Upper Bounds for Large Scale Integer Quadratic Multidimensional Knapsack Problems

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Abstract—We consider the separable quadratic multi-knapsack problem (QMKP) which consists in maximizing a concave separable quadratic integer function subject to m linear capacity constraints. The aim of this paper is to develop an effective method to compute an upper bound for (QMKP) from a surrogate relaxation originally proposed in Djerdjour et al. (1988). The quality of three other upper bounds for (QMKP) is evaluated and they are compared theoretically and experimentally with the bound we suggest. An effective heuristic method is presented to obtain a good feasible solution for (QMKP). Finally, computational experiments are reported. They assess the efficiency of our upper bound for instances up to 2000 variables and constraints.

Keywords—Integer programming, Separable quadratic programming, Multidimensional Knapsack Problem, Surrogate relaxation

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