Assessment and Future Directions of Nonlinear Model Predictive Control
Preface

The past three decades have seen rapid development in the area of model predictive control with respect to both theoretical and application aspects. Over these 30 years, model predictive control for linear systems has been widely applied, especially in the area of process control. However, today’s applications often require driving the process over a wide region and close to the boundaries of operability, while satisfying constraints and achieving near-optimal performance. Consequently, the application of linear control methods does not always lead to satisfactory performance, and here nonlinear methods must be employed. This is one of the reasons why nonlinear model predictive control (NMPC) has enjoyed significant attention over the past years, with a number of recent advances on both the theoretical and application frontier. Additionally, the widespread availability and steadily increasing power of today’s computers, as well as the development of specially tailored numerical solution methods for NMPC, bring the practical applicability of NMPC within reach even for very fast systems. This has led to a series of new, exciting developments, along with new challenges in the area of NMPC.

In order to summarize these recent developments, and to consider these new challenges, we organized an international workshop entitled “Assessment and Future Directions of Nonlinear Model Predictive Control” (NMPC05), which was held at the Waldhotel Zollernblick, in Freudenstadt-Lauterbad, Germany on August 26-30, 2005. The objective of this workshop was to bring together a diverse group of internationally recognized researchers and industrial practitioners in the area of NMPC, in order to critically assess and discuss the current status, future directions and open questions of NMPC. The number of participants was intentionally kept small in order to promote discussions and the fruitful exchange of ideas. In the spirit of the very successful predecessor workshop held in 1998 in Ascona, Switzerland, all the keynotes, as well as the main talks were given by invited speakers. There were also a limited number of contributed oral and poster presentations. Overall the workshop turned out to be very stimulating and allowed close interactions and discussions among the participants.
This volume contains a selection of papers from this workshop that summarize the key results and challenges of NMPC. We hope that it provides a useful reference, as well as inspiration for future research in this area.

We would like to thank all of the authors for their participation and their interesting contributions to the workshop. Likewise, we are grateful to all of the reviewers involved in the pre- and post-reviews of the contributions. They provided invaluable comments, which ensured the high quality of this book volume. Moreover, the workshop itself, as well as the production of this volume, would not have been possible without the financial support of the Network of Competence: Pro3-Process Technology. We would also like to thank all members of the Institute for Systems Theory and Automatic Control for their help in organizing and running the workshop. Finally, we are especially thankful to Dr. Thomas Ditzinger of the Springer Verlag for his support of this volume.

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Contents

Foundations and History of NMPC
Nonlinear Model Predictive Control: An Introductory Review
Eduardo F. Camacho, Carlos Bordons ........................................... 1

Theoretical Aspects of NMPC
Hybrid MPC: Open-Minded but Not Easily Swayed
S. Emre Tuna, Ricardo G. Sanfelice, Michael J. Messina,
Andrew R. Teel ................................................................. 17

Conditions for MPC Based Stabilization of Sampled-Data Nonlinear Systems Via Discrete-Time Approximations
Éva Gyurkovics, Ahmed M. Elaiw .................................................. 35

A Computationally Efficient Scheduled Model Predictive Control Algorithm for Control of a Class of Constrained Nonlinear Systems
Mayuresh V. Kothare, Zhaoyang Wan ........................................... 49

The Potential of Interpolation for Simplifying Predictive Control and Application to LPV Systems
John Anthony Rossiter, Bert Pluymers, Bart De Moor ................. 63

Techniques for Uniting Lyapunov-Based and Model Predictive Control
Prashant Mhaskar, Nael H. El-Farra, Panagiotis D. Christofides ....... 77

Discrete-Time Non-smooth Nonlinear MPC: Stability and Robustness
M. Lazar, W.P.M.H. Heemels, A. Bemporad, S. Weiland ................. 93
Model Predictive Control for Nonlinear Sampled-Data Systems
L. Grüne, D. Nešić, J. Pannek ........................................... 105

Sampled-Data Model Predictive Control for Nonlinear Time-Varying Systems: Stability and Robustness
Fernando A.C.C. Fontes, Lalo Magni, Éva Gyurkovics .................. 115

On the Computation of Robust Control Invariant Sets for Piecewise Affine Systems
T. Alamo, M. Fiacchini, A. Cepeda, D. Limon, J.M. Bravo,
E.F. Camacho ............................................................ 131

Nonlinear Predictive Control of Irregularly Sampled Data Systems Using Identified Observers
Meka Srinivasarao, Sachin C. Patwardhan, R.D. Gudi ................. 141

Nonlinear Model Predictive Control: A Passivity-Based Approach
Tobias Raff, Christian Ebenbauer, Frank Allgöwer .................... 151

Numerical Aspects of NMPC

Numerical Methods for Efficient and Fast Nonlinear Model Predictive Control
Hans Georg Bock, Moritz Diehl, Peter Kühl, Ekaterina Kostina,
Johannes P. Schlöder, Leonard Wirsching ............................. 163

Computational Aspects of Approximate Explicit Nonlinear Model Predictive Control
Alexandra Grancharova, Tor A. Johansen, Petter Tønдел .............. 181

Towards the Design of Parametric Model Predictive Controllers for Non-linear Constrained Systems
V. Sakizlis, K.I. Kouramas, N.P. Faísca, E.N. Pistikopoulos ........... 193

Interior-Point Algorithms for Nonlinear Model Predictive Control
Adrian G. Wills, William P. Heath ..................................... 207

Hard Constraints for Prioritized Objective Nonlinear MPC
Christopher E. Long, Edward P. Gatzke ............................... 217

A Nonlinear Model Predictive Control Framework as Free Software: Outlook and Progress Report
Andrey Romanenko, Lino O. Santos .................................. 229
Robustness, Robust Design, and Uncertainty

