John M. House

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Research Engineer

Summary

Internationally recognized leader in the buildings community with over 25 years of experience conducting research in the public and private sectors to improve the control and operation of heating, ventilating, and air-conditioning (HVAC) systems. Contributions to the field of fault detection and diagnostics (FDD) are now incorporated in an industry guideline on high performance sequences of operation for HVAC systems, have been implemented in commercial products, and are commonly used as a benchmark for other FDD methods.

Expertise

- Fault Detection and Diagnostics
- Control
- Optimization
- HVAC Equipment and Systems
- Modeling and Simulation
- Energy Efficiency

Experience

Johnson Controls — *Montreal, QC* — Jan. 2008 - Jan. 2020

Lead Principal Research Engineer — Oct. 2011 - Jan. 2018

- Initiated and conducted research on control algorithms and fault detection and diagnostic techniques to improve the energy efficiency of heating, ventilating and air-conditioning (HVAC) systems in buildings.
- Responsible for development of Modelica-based dynamic HVAC system models and use of models for development of control algorithms and diagnostic tools.
- Initiated and guided university research collaborations supporting internal technology priorities.
- Provided industry outreach and technical guidance for research projects funded by ASHRAE and U.S. Department of Energy.

Principal Research Engineer — Jan. 2008 - Oct. 2011

- Collaborated with research colleagues to develop and test algorithms for integrated control and fault detection, model-based economizer control and optimal start.
- Developed simulation platforms using Matlab, Simulink, Energy Plus, and Modelica-based tools and libraries to aid development and testing of control and fault detection algorithms.

Natural Resources Canada — *Varennes, QC* — Jan. 2005 - Jan. 2008

Research Scientist: Secondment Assignment from the Iowa Energy Center

- Developed research plans and established collaborative research projects for Intelligent Buildings Group.
- Conducted research on controls and diagnostics for HVAC and supermarket refrigeration systems.

Iowa Energy Center — *Ankeny, IA* — Nov. 2000 - Jan. 2008

Research Engineer

- Lead technical researcher of the National Building Controls Information Program.
- Conducted sponsored research and demonstration projects, and supported IEC funded research, related to building controls, fault detection and diagnostics, and commissioning for private industry and federal government.
- Represented the Iowa Energy Center on national initiatives, collaborations and committees related to building energy efficiency.
- Provided technical support and guidance for IEC-funded research projects.

National Institute of Standards and Technology — *Gaithersburg, MD* — Oct. 1994 - Nov. 2000

Principal Investigator / Project Leader

- Conducted research related to the development and testing of fault detection and diagnostic (FDD) methods for HVAC systems. Led the development of APAR (Air-handling unit Performance Assessment Rules).
- Collaborated with staff at Johnson Controls, Inc. to perform simulation and laboratory testing of advanced control strategies and FDD methods.
- Participated in international collaborations to perform FDD research with the Korea Institute of Energy Research, the Scientific and Technical Building Centre in Paris, France, and members of the International Energy Agency (IEA) Annex 34 working group.
- Monitored sponsored research on FDD methods for rooftop units conducted at Purdue University.
- Served as the IEA Annex 34 country representative for the United States.

Internship Experience

The Dow Chemical Company *Freeport, TX* **May 2010 - Aug. 2010**

Summer Research Intern

- Developed an Excel application for multivariate statistical monitoring of continuous and batch processes.

NMC North Microelectronics *Beijing, China* **Jun. 2008 - Jul. 2008**

Summer Engineering Intern

- Developed a multivariate statistical application for monitoring the operation of a semiconductor manufacturing process.

