

# **Applying a two-stage simulated annealing algorithm for shelf space allocation problems**

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## **ABSTRACT**

Shelf allocation is one of the most important issues in retailing. In retailing stores, different displaying strategies can directly influence customer's purchasing decision and profit of retail stores. In previous studies, most researches allocate items into shelf space based on product type similarity information only. However, in practical environment, the affinity relationship between product category information should be considered. In addition, to solve complex shelf allocation problems, several researchers propose different heuristic approaches. Although these methods can obtain reasonable solutions, the solution quality and computation efficiency of these algorithms can be improved further.

In this thesis, a two-stage shelf allocation method is proposed. In the first stage, product categories are located into the shelf spaces based on their category affinity using simulated annealing (SA) algorithm. In the second stage, for each product category, product types are allocated into shelf space based on the product type purchasing association information using SA algorithm. To speed up the converge speed of the SA algorithm, this study proposed Product Category Assignment Sequence (PCAS) algorithm and Product Type Assignment Sequence (PTAS) algorithm to provide better initial solutions for the SA algorithms .

Based on the experiment result, the two-stage shelf allocation method with adopting PCAS and PTAS algorithms can obtain better shelf space allocation solution than adopting random method. Adopting PCAS and PTAS algorithms in the proposed two-stage shelf allocation method, the solution quality and computation efficiency in solving the shelf allocation problems can be effectively improved. The experiment shows that the proposed two-stage shelf allocation method with adopting PCAS and PTAS algorithms not only a nice method for solving the shelf space allocation problems but also can provide retailing manager a systematical approach to make better shelf allocation decisions.

**Keyword:** Retailing Stores, Shelf Allocation, Assignment Sequence, Purchasing Association, Simulated Annealing Algorithms.