EXPERIMENTAL ANALYSIS OF SOME CLASS OF SET PACKING PROBLEMS[1]

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The well-known NP-hard set packing problem (SPP) is considered in the integer formulation:

$$\max\{cx \mid Ax \leq e,\ x \in \{0,\ 1\}^n\}.$$

Here $A = (a_{ij})_{m\times n}$ is boolean matrix, c is an n-dimensional positive vector, $e = (1, ..., 1)^T$ is m-dimensional vector and $x = (x_1, ..., x_n)^T$ is the vector of the variables. We study the class $\mathcal{P}_{n,p}$ of the SPPs, where all the elements of the matrix A are independent random variables, $\mathbf{P}\{a_{ij} = 1\} = p$, $\mathbf{P}\{a_{ij} = 0\} = 1 - p$, where $p \in (0,\ 1)$, $i = 1, ..., m,\ j = 1, ..., n$. Earlier in [1, 2] for certain subclasses of $\mathcal{P}_{n,p}$ we obtained polynomial upper bounds of the average number of iterations for some algorithms of solving of SPP based on continuous optimization techniques.

The report presents the results of experimental studies of the properties of problems of class $\mathcal{P}_{n,p}$, including duality gap, cardinality L-covering and the number of feasible solutions. Also we analyze the process of solving this problem by some cutting plane algorithms, the branch-and-bound method (the Land and Doig scheme) and L-class enumeration algorithm. In particular, the comparison of the fractional Gomory cutting plane algorithm and of its modification [1] showed the advantage of the modified version, which increases with extension of the interval for the coefficients of the objective function. The results obtained will be used to improve the efficiency of algorithms for solving the set packing problem.

REFERENCES

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[1]This research has been supported by RFBR grant №13-01-00862