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Title: A computational comparison of 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 decade, 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, but the solvers evaluated collectively found optimal solutions for 81% of the problems in our test set. The open-source solver NOMAD was the best performer among all solvers tested.

Main area: Discrete Optimization, MIP and MINLP

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