

UTC INSTITUTE FOR ADVANCED SYSTEMS ENGINEERING

Distinguished Lecture Series

Monday March 27th, 2017

1:00 - 2:00PM

UConn, Storrs Campus – ITEB 336

[To view live webcast click here](#)

Nonsmooth Differential Algebraic Equations

A nonsmooth modeling paradigm for dynamic simulation and optimization of engineering systems is advocated. Nonsmooth differential-algebraic equations (DAEs) naturally model the dynamics of a wide range of physical systems encountered in engineering problems conventionally viewed as exhibiting hybrid discrete/continuous behavior. Due to recent advancements in nonsmooth analysis, nonsmooth DAEs now have a suitable foundational theory regarding well-posedness and sensitivity analysis for use in, for example, dynamic optimization and control systems design. Moreover, the theory is computationally relevant, allowing for automatic implementations of numerical methods that scale efficiently for large-scale problems. State-of-the-art modeling efforts and challenges for engineering systems displaying hybrid behavior (e.g., hybrid automata) are highlighted as motivation for the nonsmooth DAEs approach.

Paul I. Barton

Paul Barton is the Lamot du Pont Professor of Chemical Engineering and Director of the Process Systems Engineering Laboratory at MIT, where he has been since 1992. He received his Ph.D. from the Centre for Process Systems Engineering at Imperial College, London University in 1992. He has held Visiting Professor appointments at CNRS-ENSIC, Nancy, France and EPFL, Lausanne, Switzerland. He has industrial experience with BP and Air Products, and has consulted for major corporations including Dow Chemical, Alstom Power and Aspen Technology. He has received a number of awards, including the Outstanding Young Researcher Award in 2004 and the Computing in Chemical Engineering Award in 2011, both from AIChE's CAST Division. Barton's research interests include nonsmooth and hybrid dynamic systems; numerical analysis of ordinary differential, differential-algebraic and partial differential-algebraic equations; sensitivity analysis and automatic differentiation; global, mixed-integer and dynamic optimization theory and algorithms; and open process modeling software. Some of the applications his group is currently focusing on include energy systems engineering, continuous pharmaceutical manufacturing, and quantitative engineering of microbial consortia. He served as Director for AIChE's CAST Division from 2001-2004 and is currently an associate editor for Journal of Global Optimization and Journal of Optimization Theory and Applications. He is author or co-author of over 175 articles in refereed journals. He has been very active in the design and the development of process modeling software, having been the original author of gPROMS, and having led the development of ABACUSS/JACOBIAN, DAEPACK and DFBalab at MIT, all of which are now commercial products widely used in industry and academia.

Key Words:

Dynamic simulation, Dynamic optimization, Sensitivity Analysis, Hybrid systems, Nonsmooth Analysis.

Upcoming Distinguished Lectures

5/08/17 – Ignacio Grossmann

Upcoming Seminars

4/7/17 – Ilias Bilonis

Uncertainty Quantification using Embarrassingly Small Numbers of Simulations and Experiments

4/10/17 – Nick Sahindis

The ALAMO Approach to Machine Learning: Best Subset Selection, Adaptive Sampling, and Constrained Regression

4/17/17 – Dane Boysen

Democratizing Energy TECHNOLOGY

5/22/17 – James Davis

Website:

www.utc-iaese.uconn.edu

Email:

utc-iaese@enr.uconn.edu

Phone:

860.486.3355



United Technologies Corporation

Institute for Advanced Systems Engineering

UNIVERSITY OF CONNECTICUT

UConn
SCHOOL OF ENGINEERING