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Sven Leyffer* (leyffer@mcs.anl.gov), 9700 South Cass Avenue, Argonne, IL 60439, and
Ashutosh Mahajan (mahajan@mcs.anl.gov), 9700 South Cass, Argonne, IL 60439.

MINOTAUR: A New Toolkit for Mixed-Integer and Nonlinear Optimization.

Scientists and engineers are increasingly turning from the simulation of complex processes to the optimization and design of complex systems. Many important design problems involve not only continuous variables with nonlinear relationships but also discrete decisions, giving rise to mixed-integer nonlinear programming problems (MINLPs). MINLPs combine the combinatorial complexity of the discrete decisions with the numerical challenges of the nonlinear functions.

We present a new toolkit for solving mixed-integer nonlinear optimization problems, called MINOTAUR. The MINOTAUR toolkit is designed to provide a flexible and efficient framework for solving MINLPs. The code is developed in a modular way to enable developers and users to efficiently combine the knowledge of problem structure with algorithmic insights. We will survey recent developments in MINLP and present the underlying algorithmic ideas of MINOTAUR. Our talk will focus on the integration of nonlinear solvers into the MINOTAUR's branch-and-cut framework, and highlight challenges and opportunities for nonlinear optimization. (Received September 22, 2011)