UNIVERSITEIT GENT

Faculty of Engineering & Architecture
Department of Electrical Energy, Systems & Automation

Invitation

Wednesday 24 September 2014

for the public defence of
the thesis of
Abhishek Dutta

titled
Design and Certification of Industrial Predictive Controllers

to obtain the academic degree of
Doctor in Electromechanical Engineering

Abstract of the doctoral thesis

Most physical systems have limitations in size of their inputs and outputs (constraints). Model Predictive Control (MPC) provided a systematic means of handling all forms of constraints leading to tremendous impact on industrial control practice. MPC transcribes the control objective into a cost function and solves the constrained optimization online.

The improvement in efficiency of the online optimization part of MPC led to its adoption in mechanical and mechatronic systems from process control and petrochemical applications. However, the massive strides made by the academic community in guaranteeing stability through state-space MPC have not always been directly applicable in an industrial setting.

This thesis is concerned with design and a posteriori certification of feasibility, stability and convergence of input-output MPC controllers for industrial applications without terminal conditions (i.e. terms included at the end of cost function and constraint set). Terminal conditions in essence are difficult to compute, may compromise performance and are not used in the industry.

The main contribution of the thesis is a systematic development and analysis of MPC without terminal conditions for linear, nonlinear and distributed (system composed of interacting subsystems) systems. The results are validated on industrial test benches such as automatic transmissions and flight control.

Brief Curriculum Vitae

Abhishek Dutta graduated from The Univeristy of Edinburgh's College of Science and Engineering with a Distinction in Master of Science in 2007 where he was awarded the 'Informatics Prize for Outstanding Thesis'. He completed a second Erasmus Mundus masters from the Faculty of Mathematical, Physical and Natural Sciences at the University of Trento with a final mark of 110 over 110.

During the next couple of years, he was a research scholar at the Robotics Research Centre, School of Mechanical and Aerospace Engineering, Nanyang Technological University followed by research assistantship at the Institute of Automatic Control Engineering, Department of Electrical Engineering, Technical University Munich.

Starting form the academic year 2009-10 onwards, he has been a doctoral researcher at Ghent University. He has been a visiting doctoral student in the Control Group, Department of Engineering, University of Cambridge and holds a junior membership at Wolfson College Cambridge for the academic year 2013-14.

His research on predictive control resulted in publication of 5 journal papers and 15 conference papers, which have received over 30 citations. He has given invited talks at Imperial College London, King's College London, TU Eindhoven and Trinity Mathematical Society, Cambridge.

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Promoters

Prof. dr. Robin De Keyser
Ghent University

Dr. Clara Ionescu
Ghent University

Advisors

Prof. dr. Jan Maciejowski
University of Cambridge

Dr. Edward Hartley
University of Cambridge

Practicalities

The defence will take place on Wednesday 24 September 2014 at 9am in the 'Aula Ceremonial Hall' in Voldersstraat 9, Gent 9000.

Afterwards you are kindly invited to the reception.

Please confirm your attendance before 15 September 2014 to:

Dutta.Abhishek@UGent.be

Coordinates

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