Yu, Shanshan; Jin, Miaomiao; Luo, Wenchang
Approximation scheme for rescheduling on a single machine with job delay and rejection.
(Chinese. English summary) [Zbl 07404508]
Oper. Res. Trans. 25, No. 2, 104-114 (2021)

Summary: In this paper, we investigate a rescheduling problem with rejection on a single machine due to the disruption of job delay. In this problem, a set of jobs scheduled to arrive at time zero must be processed on a single machine. Each job has its processing time and weight. Before the formal processing begins, an original schedule by shortest weighted processing time first is given with the goal of minimizing the total weighted completion time. Based on the original schedule, the promised due date for each job is also given. However, when the formal processing starts, some jobs are delayed, which creates a disruption to the original schedule. Thus, it is necessary to adjust the original schedule, i.e., rescheduling. To achieve a reasonable service level, we are allowed to reject some delayed jobs by paying the corresponding rejection costs. In the adjusted schedule, the overall objective function is to minimize the sum of the total weighted completion time of the accepted jobs, the total rejection cost of the rejected jobs, and the weighted penalty for the maximum tardiness of the accepted jobs, while keeping the maximum tardiness no more than the given upper bound. For this problem, we design a dynamic programming exact algorithm running in pseudo-polynomial time. Furthermore, we derive a fully polynomial time approximation scheme by using the sparse technique.

MSC:
90B35 Deterministic scheduling theory in operations research
90C59 Approximation methods and heuristics in mathematical programming
90C39 Dynamic programming

Keywords:
rescheduling; job rejection; job delay; dynamic programming; approximation scheme

Full Text: DOI