General purpose solvers

BlockIP

BlockIP implements a specialized primal-dual long-step path-following interior point algorithm for large scale linear, separable convex quadratic, or separable convex nonlinear problems with primal block-angular structure, i.e., problems whose variables and constraints can be partitioned in blocks, with some linking constraints coupling all of them. For some huge (millions of variables and/or constraints) quadratic problems have shown to be orders of magnitude faster than other approaches. In the electrical energy field it can be appropriate for any problem that fits the above block-angular structure (for instance, multi-period or multi-product problems).Some references:J. Castro, Interior-point solver for convex separable block-angular problems, Optimization Methods & Software, (2016), 31, 88-109.J. Castro, J. Cuesta, Quadratic regularizations in an interior-point method for primal block-angular problems, Mathematical Programming, 130 (2011) 415-445.J. Castro, A specialized interior-point algorithm for multicommodity network flows, SIAM Journal on Optimization, 10 (2000), 852-877.Package webpage: http://www-eio.upc.es/~jcastro/BlockIP.html

SCIP

SCIP is a framework for Constraint Integer Programming. In particular, it can be used as a global solver for general MINLP. It currently implements an LP-based branch and bound algorithm. SCIP is design in a plug-in fashion, which allows to be easily extendible to handle different non-linear constraints. As a particularly relevant constraint for some energy problems (gas network expansion, water distribution network, etc) is the so-called abspower, which models l <= abs(x)^p * x - a * z <= r, where l,r,p,a are constants and x,z are variables. This constraint is supported by SCIP as well as quadratic constraints and many others.

As for references of SCIP:

http://mpc.zib.de/index.php/MPC/article/view/4

http://link.springer.com/chapter/10.1007%2F978-1-4614-1927-3_15

and Stefan Vigerske's Phd Thesis:

Decomposition of Multistage Stochastic Programs and a Constraint Integer Programming Approach to Mixed-Integer Nonlinear Programming

Humboldt-University Berlin, 2013

http://edoc.hu-berlin.de/dissertationen/vigerske-stefan-2012-08-21/PDF/vigerske.pdf

As for applications of SCIP:

http://www.aimsciences.org/journals/displayArticlesnew.jsp?paperID=7953

http://bookstore.siam.org/mo21

http://www.tandfonline.com/doi/abs/10.1080/10556788.2014.888426

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