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Assessment and Future Directions of Nonlinear Model Predictive Control

Springer

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Library of Congress Control Number: 2007927163

ISSN print edition: 0170-8643
ISSN electronic edition: 1610-7411
ISBN-10 3-540-72698-5 Springer Berlin Heidelberg New York
ISBN-13 978-3-540-72698-2 Springer Berlin Heidelberg New York

Typesetting: by the authors and SPS using a Springer LaTeX macro package

Printed on acid-free paper SPIN: 12067183 89/SPS 5 4 3 2 1 0

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 "Assesment 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.

Stuttgart, Pittsburgh
December 2006

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