHM</b> .....	1079
<i>Anca Maxim, Clara M. Ionescu, Constantin F. Caruntu, Corneliu Lazar, Robin De Keyser</i>	
<b>HYBRID MODEL BASED CONTROL FOR MEMBRANE FILTRATION PROCESS</b> .....	1085
<i>Lester Lik Teck Chan, Chen-Pei Chou, Junghui Chen</i>	
<b>REACTION VARIANTS AND INVARIANTS BASED OBSERVER AND CONTROLLER DESIGN FOR CSTRS*</b> .....	1091
<i>Zixi Zhao, John M. Wassick, Jeff Ferrio, B. Erik Ydstie</i>	
<b>PROACTIVE ACTUATOR FAULT-TOLERANCE IN ECONOMIC MPC FOR NONLINEAR PROCESS PLANTS*</b> .....	1097
<i>Brage Rugstad Knudsen</i>	

<b>CONSTRAINED MULTIVARIABLE PREDICTIVE CONTROL OF A TRAIN OF CRYOGENIC <sup>13</sup>C SEPARATION COLUMNS</b> .....	1103
<i>Clara M. Ionescu, Cristina I. Muresan, Dana Copot, Robin De Keyser</i>	
<b>BAYESIAN ESTIMATION IN STOCHASTIC DIFFERENTIAL EQUATION MODELS VIA LAPLACE APPROXIMATION</b> .....	1109
<i>Hadiseh Karimi, Kimberley B. McAuley</i>	
<b>A GENERALIZED INSTRUMENTAL VARIABLE METHOD BASED ON MATRIX DECOMPOSITION FOR SIMULTANEOUS IDENTIFICATION OF BI-DIRECTIONAL PATHS IN CLOSED-LOOP SYSTEMS</b> .....	1115
<i>Benben Jiang, Qunxiang Zhu, Xiaoxiang Zhu, Zhiqiang Geng</i>	
<b>LATENT AUTOREGRESSIVE GAUSSIAN PROCESSES MODELS FOR ROBUST SYSTEM IDENTIFICATION</b> .....	1121
<i>César Lincoln C. Mattos, Andreas Damianou, Guilherme A. Barreto, Neil D. Lawrence</i>	
<b>MODELING, SENSITIVITY ANALYSIS AND PARAMETER IDENTIFICATION OF A TWIN SCREW EXTRUDER</b> .....	1127
<i>Jonathan Grimard, Laurent Dewasme, Justine Thiry, Fabrice Krier, Brigitte Evrard, Alain Vande Wouwer</i>	
<b>OPTIMAL EXPERIMENTAL DESIGN IN THE EVALUATION OF FOOD PACKAGING COMPLIANCE WITH SAFETY REGULATIONS</b> .....	1133
<i>Miguel Mauricio-Iglesias</i>	
<b>NON-LINEAR DATA RECONCILIATION FOR A PARTIAL NITRITATION (SHARON) REACTOR</b> .....	1139
<i>Q. H. Le, P. J. T. Verheijen, K. E. Mampaey, M. C. M. Van Loosdrecht, E. I. P. Volcke</i>	
<b>ON THE USE OF SHAPE-CONSTRAINED SPLINES FOR BIOKINETIC PROCESS MODELING*</b> .....	1145
<i>Alma Mašić, Sriniketh Srinivasan, Julien Billeter, Dominique Bonvin, Kris Villez</i>	
<b>BIOFLOCCULATION AND ACTIVATED SLUDGE SEPARATION: A PLS CASE STUDY</b> .....	1151
<i>G. Van De Staey, G. Gins, I. Smets</i>	
<b>CONTROL OF WASTEWATER N<sub>2</sub>O EMISSIONS BY BALANCING THE MICROBIAL COMMUNITIES USING A FUZZY-LOGIC APPROACH</b> .....	1157
<i>Riccardo Boiocchi, Krist V. Gernaey, Gürkan Sin</i>	
<b>FULL-SCALE IMPLEMENTATION OF AN ADVANCED CONTROL SYSTEM ON A BIOLOGICAL WASTEWATER TREATMENT PLANT</b> .....	1163
<i>Michela Mulas, Francesco Corona, Jukka Sirviö, Seppo Hyvönen, Riku Vahala</i>	
<b>DYNAMIC MODELLING OF AN ANAEROBIC DIGESTER FOR WASTES AT THE TERRITORY LEVEL</b> .....	1169
<i>Nouceiba Adouani, Marie-Noëlle Pons, Rainier Hreiz, Stéphane Pacaud</i>	
<b>A MULTI-RATE MOVING HORIZON ESTIMATION FRAMEWORK FOR ELECTRIC ARC FURNACE OPERATION*</b> .....	1175
<i>Smriti Shyamal, Christopher L. E. Swartz</i>	
<b>PHASE PARTITION FOR NONLINEAR BATCH PROCESS MONITORING</b> .....	1181
<i>Jingxiang Liu, Tao Liu, Jie Zhang</i>	
<b>COMPARATIVE STUDY OF MULTICOMPONENT DISTILLATION STATIC ESTIMATORS BASED ON INDUSTRIAL AND RIGOROUS MODEL DATASETS</b> .....	1187
<i>Andrei Torgashov, Sigurd Skogestad, Alexey Kozlov</i>	
<b>DEVELOPMENT OF SOFT SENSORS FOR THE CASE WHERE THE TIME DELAY IS RANDOM</b> .....	1193
<i>Yuri A. W. Shardt, Xu Yang</i>	
<b>ROBUST OBSERVATION STRATEGY TO ESTIMATE UNKNOWN INPUTS*</b> .....	1199
<i>Ixbalank Torres, Alejandro Vargas, Germán Buitrón</i>	
<b>ON-LINE ESTIMATION OF THE REACTION RATES FROM SAMPLED MEASUREMENTS IN BIOREACTORS</b> .....	1205
<i>I. Bouraoui, M. Farza, T. Menard, R. Ben Abdennour, M. M'Saad</i>	
<b>Author Index</b>	