Two Efficient Heuristic Algorithms for the Integrated Production Planning and Warehouse Layout Problem

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Abstract : In the literature, a mixed-integer linear programming model for the integrated production planning and warehouse layout problem is proposed. To solve the model, the authors proposed a Lagrangian relax-and-fix heuristic that takes a significant amount of time to stop with gaps above 5% for large-scale instances. Here, we present two heuristic algorithms to solve the problem. In the first one, we use a greedy approach by allocating warehouse locations with less reservation costs and also less transportation costs from the production area to locations and from locations to the output point to items with higher demands. Then a smaller model is solved. In the second heuristic, first, we sort items in descending order according to the fraction of the sum of the demands for that item in the time horizon plus the maximum demand for that item in the time horizon and the sum of all its demands in the time horizon. Then we categorize the sorted items into groups of 3, 4, or 5 and solve a small-scale optimization problem for each group, hoping to improve the solution of the first heuristic. Our preliminary numerical results show the effectiveness of the proposed heuristics.

Keywords : capacitated lot-sizing, warehouse layout, mixed-integer linear programming, heuristics algorithm

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