Heuristics for Maximizing the Total Weight of Just-In-Time Jobs under Multi-Slot Conditions

Ryo Saito
Graduate School of Science and Engineering
Hosei University
3-7-2 Kajino-cho, Koganei-shi, Tokyo 184-8584, Japan
ryo.saito@stu.housei.ac.jp

Eishi Chiba
Department of Industrial and Systems Engineering
Hosei University
3-7-2 Kajino-cho, Koganei-shi, Tokyo 184-8584, Japan
e-chiba@hosei.ac.jp

Abstract

We focus on a problem maximizing the total weight of just-in-time jobs under multi-slot conditions. In just-in-time scheduling, each job has to be completed exactly on its due date. Since just-in-time scheduling has applications to both manufacturing and computer systems, a number of research papers on such scheduling problems exist. Under multi-slot conditions, each job has one due date per time slot and has to be completed just-in-time on one of its due dates. We assume that each job has a certain weight per time slot, and the weight is non-increasing with increasing completion time for each job. This problem maximizing the total weight of just-in-time jobs under multi-slot conditions was recently proven to be NP-hard. Our research presents two heuristics for this problem. The first is a simple greedy algorithm, in which each job is scheduled in the order of largest to smallest on weight for each time slot. The second applies a well-known algorithm for a weighted interval scheduling problem to this problem. We implement the two heuristics, and compare their performances from computational experimentation.

Keywords
Scheduling, algorithm, heuristics, just-in-time, time slot, weight

Biographies
Ryo Saito is a student in the Graduate School of Science and Engineering at Hosei University, Japan. His research interests include scheduling and discrete algorithms.

Eishi Chiba received a B.E. degree from Tohoku University in 2001, and an M.S. degree and a Ph.D. degree from the Japan Advanced Institute of Science and Technology in 2003 and 2006, respectively. He is currently an associate professor in the Department of Industrial and Systems Engineering at Hosei University, Japan. His research interests include scheduling algorithms, operations research and their applications.