

ABSTRACT**OPTIMAL SINGLE-MACHINE SCHEDULING
FOR MINIMIZING THE SUM OF EARLINESS
AND TARDINESS PENALTIES**

Susumu FUJII

Jin WANG

Kobe University

We consider a single-machine scheduling problem in which penalties occur for jobs which are completed either before or after their due date. The objective is to minimize the sum of the penalties for all jobs. A dominance relation based on pairwise precedence relation of adjacent jobs is proposed in this paper to improve the efficiency of the branch and bound algorithm which was proposed previously. A method is presented to obtain the pairwise precedence interval on which job i precedes its adjacent job j . The effectiveness of the proposed algorithm is demonstrated by numerical examples with various types of due dates. The results are summarized as follows.

1. The efficiency of the branch-and-bound algorithm can be improved by introducing the pairwise precedence relation.
2. For the problems in which the due dates of jobs distribute uniformly over the total processing time or over its latter half, the value of the objective function can be largely improved by sequencing jobs in the order of earliest due date (EDD sequence) than in the order of random sequence. In this type of problems the optimal or a good solution can be obtained in some reasonable time. When the due dates are concentrated or are distributed over the first half of total processing time, EDD sequence may not provide an effective initial sequence.
3. The computing time and total nodes generated by attaining a first optimal sequence are less than the half of them required by completing the computation.