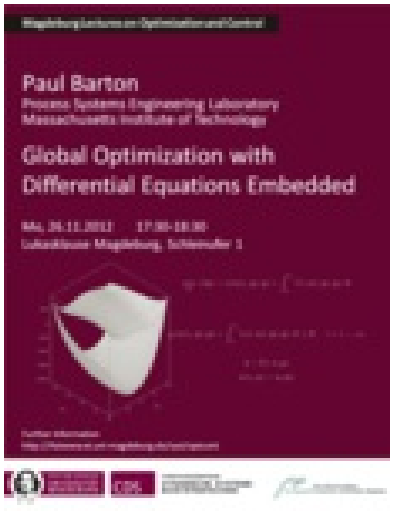
OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG

MAGDEBURG LECTURES ON OPTIMIZATION AND CONTROL

Paul I. Barton



Global Optimization with Differential Equations Embedded

Prof. Paul I. Barton
Department of Chemical Engineering
Massachusetts Institute of Technology
USA

Time & Place

The presentation on November 26, 2012 will be given in the Lukas Klause ›(Schleinufer 1, 39104 Magdeburg) (http://ifatwww.et.uni-magdeburg.de/syst/maloc/seminars/Standort%20Lukas%20Klause.pdf) and starts at 5.30 p.m.

Abstract

Optimization problems with ordinary differential equations (ODEs) or differential-algebraic equations (DAEs) embedded are ubiquitous in many science and engineering disciplines. These optimization problems are usually nonconvex and often exhibit multiple local minima, some of which are suboptimal. This talk will discuss the theory and implementation of algorithms that can guarantee locating a global optimal solution of nonconvex optimization problems with ODEs and DAEs embedded. In particular, we will discuss the theory required to construct bounds and convex relaxations for nonconvex functionals with ODEs and DAEs embedded, and how the estimates generated by these relaxations can be computed practically. We also demonstrate the use of these bounds and relaxations in deterministic global optimization algorithms for continuous and mixed-integer problems.

Short CV

Paul Barton is the Lammot 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 hybrid discrete/continuous 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 nano-scale systems engineering. He served as Director for AIChE's CAST Division from 2001-2004 and is currently a subject editor for Optimal Control Applications and Methods and associate editor for Journal of Global Optimization and Journal of Optimization Theory and Applications. He is author or co-author of over 120 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 and DAEPACK at MIT, all of which are now commercial

products widely used in industry.