LMI-based Robust MPC Design

Introduction

Juraj Oravec – Monika Bakošová

STU

Slovak University of Technology in Bratislava

Institute of Information Engineering, Automation, and Mathematics

www.kirp.chtf.stuba.sk

Main education, research, and applications areas:

- modelling, identification, optimization, and process control in chemical and food industries,
- design and development, measurement and data processing, process automation and visualization,
- mathematics, mathematical statistics, fuzzy sets, and fuzzy logic,
- information technologies.

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Main research groups:

Prof. Miroslav Fikar

- Dynamic optimization group
- DYNOPT toolbox
- Optimal control of membrane filtration

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Main research groups:

Assoc. Prof. Michal Kvasnica

- (Explicit) Model Predictive Control
- MPT toolbox
- HYSDEL

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Main research groups:

Assoc. Prof. Monika Bakošová

- Robust Model Predictive Control
- Fuzzy Control
- MUP toolbox

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Laboratories:

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Laboratories:

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ERASMUS+ IAM

www.kirp.chtf.stuba.sk/study

“

You can find here a very friendly, collaborative, and creative working environment. (*Anh*)

The exchange program gave me exposure to a new organized way of thinking. (*Rajesh*)

I would definitely recommend studying at IAM. (*Deepak*)

Support web-page

www.kirp.chtf.stuba.sk/~oravec/lmi_rmpc

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Part I: **Alternative Robust MPC Design**

Part II: **Toolbox**

Part III: **LMI-based Robust MPC Design Exercises**

Part IV: **Some references**

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LMI-based Robust MPC Design

Contact information: Juraj Oravec

Part I: Alternative Robust MPC Design

Abstract:

Robust MPC is an advanced control strategy to optimize control performance subject to the constraints of the system inputs/outputs and in the presence of bounded disturbance. Several alternative approaches of on-line robust MPC design

Presentation:

[download PDF (approx. 5 MB)]

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Part II: Toolbox

Abstract:

Software MUP represents an efficient and user-friendly MATLAB-based toolbox for on-line robust MPC design in LMI-framework. The toolbox enables designing robust MPC using all-in-one MATLAB/Simulink block. The advanced users may benefit from

Presentation:

[download PDF (approx. 3 MB)]

Support web-page

www.kirp.chtf.stuba.sk/~oravec/lmi_rmpc

Part III: LMI-based Robust MPC Design Exercises

Scope:

The LMI-based robust MPC design exercises are oriented on implementation of simple robust MPC for uncertain system with input and state constraints. Two approaches are considered, i.e., manual implementation and implementation using

Task:

[download PDF (approx. 1 MB)]

Software:

The LMI-based robust MPC design exercises are evaluated using MATLAB/Simulink environment. Although, there were not observed obstacles by using older releases

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Part IV: Some references

Obviously, there should me much more extensive list of references focused on LMI-based robust MPC design. Here are mentioned just several publications closely related to the considered topic. The following works (listed subject to the time of publishing) are crucial to cover the necessary theoretical backgrounds, considered software implementation, and selected applications.

1. S. Boyd, L. El Ghaoui, E. Feron, V. Balakrishnan (1994): Linear Matrix Inequalities in System and Control Theory. SIAM.

   Chapters 2 and 3 discussed wide classes of process control problems that can be formulated using linear matrix inequalities. Chapter 7 considered State-Feedback Synthesis for the systems in continuous-time domain.

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