

MODEL PREDICTIVE CONTROL IN BUILDINGS WORKSHOP

MONTREAL, JUNE 24-25, 2011



Natural Resources Canada / Ressources naturelles Canada

Canada



Renewable and Sustainable
energy institute
A joint Institute of the University of Colorado at Boulder
& the National Renewable Energy Laboratory



PROGRAM

OVERVIEW



This event is endorsed by IBPSA-USA and IBPSA-Canada.

The promise of harnessing the predictive and diagnostic powers of a well-calibrated building energy model for improved building operations is attracting a growing number of researchers around the globe. IBPSA-USA and IBPSA-Canada invite you to join a two-day workshop on model predictive control (MPC) in buildings that will serve as a forum for lively dialogue on different approaches, applications, and field experiences. The event will feature a series of technical presentations, selected by a Scientific Committee of internationally recognized domain experts, as well as time for networking and exchange. It will close with a roundtable discussion to define future research needs and highlight opportunities for collaboration and business applications. The Scientific Committee will then invite selected presenters to submit manuscripts to be published in a 2012 Special Issue of the Journal of Building Performance Simulation (JBPS) on "MPC in Buildings."

Scientific Committee

Johan Åkesson	Lund University, Sweden
Andreas Athienitis	Concordia University, Canada
Ian Beausoleil-Morrison	Carleton University, Canada
Francesco Borrelli	UC Berkeley, USA
Clemens Felsmann	TU Dresden, Germany
Jan Hensen	TU Eindhoven, Netherlands
Colin Jones	EPFL, Switzerland
Michael Kummert	Ecole Polytechnique Montreal, Canada
Ardeshir Mahdavi	TU Vienna, Austria
Yasuo Utsumi	Sendai National College of Tech., Japan
Shengwei Wang	Hong Kong Polytechnic University

Workshop Chair

Gregor Henze	U Colorado, USA
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Organizing Committee

Brian Coffey	UC Berkeley, USA
Peter May-Ostendorp	U Colorado, USA
Meli Stylianou	Natural Resources Canada

Sponsors



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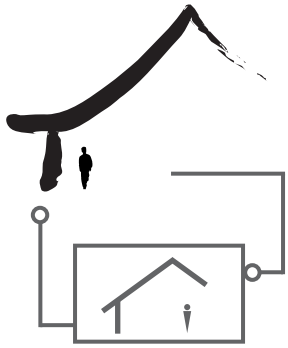
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REGISTRATION AND GETTING THERE



Registration

\$25 registration fee collected at door
(Cash only, Canadian dollars)

Visit our website and use the following password to register as either a presenter or non-presenter as appropriate:
<http://mpcworkshop.eventbrite.com>, pwd: 2011mpcworkshop

Space for non-presenters is limited and will be on a first come first served basis

Getting there

By public transit: Take the metro to Guy-Concordia and go upstairs.

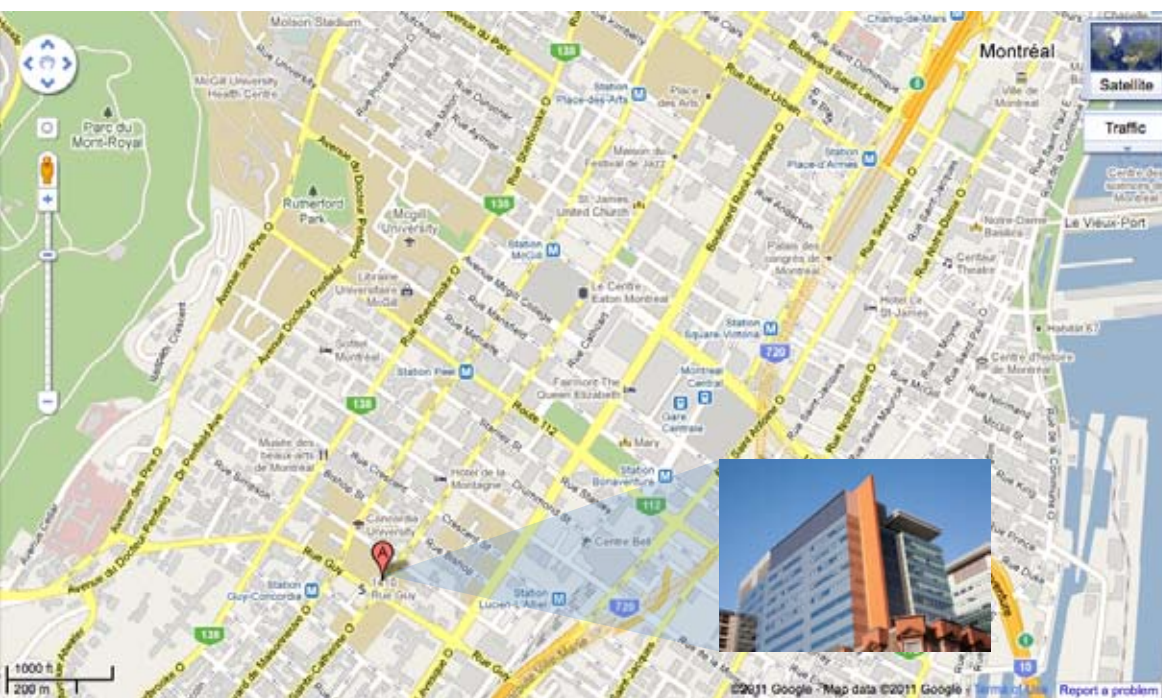
By car:

From the airport or the west island, take hwy 720 to exit 3 for Rue Guy towards Montreal/Centre-Ville, turn right onto Boulevard Rene-Levesque, then left onto Rue Guy and drive to the corner of Sainte-Catherine and Guy.

