University of Stuttgart
Institute for Systems Theory in Engineering

European Control Training Site

One Day Mini Course

Introduction to and Current Issues in Nonlinear Model Predictive Control

Tuesday August 31st, 2004

directly prior to NOLCOS 2004 at the IST, University of Stuttgart, Germany

Content and objective:
Linear model predictive control is popular since the 70s of the past century and by now widely employed in practice. The 90s have witnessed a steadily increasing attention from control theoreticians as well as control practitioners in the area of nonlinear model predictive control (NMPC) and over the past decade significant theoretical as well as implementational advances in the area of NMPC have been achieved. The focus of this mini course is twofold. Besides an in depth introduction to the basic ideas and principles of (nonlinear) predictive control current application and research issues in NMPC spanning from stability and robustness, output-feedback, efficient numerical solution as well as implementation aspects are discussed. For this purpose the course is split up in six parts. The first part provides an introduction as well as a historical review of (nonlinear) predictive control, often also referred to as receding horizon control or moving horizon control. Part two focuses on how to achieve nominal stability of the closed-loop using NMPC. In part three the robustness as well as the robust design of NMPC are discusses. Part four provides an overview on output-feedback in conjunction with NMPC. The efficient numerical solution and implementation of NMPC is discussed in depth in part five. Part six discusses existing applications as well as application aspects of NMPC. The mini course is concluded by a short wrap up, summary and outlook. For the detailed program see http://www.ist.uni-stuttgart.de/nmpccourse/.

Major parts of the lecture will focus on NMPC for continuous time systems, either with or without sampling. However, most of the presented results possess discrete time counterparts.

The course is given in English. It starts with an elementary level before moving to the more advanced topics. It is accompanied by copies of the slides and supplementary material provided by the lecturers.

Who should attend?
Graduate students, engineers, mathematicians and researchers, who are interested in becoming familiar with nonlinear model predictive control or who want to improve their understanding of nonlinear model predictive control.

Lecturers (alphabetical order):
-Frank Allgöwer (IST, University of Stuttgart, Germany)
-Moritz Diehl (IWR, University of Heidelberg, Germany)
-Rolf Findeisen, organizer (IST, University of Stuttgart, Germany)
-Lalo Magni (SISDIN, University of Pavia, Italy)
-Zoltan Nagy (IST, University of Stuttgart, Germany)

Organization fee and registration:
The organization fee/contribution towards expenses of 100 € includes: binder containing copies of the slides and supplementary material, coffee and refreshments, lunch.

Detailed informations:
For detailed informations see http://www.ist.uni-stuttgart.de/nmpccourse/ or contact: Rolf Findeisen, findeise@ist.uni-stuttgart.de, Institute for Systems Theory in Engineering, University of Stuttgart, 70550 Stuttgart, Germany.