Education

The University of Iowa: Iowa City, Iowa

Doctor of Philosophy in Mechanical Engineering **1994**

- Ph.D. Dissertation: Optimal Control for HVAC and Building Systems

Master of Science in Mechanical Engineering **1988**

- MS Thesis: Development of Two Optimal Control Methodologies for Thermal Systems

Bachelor of Science in Mechanical Engineering, with distinction **1987**

Skills

Programming Modelica, Python, R, LaTeX
Applications Dymola, Matlab, Simulink, EnergyPlus, Jupyter Notebook

Certifications

Introduction to Computer Science and Programming Using Python *MITx* **Mar. 26, 2020**

edX

Credential ID: 48f759f8883c44b9a6a0bad569f95df4

Publications

Journal Papers

A method for setpoint alarming using a normalized index
Carlos F. Alcala, Timothy I. Salsbury
Control Engineering Practice *60.3 (2017) pp. 1–6. 2017*

An extremum-seeking control method driven by input–output correlation
Timothy I Salsbury, John M House, Carlos F Alcala, Yaoyu Li
Journal of Process Control *58 (2017) pp. 106–116. Elsevier, 2017*

Analysis and generalization of fault diagnosis methods for process monitoring
Carlos F. Alcala, S. Joe Qin
Journal of Process Control *21.3 (2011) pp. 322–330. 2011*

Generalized reconstruction-based contributions for output-relevant fault diagnosis with application to the tennessee eastman process
Gang Li, Carlos F. Alcala, S. Joe Qin, Donghua Zhou
Control Systems Technology, IEEE Transactions on *19.5 (Sept. 2011) pp. 1114–1127. 2011*

Reconstruction-based contribution for process monitoring with kernel principal component analysis
Carlos F. Alcala, S. Joe Qin
Industrial & Engineering Chemistry Research *49.17 (2010) pp. 7849–7857. 2010*

Reconstruction-based contribution for process monitoring
Carlos F. Alcala, S. Joe Qin
Automatica *45.7 (2009) pp. 1593–1600. 2009*

Conference Papers

Self-optimizing Control of an Air Source Heat Pump
Zhongfan Zhao, Yaoyu Li, Timothy I Salsbury, Carlos F Alcala, John M House
2019 American Control Conference (ACC), 2019

Identification of a Self-Optimizing Control Structure from Normal Operating Data
Carlos F Alcala, Timothy I Salsbury, John M House
2019 American Control Conference (ACC), 2019

Decoupling Method for PI Controllers via Setpoint Modification Applied to HVAC Systems
Timothy I Salsbury, John M House, Carlos F Alcala
ASME 2018 Dynamic Systems and Control Conference, 2018

Reduction of Transmissions in Wireless Thermostats with Send-on-Delta Sampling and a Deadband Filter
Carlos F Alcala, Timothy I Salsbury
2018 Annual American Control Conference (ACC), 2018

Decoupling Method for PI Controllers via Setpoint Modification Applied to HVAC Systems
Timothy I. Salsbury, John M. House, Carlos F. Alcala
Proceedings of the Dynamic Systems and Control Conference, 2018

Reduction of Transmissions in Wireless Thermostats with Send-on-Delta Sampling and a Deadband Filter
C. F. Alcala, T. I. Salsbury
Proceedings of the 2018 Annual American Control Conference (ACC), 2018

Model Selection for Predicting the Return Time from Night Setback
John E Seem, John M House, Carlos F Alcala
Proceedings of the International High Performance Buildings Conference, 2016

Two new normalized EWMA-based indices for control loop performance assessment
Timothy I. Salsbury, Carlos F. Alcala
Proceedings of the American Control Conference (ACC), 2015

Monitoring of dynamic processes with subspace identification and principal component analysis
Ricardo Dunia Carlos F. Alcala, S. Joe Qin
Proceedings of the 8th IFAC International Symposium on Fault Detection, Supervision and Safety of Technical Processes, 2012, Mexico City, Mexico

Unified analysis of diagnosis methods for process monitoring
Carlos F. Alcala, S. Joe Qin
Proceedings of the 7th IFAC International Symposium on Fault Detection, Supervision and Safety of Technical Processes, 2009, Barcelona, Spain

Unification of contribution analysis for process monitoring
Carlos F. Alcala, S. Joe Qin
Proceedings of the 2008 AIChE Annual Meeting, 2008, Philadelphia, USA

Reconstruction-based contribution for process monitoring
Carlos Alcala, S. Joe Qin
Proceedings of the 17th IFAC World Congress, 2008, Seoul, Korea