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The ESA NLP solver WORHP. (English) Zbl 1365.90007

Fasano, Giorgio (ed.) et al., Modeling and optimization in space engineering. New York, NY: Springer (ISBN 978-1-4614-4468-8/hbk; 978-1-4614-4469-5/ebook). Springer Optimization and Its Applications 73, 85-110 (2013).

Summary: We Optimize Really Huge Problems (WORHP) is a solver for large-scale, sparse, nonlinear optimization problems with millions of variables and constraints. Convexity is not required, but some smoothness and regularity assumptions are necessary for the underlying theory and the algorithms based on it. WORHP has been designed from its core foundations as a sparse sequential quadratic programming (SQP) / interior-point (IP) method; it includes efficient routines for computing sparse derivatives by applying graph-coloring methods to finite differences, structure-preserving sparse named after Broyden, Fletcher, Goldfarb and Shanno (BFGS) update techniques for Hessian approximations, and sparse linear algebra. Furthermore it is based on reverse communication, which offers an unprecedented level of interaction between user and nonlinear programming (NLP) solver. It was chosen by ESA as the European NLP solver on the basis of its high robustness and its application-driven design and development philosophy. Two large-scale optimization problems from space applications that demonstrate the robustness of the solver complement the cursory description of general NLP methods and some WORHP implementation details.

For the entire collection see [Zbl 1255.90006].

MSC:

90-04	Software, source code, etc. for problems pertaining to operations research and mathematical programming	Cited in **10** Documents
90C06	Large-scale problems in mathematical programming	
90C33	Complementarity and equilibrium problems and variational inequalities (finite dimensions) (aspects of mathematical programming)	
90C55	Methods of successive quadratic programming type	

Keywords:

nonlinear optimization; large-scale; mathematical optimization; NLP

Software:

SNOPT; WORHP; AMPL; OOQP

Full Text: DOI