THE BINARY CUTTING METHOD FOR SOLVING LINEAR PROGRAMMING PROBLEMS WITH BOOLEAN VARIABLES

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The report is dedicated to the description of the algorithm for one of the methods for solving Boolean variables' or mixed-integer linear programming problems, which is based on binary cuttings. The introductory part contains a brief review of discrete optimization methods development directions, of theoretical and applied aspects of discrete optimization theory. Then, the theoretical description of the main points of the binary cutting method (BCM) follows.

The author developed two BCMs for solving general integer linear programming problem, which are based on binary cuttings construction procedures. The first one uses the procedure of consecutive constructing and implicit enumeration of binary cuttings [1], while the second one is a hybrid algorithm of binary cuttings and branching, combining the idea of branch and bound method with building cutting planes. The details and the main points that underlie the binary cuttings and branching algorithm are published in [2] and are presented in the current report. It is shown that when seeking optimal solution for a linear programming problem with Boolean variables (LPPBV), it's enough to build O(n2) proper linear cuttings (PLC) for line relaxation of the initial problem. So, to create effective algorithm for solving LPPBV, it's enough to develop polynomial-difficult procedure for synthesizing PLC, which however couldn't be done to the present moment.

At the same time, we were able to develop several heuristic procedures for building binary cuttings, which allowed implementing fast algorithms to solve LPPBV. The procedures do not guarantee the construction of proper cuttings in general case, but the received a posteriori estimations of PLC's share in the total number of cuttings, and indirect estimations of overall performance, allowed making a conclusion regarding the BCM method advantage over other combinatory and hybrid methods for solving LPPBV.

The reliability of the binary cuttings and branching algorithm and its applicability for solving mixed-integer linear programming problems were experimentally confirmed.

REFERENCES

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