Texas Wisconsin California Control Consortium — Group Highlights

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Los Angeles, CA
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Outline

1. Overview of Research Projects
2. Recent news
New project: Rapid synthesis of epitaxial semiconductors for energy applications

- Ph.D. student: Min Yao
- Faculty: Tom Kuech (CBE)
- NSF proposal to Division of Civil, Mechanical and Manufacturing Innovation (CMMI)
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- Ph.D. student: new opening
- Industrial partner: Eastman
- Faculty: Gabriele Pannocchia (Pisa), David Mayne (Imperial)
- Funding: Submitted NSF GOALI proposal with Eastman (declined)
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Control performance monitoring principles for model predictive control

- Ph.D. student: Luo Ji → Megan Zagrobelny
- Faculty: Edgar and Qin?
- Industrial partner: ExxonMobil, Air Products, Praxair, Others?
- Success with NSF GOALI with ExxonMobil.

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- Recent and upcoming publications:

  Zagrobelny, M. A., L. Ji, and J. B. Rawlings. Quis custodiet ipsos custodes?
  In *IFAC Conference on Nonlinear Model Predictive Control 2012*. Noordwijkerhout, the Netherlands, August 2012.
Economic model predictive control

- Ph.D. student: Cuyler Bates
- Faculty: David Angeli (Imperial), Moritz Diehl (Leuven)
- Funding: Submitted NSF GOALI proposal with Shell
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Recent and upcoming publications

Fundamentals of economic model predictive control. 

Angeli, D., R. Amrit, and J. B. Rawlings. 
On average performance and stability of economic model predictive control. 

Amrit, R., J. B. Rawlings, and D. Angeli. 
Economic optimization using model predictive control with a terminal cost. 

Angeli, D., R. Amrit, and J. B. Rawlings. 
Enforcing convergence in nonlinear economic MPC. 
In *IEEE Conference on Decision and Control (CDC)*. Orlando, FL, 2011.

Diehl, M., R. Amrit, and J. B. Rawlings. 
A Lyapunov function for economic optimizing model predictive control. 
Computational modeling of the growth and spread of viruses

- Ph.D. students: Rishi Srivastava, Ankur Gupta
- Faculty: John Yin (CBE), Dave Anderson (Math), Jeff Linderoth (ISyE)
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Parameter estimation in stochastic chemical kinetic models using derivative free optimization and bootstrapping.  
2012.  
To be submitted to Biometrics.

New methods to obtain sensitivities of stochastic chemical kinetic models.  
2012.  
Accepted for publication in Journal of Chemical Physics.

Parameter estimation in stochastic kinetic models.  

The stochastic quasi-steady-state assumption: Reducing the model but not the noise.  
Nonlinear stochastic systems and moving horizon estimation

- Postdoc, Ph.D. student: Fernando Lima → Luo Ji
- Industrial partner: Tyler Soderstrom, ExxonMobil
Nonlinear stochastic systems and moving horizon estimation

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Rawlings, J. B. and L. Ji.
Optimization-based state estimation: Current status and some new results.

Rawlings, J. B., L. Ji, and G. Mancuso.
Current status and future challenges of moving horizon state estimation.

Covariance and state estimation of weakly observable systems: Application to polymerization processes.
Accepted for publication.

Lima, F. V. and J. B. Rawlings.
Nonlinear stochastic modeling to improve state estimation in process monitoring and control.
Optimization of supply chains

- Ph.D. students: Kaushik Subramanian
- Faculty: Christos Maravelias (CBE)
- Industrial partner: Larry Megan, Jesus Flores-Cerrillo, Praxair
- NSF GOALI: Optimization of the Industrial Gas Supply Chain (ended)
Optimization of supply chains

- Ph.D. students: Kaushik Subramanian
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Subramanian, K. and J. B. Rawlings.
Cooperative model predictive control: Current status and limitations.

Subramanian, K. and J. B. Rawlings.
Economic model predictive control for inventory management in supply chains.

Subramanian, K., C. T. Maravelias, and J. B. Rawlings.
A state-space model and advanced control methods for chemical production scheduling.
AIChe Annual Meeting, Pittsburgh, PA, November 2012.

Subramanian, K., C. T. Maravelias, and J. B. Rawlings.
A state-space model for chemical production scheduling.

Integration of control theory and scheduling methods for supply chain management.
Current research sponsors

- TWCCC members: ExxonMobil, Eastman, Shell, Praxair
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Questions or Comments?