Yunfei Chu

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OBJECTIVE

Seeking a position in Process Identification, Control, Monitoring, Optimization and Analysis.

EDUCATION

Ph.D   Chemical Engineering, Texas A&M University, College Station, TX, Expected Aug. 2010
M.S.   Control Theory and Engineering, Tsinghua University, Beijing, China, 2005
B.S.   Automation, Tsinghua University, Beijing, China, 2002

RESEARCH EXPERIENCE

Texas A&M University, Chemical Engineering Department   **College Station, TX**
Research Assistant of Prof. Juergen Hahn   2005-present

Dissertation: ***Identification of Complex Chemical Systems from Noisy Data: Build an Accurate Model for Process Control, Optimization, Monitoring and Design***, including

- ***Optimal experiment design under uncertainty***
  Invented robust approaches to determine optimal experimental conditions for collecting informative data sets while reducing experiment cost, including input design, sampling selection and sensor location.
- ***Reliable parameter estimation***
  Created robust methods to select identifiable parameter subsets for nonlinear estimation and improved the estimation precision by considerably reducing the noise impact.
- ***Analysis of complex chemical systems***
  Designed global sensitivity analysis techniques for large-scale chemical reaction networks to identify the few influential factors that determine key properties of the system.
- ***Nonlinear model reduction with preservation of original variables***
  Developed a general method to simplify a large-scale system while the essential physical/chemical meanings in the original model could be preserved in the reduced model.
- ***Time series analysis***
  Created a frequency-domain method to solve the ill-conditioned inverse problem for estimating the time-varying parameters in the time series model.
- ***Nonlinear state filtering***
  Compared various implementations of Extended Kalman Filters (EKF) and Unscented Kalman Filters (UKF) and provided guidelines for applying nonlinear filters according to practical requirements.

Teaching Assistant   Spring 2006, Fall 2006, Spring 2007, Fall 2007
- ***Process dynamics & control***   Grading, solution, simulation, lab

Tsinghua University, Control Theory and Engineering Institute   **Beijing, China**
Research Assistant of Prof. Wenli Xu   2002-2005
Thesis: ***Study on Automatic Control in Grinding and Floatation Proces***, including

- ***Averaging level control by model predictive control (MPC) and implementation in PLC***
  A new MPC was developed by changing the length of the receding horizon. This approach simplified the nonlinear constrained optimization problem and enhanced the robustness under random flow disturbances. The controller was implemented in Rockwell PLC and successfully applied to the grinding process in the Jinchuan Nonferrous Metal Group Co. Gansu, China.
- ***System analysis of closed-circuit grinding-separation process***
  Modeled the recycle process from systematic perspective and applied Fourier analysis on the measured data to discover and classify different sources which could cause oscillations in the process.

- *Distributed PI control of coupled tank levels in floatation process*
  Simultaneously tuned multiple PI controllers of coupled tank networks by simulation and then implemented the tuned controllers in the real process, achieving better results than those tuned separately.

Tsinghua University, Automation Department　　　　　　　　　　　　　　**Beijing, China**
Undergraduate Project　　　　　　　　　　　　　　　　　　　　　　　　　　2002 Spring
- *Controller implementation in the THBIP-I humanoid robot*
  Implemented control algorithms in MCS-51 microcontrollers and an embedded PC and developed the communication program of the Controller-Area Network (CAN) fieldbus
- *Software development*
  Implemented algorithms in data analysis, pattern recognition and image processing in C/C++ and obtained skills and training in data structure, object-oriented programming and software engineering.

SELECTED JOURNAL PUBLICATIONS

[J1] **Chu, Y.** and Hahn, J. "Quantitative optimal experimental design using global sensitivity analysis via quasi linearization", *Ind. Eng. Chem. Res.*, in press, 2009.

[J2] **Chu, Y.**, Huang, Z. and Hahn, J. "Improving prediction capabilities of complex dynamic models via parameter selection and estimation", *Chem. Eng. Sci.*, 64 (19): 4178-4185, 2009.

[J3] **Chu, Y.** and Hahn, J. "Parameter set selection via clustering of parameters into pairwise indistinguishable groups of parameters", *Ind. Eng. Chem. Res.*, 48 (13): 6000-6009, 2009.

[J4] **Chu, Y.** and Hahn, J. "Integrating parameter selection with experimental design under uncertainty for nonlinear dynamic systems", *AICHE J.*, 54 (9): 2310-2320, 2008.

[J5] **Chu, Y.** and Hahn, J. "Parameter set selection for estimation for nonlinear dynamic systems", *AICHE J.*, 53 (11): 2858-2870, 2007.

[J6] **Chu, Y.**, Jayaraman, A. and Hahn, J. "Parameter sensitivity analysis of IL-6 signalling pathways", *IET Syst. Biol.*, 1 (6): 342-352, 2007.

[J7] **Chu, Y.**, Xu, W. and Wan, W. "Dynamic modeling and analysis of the closed-circuit grinding-classification process", *J. Univ. Sci. Technol. Beijing*, 12 (2): 111-115, 2005.

SELECTED CONFERENCE PAPERS & PRESENTATIONS

[C1] **Chu, Y.** and Hahn, J. "A New Global Sensitivity Analysis Procedure Involving Quasi Linearization for Optimal Experimental Design", AIChE Annual Meeting, Nashville, Tennessee, 2009.

[C2] **Chu, Y.** and Hahn, J. "Selection of Parameter Sets and Design of Experiments for Estimation of Nonlinear Dynamic Systems", Proc. IFAC World Congress, Seoul, Korea, 2008.

[C3] **Chu, Y.** and Hahn, J. "Parameter Set Selection Via Clustering of Parameters into Pair-Wise Indistinguishable Groups of Parameters", AIChE Annual Meeting, Philadelphia, Pennsylvania, 2008.

[C4] **Chu, Y.**, Cox, R., Misra, M. and Hahn, J. "Parameter Set Selection for Estimation of Nonlinear Dynamic Systems", AIChE Annual Meeting, Salt Lake City, Utah, 2007.

[C5] **Chu, Y.**, Singh, A.K., Jayaraman, A. and Hahn, J. "Sensitivity Analysis-Based Approach for Identifying Key Steps in Cell Signaling", AIChE Annual Meeting, San Francisco, California, 2006.

ADWARDS

Deisler Fellowship, 2007 ($7500, most prestigious graduate fellowship)
Rockwell Automation Scholarship, 2004 (for best graduate contributed to process technology)
Excellent Academic Scholarship of Tsinghua University 2000
Excellent Academic Scholarship of Tsinghua University 1998

TECHNICAL SKILLS

Programming Language: C/C++, Assembly Language, Ladder Logic, FORTRAN, VB, UML, HTML
Software: Matlab, Maple, Aspen, MS Office and Visual Studio
Hardware: Intel MCS-51 microcontrollers, CAN prestigious fieldbus, Rockwell PLCs

ORGANIZATION & AFFILIATION

Student Member, American Institute for Chemical Engineers, from 2007