From the east, take hwy 10/15 over the Champlain bridge, continue on hwy 15/20, take exit 61 to merge onto Avenue Atwater, stay on Atwater until you reach Rue Sainte-Catherine, turn right and drive to the corner of Sainte-Catherine and Guy.

Workshop Location Room EV2.260

Engineering, Computer Science and Visual Arts Integrated Complex
Concordia University, 1515 Saint Catherine W., Montreal, Quebec



WORKSHOP SCHEDULE

Friday, June 24

15:00-16:00 Simulation Studies

Michaël Kummert, Marie-Andrée Leduc,
Alain Moreau

Using MPC to reduce the peak demand associated with electric heating

Clara Verhelst, Maarten Sourbron,
Stefan Antonov, Lieve Helsen

Model predictive control for office rooms with thermally activated building systems connected to a heat pump system

Clemens Felsmann, R. Kretschmer, F. Stanel

Optimizing operations of block heat and power stations

16:00-16:15 Break

16:15-17:15 Simulation Studies

Charles Fremond, Bruno Duplessis,
Jérôme Adnot

Which benefits can predictive thermal and electric models bring in an unbundled electricity sector?

Matt Wallace, Ryan McBride, Siam Aumi,
Prashant Mhaskar, John House, Tim Salisbury

Energy efficient Model Predictive Control of vapor-compression systems

José Candanedo, Scott Bucking,
Amélie Allard, Andreas K. Athienitis

Model-based predictive control applications for solar homes and communities

17:15-17:30 Break

17:30-18:50 Field and Experimental Studies

Manfred Murrari, Dimitrios Gyalistras
and the OptiControl Team

Results from the OptiControl project

Yasuo Utsumi, Ken Hatakeyama, Kazuyuki Kamimura,
Syuzo Kishima, Tsuyoshi Fujita, Hideaki Nakane, Ryushi Kimura

Feed-forward air-conditioning control with heat load prediction using a weather forecasting data in heating season

Anthony Maitos, Paul Strachan,
Filip Jordán, Karel Kabele

Quantifying performance of simulation assisted control against conventional BEMS controls

Emerson Donaisky, Gustavo Oliveira,
Nathan Mendes

Experimental evaluation of PMV-based predictive algorithms for controlling thermal comfort

18:50-19:00 Break

19:00-20:00 Field and Experimental Studies

Nicholas Gayeski, Leslie K. Norford

Data-driven model-predictive control of low-lift chillers pre-cooling thermo-active building systems

Ardeshir Mahdavi, **Matthias Schuss**,
Kristina Orehounig

Implementation and evaluation of a predictive building systems control approach with embedded numeric simulation

Victor Zavala

Techno-economic evaluation of a next-generation energy management system

20:00-22:00 Group dinner (self-pay)

WORKSHOP SCHEDULE

Saturday, June 25

08:00-09:00 Modeling, Model Complexity, Calibration and Mismatch

Anthony Kelman, Yudong Ma, Francesco Borrelli

Analysis of local optima in predictive control for building temperature regulation

Bing Dong, **Zheng O'Neill**

Model predictive control based on occupant pattern detection and local weather forecasting for building energy management

Rhys Goldstein, Alex Tessier, Ebenezer Hailemariam, Azam Khan

Real-time sensor-based occupancy prediction for model predictive control in buildings

09:00-09:15 Break

09:15-10:15 Environment and Methodology

Yudong Ma, Anthony Kelman, Allan Daly, Francesco Borrelli

Hierarchical predictive control for energy efficient buildings with thermal storage

Brian Coffey

Open-source software for online MPC and offline derivation of control lookup tables using common building simulation tools

Georgios Lilis, G.I. Giannakis, G.D. Kontes, E.B. Kosmatopoulos, D.V. Rovas

A model-assisted control design methodology to improve building energy performance

10:15-10:30 Break

10:30-11:30 Environment and Methodology

Georg Haag

A project overview: FIEMSER – Friendly Intelligent Energy Management System for Existing Residential Buildings

Charles Corbin, Peter May-Ostendorp, Gregor Henze

A model predictive control optimization environment for real-time commercial building application

Stephen Treado

Real-time optimization of a building CHP/thermally driven space conditioning system using Model Predictive Control

11:30-11:45 Break

11:45-12:30 Environment and Methodology

Peter May-Ostendorp, Gregor Henze, Balaji Rajagopalan

Rule extraction: developing near-optimal heuristics from offline MPC studies in buildings

Joe Qin, Jingran Ma, Tim Salisbury

Economic model predictive control for building energy systems

12:30-13:30 Lunch (provided)

13:30-15:00 Roundtable discussion

15:00 Adjourn

