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Title: A review and computational comparison of bound constrained mixed-integer derivative-free optimization algorithms

Abstract: A growing number of applications in science and engineering deal with the solution of black-box optimization problems, where derivative information of the objective function is unavailable, unreliable or impractical to obtain. The algorithms that are utilized to solve this type of problems are called derivative-free algorithms. Although the algorithmic and theoretical aspects of derivative-free algorithms have significantly progressed over the past two decades, derivative-free algorithms dealing with discrete variables have not yet attracted much attention. In this work, we review recent advances on solving bound-constrained mixed-integer derivative-free optimization problems and present a computational comparison of existing implementations on a large collection of test problems. Thirteen bound constrained mixed-integer derivative-free optimization solvers are compared using a test set of 188 problems. The test bed includes pure integer and mixed-integer problems. Computational results show that the ability of all these solvers to obtain good solutions diminishes with increasing problem size. Computational results show that there is no single solver whose performance dominates that of all others in all types of problems. We present the best solvers for each type of problems (pure integer or mixed integer problems; small, medium or large problems; problems with well-defined or missing bounds).

Main area: Discrete Optimization, MIP and MINLP

Keywords: Mathematical Programming, Programming Mixed-Integer, Programming Integer