Title: **Decomposing Unrestricted Binary Quadratic Programing problems**

Abstract: The Unrestricted Binary Quadratic Programming (UBQP) problem consists in maximizing (or minimizing) a quadratic objective function with binary decision variables. The UBQP is a classical NP-hard nonlinear problem. Furthermore, UBQP represents a unifying framework for a wide variety of combinatorial optimization problems.

To solve it, several algorithms and methods have been developed, exact but also heuristic and approximate. Some based on combinatorial algorithms, semi-definite matrixes or properties of the polytope that results when the problem is linearized. Other methods solve MIP models by improving the branch and bound process or using Lagrangian relaxation.

The UBQP can be represented as a graph in which the variables x_i are the nodes and the terms x_i x_j are the edges. By setting variables during the branch and bound procedure, the graph is simplified and even results disconnected multiple times. In the present work we develop a method to decompose the subproblems got by the branch and bound procedure when the representation graph results disconnected, as well as to take advantage of the 'vulnerabilities' of the original graph both to guide the branch and bound procedure and to obtain math-heuristic solutions.

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