BiqCrunch

A semidefinite branch-and-bound method for solving binary quadratic problems

BiqCrunch

BiqCrunch is a semidefinite-based solver for binary quadratic problems. It uses a branch-and-bound method featuring an improved semidefinite bounding procedure [4], mixed with a polyhedral approach (see [2,3] for details). BiqCrunch uses a particular *BC* input file format that is similar to the *SDPA* format to describe the combinatorial problems. We provide also a *LP* to *BC* conversion tool . Documentation is available here.

The second release (May 2016) of BiqCrunch is now available as a free and open-source software. Specific versions are provided for solving *Max-Cut*, *k-cluster* and *Max-independent set* problems, as well as conversion tools for these problems. You can also use BiqCrunch online to solve any 0-1 quadratic problem to optimality, or simply to get an SDP-quality bound [4].

Papers

[1] N. Krislock, J. Malick, F. Roupin. BiqCrunch : a semidefinite branch-and-bound method for solving binary quadratic problems. To appear in ACM Transactions on Mathematical Software, 2016.

[2] N. Krislock, J. Malick, F. Roupin. Computational results of a semidefinite branch-and-bound algorithm for k-cluster. Computers and Operations Research 66: 153–159, 2016.

[3] N. Krislock, J. Malick, F. Roupin: Improved semidefinite bounding procedure for solving Max-Cut problems to optimality. Mathematical Programming A 143(1/2): 61-86, 2014.

[4] J. Malick, F. Roupin: On the bridge between combinatorial optimization and nonlinear optimization: a family of semidefinite bounds for 0-1 quadratic problems leading to quasi-Newton methods. Mathematical Programming B (140)1 pp 99-124, 2013.

Acknowledgments

BiqCrunch is the outcome of several research works and collaborations. This work was supported by the LIPN lab, CNRS (through "GdR Recherche Opérationnelle"), Grenoble University (Université Joseph

CONTACTS

Nathan Krislock:
krislock@math.niu.edu

Jérôme Malick:
jerome.malick@inria.fr

Frédéric Roupin:
Frederic.Roupin@lipn.univ-paris13.fr