Imperial College London

Centre for Process Systems Engineering
2017 Seminar Series:

UCL

Towards the grand unification of model-based design, control and scheduling

Prof. Stratos Pistikopoulos
(Texas A&M)

Abstract:

The design and operation of a process system over its lifetime span require decisions at different levels and scales, which significantly affect the initial capital investment, optimal operation and economic, environmental and energy performance – especially in the presence of dynamic and continuously changing conditions. While significant progress has been achieved over the years within the PSE community in the areas of (i) integration of design and control, and (ii) control and scheduling, it is fair to say that at the moment there is not a generally accepted methodology and/or 'protocol' for such an integration of scales. It is also interesting to note that currently there is no commercially available software system to fully support such an activity.

In this presentation, we present the foundations of such an integrated framework and a prototype software platform that enables the grand unification of process design, control and scheduling in the presence of dynamic conditions and uncertainty. Based on on-going research developments over the last twenty-five years, we describe the PAROC [PARametric Optimization and Control] system featuring: (i) a high-fidelity dynamic model representation, (ii) a suite/toolbox of model approximation methods, (iii) a host of multi-parametric programming solvers for mixed continuous and integer optimization problems, (iv) a state-space modelling representation capability for scheduling and control problems, and (v) an advanced toolkit for explicit model predictive control and moving horizon reactive scheduling algorithms. Key advantage of PAROC is that the obtained solutions at different scales (i) originate from the same high-fidelity dynamic model, and (ii) the resulting explicit integrated solutions are validated off-line and in-silico viz. the original model. We demonstrate the potential of the approach to capture decisions in three different time scales (spanning from years to seconds) through its application to a residential-scale cogeneration system for the production of usable heat and electrical power.

Bio:

Professor Pistikopoulos is TEES Distinguished Research Professor in the Artie McFerrin Department of Chemical Engineering at Texas A&M University. He was a Professor of Chemical Engineering at Imperial College London, UK (1991-2015) and the Director of its Centre for Process Systems Engineering (2002-2009). At Texas A&M he is the Interim Co-Director of the Texas A&M Energy Institute, the Course Director of the Master of Science in Energy, the Director of the Gulf Coast Regional Manufacturing Centre, and the Texas A&M Principal Investigator of the DoE-funded RAPID initiative on process intensification.

He holds a Ph.D. degree from Carnegie Mellon University and he worked with Shell Chemicals in Amsterdam before joining Imperial. He has authored or co-authored over 400 major research publications in the areas of modelling, control and optimization of process, energy and systems engineering applications, 10 books and 2 patents. He is a co-founder of Process Systems Enterprise (PSE) Ltd, a founder of Parametric Optimization Solutions (ParOS) Ltd, a Fellow of IChemE and the current Editor-in-Chief of Computers & Chemical Engineering. He is the current Chair of the Computing and Systems Technology (CAST) Division of AIChE and he serves as a trustee of the Computer Aids for Chemical Engineering (CACHE) Organization. In 2007, Prof. Pistikopoulos was a co-recipient of the prestigious MacRobert Award from the Royal Academy of Engineering. In 2012, he was the recipient of the Computing in Chemical Engineering Award of CAST/AIChE. He received the title of Doctor Honoris Causa in 2014 from the University Politehnica of Bucharest, and from the University of Pannonia in 2015. In 2013, he was elected Fellow of the Royal Academy of Engineering in the UK.

17 May 2017, 11am
CPSE Seminar room, RODH C615

CPSE Seminar room, RODH C615, Roderic Hill Bldg, Chemical Engineering department, Imperial College London, SW7 2AZ
This event is free and open to the public. No registration is required.
Refreshments before the seminar in CPSE Common room (top floor Roderic Hill Bldg).

Organisers & Contacts: Dr. Gonzalo Guillen Gosalbez (g.guillen05@imperial.ac.uk), Dr. Alex Kiparissides (alex.kiparissides@ucl.ac.uk), Ms. Cristina Romano(c.romano@imperial.ac.uk)