The Order-picking with Replenishment Scheduling Problem

(Asso. Prof. J. Ota)

Order-picking is the most costly activity in a warehouse. Nowadays, with the trend of shrinking of picking area, the replenishment activity also becomes frequent and crucial. Because of the existence of picking and replenishing tasks in the same period, delays caused by the interaction of agents will increase the difficulty of solving this problem. Given the warehouse stock information and customers' orders, we aim to propose the scheduler to generate the agents' schedules and optimize those generated schedules to make the agents finish the tasks as soon as possible (Figure 1).

An efficient search-based metaheuristic is proposed in this study. However, in the metaheuristic, the transition from one solution to new solution is a serious problem. Thus, we proposed efficient operators which aim to implement the transition from one schedule to another by way of relocating (moving) the tasks between agents. Two problems are followed by the operators. a) Travel distance for the related agents will be affected, and resulting in longer operation time. b) Some delays may occur in the unchecked new schedule. The first problem is to determine how to cluster the tasks to some trips to minimize the traveling cost. Such problem can be considered as Vehicle Routing Problem. After the routing problem has been solved, the next step is to minimize the delays caused by the interactions between agents. Trips Exchange is simple process which aims to minimize the delays according to exchange the trips sequence inside the corresponding agent. From the experiment results, the proposed scheduler achieved significant improvement by comparing with reference scheduler (Figure 2).

Keywords: Warehouse management warehouse, order-picking, replenishing, scheduling

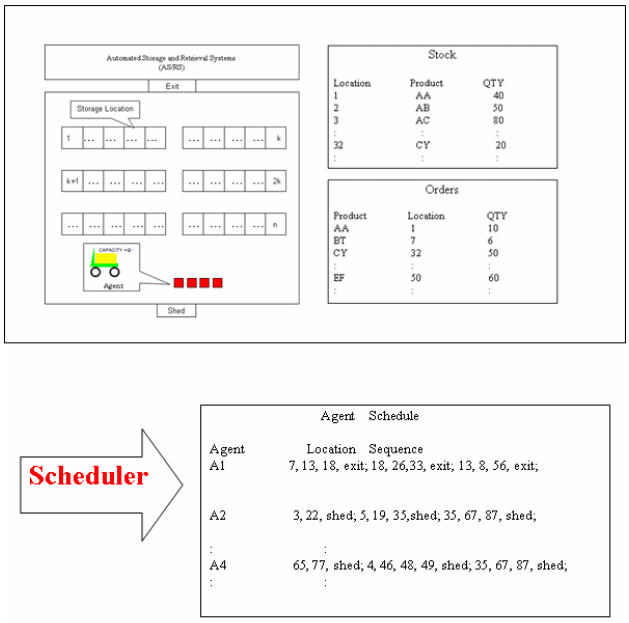

Fig.1 Input and output of order-picking scheduling model

Reference

1) Jie Gong, Jun Ota, Hirofumi Tamura and Toshimitsu Higashi: A Model and Efficient Heuristics of Order-Picking with Replenishment in a Warehouse, Prepr. the 16th Intelligent Systems Symposium, 161/166 (2006).

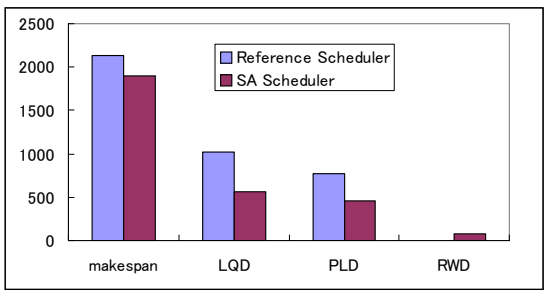

Fig.2 Comparison of proposed scheduler with the reference scheduler