Robustness and Robust Design of MPC for Nonlinear Discrete-Time Systems
Lalo Magni, Riccardo Scattolini ................................................................. 239

MPC for Stochastic Systems
Mark Cannon, Paul Couchman, Basil Kouvaritakis ................................. 255

NMPC for Complex Stochastic Systems Using a Markov Chain Monte Carlo Approach
Jan M. Maciejowski, Andrea Lecchini Visintini, John Lygeros ............. 269

On Disturbance Attenuation of Nonlinear Moving Horizon Control
Hong Chen, Xingquan Gao, Hu Wang, Rolf Findeisen ....................... 283

Chance Constrained Nonlinear Model Predictive Control
Lei Xie, Pu Li, Günter Wozny ................................................................. 295

Close-Loop Stochastic Dynamic Optimization Under Probabilistic Output-Constraints
Harvey Arellano-Garcia, Moritz Wendt, Tilman Barz, Guenter Wozny... 305

Interval Arithmetic in Robust Nonlinear MPC

Optimal Online Control of Dynamical Systems Under Uncertainty
Rafail Gabasov, Faina M. Kirillova, Natalia M. Dmitruk ...................... 327

State Estimation and Output Feedback

State Estimation Analysed as Inverse Problem
Luise Blank ................................................................. 335

Minimum-Distance Receding-Horizon State Estimation for Switching Discrete-Time Linear Systems
Angelo Alessandri, Marco Baglietto, Giorgio Battistelli ....................... 347

New Extended Kalman Filter Algorithms for Stochastic Differential Algebraic Equations
John Bagterp Jørgensen, Morten Rode Kristensen, Per Grove Thomsen, Henrik Madsen .................................................. 359
Industrial Perspective on NMPC

NLMPC: A Platform for Optimal Control of Feed- or Product-Flexible Manufacturing
R. Donald Bartusiak .............................................. 367

Experiences with Nonlinear MPC in Polymer Manufacturing
Kelvin Naidoo, John Guiver, Paul Turner, Mike Keenan, Michael Harmse ................................................................. 383

Integration of Advanced Model Based Control with Industrial IT
Rüdiger Franke, Jens Doppelhamer ........................................ 399

Putting Nonlinear Model Predictive Control into Use
Bjarne A. Foss, Tor S. Schei ............................................. 407

NMPC and Process Control

Integration of Economical Optimization and Control for Intentionally Transient Process Operation
Jitendra V. Kadam, Wolfgang Marquardt ......................... 419

Controlling Distributed Hyperbolic Plants with Adaptive Nonlinear Model Predictive Control
José M. Igreja, João M. Lemos, Rui Neves da Silva ............... 435

A Minimum-Time Optimal Recharging Controller for High Pressure Gas Storage Systems
Kenneth R. Muske, Amanda E. Witmer, Randy D. Weinstein .... 443

Robust NMPC for a Benchmark Fed-Batch Reactor with Runaway Conditions
Peter Kühl, Moritz Diehl, Aleksandra Milewska, Eugeniusz Molga, Hans Georg Bock ......................................................... 455

Real-Time Implementation of Nonlinear Model Predictive Control of Batch Processes in an Industrial Framework
Zoltan K. Nagy, Bernd Mahn, Rüdiger Franke, Frank Allgöwer .......................... 465

Non-linear Model Predictive Control of the Hashimoto Simulated Moving Bed Process
Achim Küpper, Sebastian Engell ........................................ 473

Receding-Horizon Estimation and Control of Ball Mill Circuits
Renato Lepore, Alain Vande Wouwer, Marcel Remy, Philippe Bogaerts... 485
Hybrid NMPC Control of a Sugar House  
D. Sarabia, C. de Prada, S. Cristea, R. Mazaeda, W. Colmenares 495

Application of the NEPSAC Nonlinear Predictive Control Strategy to a Semiconductor Reactor  
Robin De Keyser, James Donald III 503

Integrating Fault Diagnosis with Nonlinear Model Predictive Control  
Anjali Deshpande, Sachin C. Patwardhan, Shankar Narasimhan 513

NMPC for Fast Systems

A Low Dimensional Contractive NMPC Scheme for Nonlinear Systems Stabilization: Theoretical Framework and Numerical Investigation on Relatively Fast Systems  
Mazen Alamir 523

A New Real-Time Method for Nonlinear Model Predictive Control  
Darryl DeHaan, Martin Guay 537

A Two-Time-Scale Control Scheme for Fast Unconstrained Systems  
Sebastien Gros, Davide Buccieri, Philippe Mullhaupt, Dominique Bonvin 551

Novel Applications of NMPC

Receding Horizon Control for Free-Flight Path Optimization  
Xiao-Bing Hu, Wen-Hua Chen 565

An Experimental Study of Stabilizing Receding Horizon Control of Visual Feedback System with Planar Manipulators  
Masayuki Fujita, Toshiyuki Murao, Yasunori Kawai, Yujiro Nakaso 573

Coordination of Networked Dynamical Systems  
Alessandro Casavola, Domenico Famularo, Giuseppe Franzè 581

Distributed NMPC, Obstacle Avoidance, and Path Planning

Distributed Model Predictive Control of Large-Scale Systems  
Aswin N. Venkat, James B. Rawlings, Stephen J. Wright 591

Distributed MPC for Dynamic Supply Chain Management  
William B. Dunbar, S. Desa 607
Robust Model Predictive Control for Obstacle Avoidance: Discrete Time Case
Saša V. Raković, David Q. Mayne ................................................. 617

Trajectory Control of Multiple Aircraft: An NMPC Approach
Juan J. Arrieta-Camacho, Lorenz T. Biegler,
Dharmashankar Subramanian .................................................. 629

Author Index ............................................................................. 641