One-dimensional cutting stock problem with a given number of setups: a hybrid approach of metaheuristics and linear programming

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One-dimensional cutting stock problem (1D-CSP) is one of the representative combination optimization problems, and arises in many industries. Since the setup costs for switching different cutting patterns become more dominant in recent cutting industry, we consider a variant of 1D-CSP, called the pattern restricted problem (PRP), which minimizes the number of stock rolls while the number of different cutting patterns on constrained within a bound given by users. For this problem, we proposed a local search algorithm which alternately uses types of local search processes with the 1-add and shift neighborhoods. To improve the performance of the local search algorithm, we incorporated it with linear programming (LP) techniques, which restrict the number of solution in the neighborhoods and solve a large number of associated LP problems quickly. Through computational experiments, we observed that the new algorithm obtains solutions of better quality compared to other existing approaches.