

Row and column generation technique for a multistage cutting stock problem

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ABSTRACT

We investigate a special class of large-scale linear programming problems and suggest an efficient way to solve them. Due to the special structure we can work with only a few rows and columns at a time. An iteration of the revised simplex algorithm may "enrich" the current LP matrix either by generating a new column or by generating a combination of a new row and a pair of new columns. The latest is the row and column generation technique we propose and investigate. It generalizes the famous column generation method suggested by P. C. Gilmore and R. E. Gomory for solving a classic cutting stock problem (CSP). The problems occur in the paper industry and some others where a so-called multistage cutting process takes place. Intermediate roll widths (rows) and cutting pattern (column) activities are decision variables in the multistage CSP. The procedure generates only those intermediate rolls and cutting patterns that are needed. The auxiliary problem embedded into the frame of the revised simplex algorithm is a non-linear knapsack problem that, however, can be solved efficiently. Computational results prove the overall method is a valuable addition to the arsenal of tools for modeling and solving the multistage CSP.

Keywords: *Cutting; Multistage cutting stock problem; Large-scale optimization; Row and column generation*

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