Algorithmic Approaches to Flexible Job Shop Scheduling

Efficient Solution Techniques and Practical Applications

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Disjunctive Mixed Integer Programming Formulation

$$
\begin{aligned}
\min \quad & C_{\max} \\
\text{s.t.} \quad & \\
& C_{\max} - \sum_{k \in M_i} x_{i,k} p_{i,k} \geq S_i && \text{for all } i \in O : P(i) = n_{J(i)} && (1) \\
& \sum_{k \in M_i} x_{i,k} = 1 && \text{for all } i \in O && (2) \\
& S_i + \sum_{k \in M_i} x_{i,k} p_{i,k} \leq S_j && \text{for all } (i,j) \in C && (3) \\
& S_i + \sum_{k \in M_i} x_{i,k} p_{i,k} \leq S_j \quad \vee && && \\
& S_j + \sum_{k \in M_j} x_{j,k} p_{j,k} \leq S_i && \text{for all } (i,j) \in D(x) && (4) \\
& S_i \geq 0 && \text{for all } i \in O && \\
& x_{i,k} \in \{0,1\} && \text{for all } k \in M_i;\ i \in O &&
\end{aligned}
$$

S_i	starting time of operation i
$x_{i,k}$	$= \begin{cases} 1, & \text{if operation } i \text{ is assigned to machine } k \\ 0, & \text{otherwise.} \end{cases}$
O	set of operations
C	set of conjunctions
$D(x)$	set of disjunctions
$p_{i,k}$	processing time of operation i on machine k
$J(i)$	job of operation i
n_j	number of operations of job j
$P(i)$	position of operation i in the sequence of job $J(i)$
M_i	set of valid machines for operation i