Bi-objective Resource Constrainted Assignment Problem

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Abstract

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1. Introduction

1.1. the Single Objective Resource Constrainted Assignment Problem (RCAP)

The Resource Constrainted Assignment Problem (RCAP) with a single objective to optimize can be expressed as follow:

$$
\left[\begin{array}{lll}
\min z(x) = & \displaystyle\sum_{i=1}^{n}\sum_{j=1}^{n} c_{ij}x_{ij} & (0) \\
s/c & \displaystyle\sum_{i=1}^{n} x_{ij} = 1 \qquad j = 1,\ldots,n & (1) \\
& \displaystyle\sum_{j=1}^{n} x_{ij} = 1 \qquad i = 1,\ldots,n & (2) \\
& \displaystyle\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}x_{ij} \leq \omega & (3) \\
& x_{ij} \in \{0,1\} & (4)
\end{array}\right] \qquad (RCAP)
$$

where:

n, the number of tasks/machines

i, index of a task

j, index of a machine

c_{ij}, the operating cost of the machine j for the task i

w_{ij}, the operating time of the machine j for the task i

ω, the duedate of the project

$x_{ij} = 1$ if the task i is assigned to the machine j, 0 otherwise

and

(0): the objective function

(1): each machine perform only one task

(2): each task is performed by only one machine

(3): the total operating time produced by the n assignments tasks/machines must fits with the duedate

(4): integrity of variables

1.2. Overview of the literature

Aggarwal [1]
Lieshout and Volgenant [2]

References

[1] V. Aggarwal, A lagrangean-relaxation method for the constrained assignment problem, Computers & Operational Research 12 (1985) 97–106.

[2] P. Lieshout, A. Volgenant, A branch-and-bound algorithm for the singly constrained assignment problem, European Journal of Operational Research 176 (2007) 151–164.