Automated Exam Timetable Scheduler

CS 609 Assignment 1

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Parameter	Meaning
$\mathcal{P} = \{p\}$	denote the number of slots
$\mathcal{D} = \{d\}$	denote the number of days
$\mathcal{S} = \{s\}$	denote the set of students
$\mathcal{C} = \{c\}$	denote the set of courses
$\mathcal{V} = \{v\}$	denote the set of venues
$\mathcal{A} = \{c\}$	denote the set of campuses
$SC(s, c) = 1$	if student $s \in \mathcal{S}$ is enrolled in course $c \in \mathcal{C}$; 0 otherwise
$CC(c, ca) = 1$	if course $c \in \mathcal{C}$ exam to be scheduled in campus $ca \in \mathcal{A}$; 0 otherwise
$VC(v, ca) = 1$	if venues $v \in \mathcal{V}$ is in campus $ca \in \mathcal{A}$; 0 otherwise
$s1(v)$	gives number of 1 seaters for venue $v \in \mathcal{V}$
$s2(v)$	gives number of 2 seaters for venue $v \in \mathcal{V}$
$s3(v)$	gives number of 3 seaters for venue $v \in \mathcal{V}$
$str(c)$	gives strength for course $c \in \mathcal{C}$

Variable	Meaning
$x\{d, p, v, c\} = 1$ if course $c \in \mathcal{C}$ x is a binary variable	is assigned venue $v \in \mathcal{V}$ and slot $p \in \mathcal{P}$, d is day in week ; 0 otherwise.

I. Constraints

Each student has atmost one exam per slot.

$$\forall p \in \mathcal{P} \quad \forall d \in \mathcal{D} : \sum_{s \in \mathcal{S}} \left(\sum_{c \in \mathcal{C}} SC(s, c) \cdot \sum_{v \in \mathcal{V}} x(d, p, v, c) \right) \leq 1 \tag{1}$$

Each course exam is scheduled in specified campus.

$$\forall c \in \mathcal{C}, \forall v \in \mathcal{V}, \forall ca \in \mathcal{A} : if \quad CC(c, ca) \neq VC(v, ca), \quad then \sum_{\forall d \in \mathcal{D}, \forall p \in \mathcal{P}} x(d, p, v, c) = 0 \tag{2}$$

Each course exam is scheduled exactly once in timetable.

$$\forall c \in \mathcal{C} : \sum_{\forall d \in \mathcal{D}, \forall p \in \mathcal{P}, \forall v \in \mathcal{V}} x(d, p, v, c) = 1 \tag{3}$$

The number of students giving a exam assigned to a venue should not exceed its capacity

$$\forall d \in \mathcal{D}, \forall p \in \mathcal{P}, \forall v \in \mathcal{V} : \quad s1(v) + s2(v) + 2 * s3(v) \geq \sum_{\forall c \in \mathcal{C}} x(d, p, v, c) * str(c) \tag{4}$$

$$\forall d \in \mathcal{D}, \forall p \in \mathcal{P}, \forall v \in \mathcal{V}, \forall c \in \mathcal{C} : if \quad x(d, p, v, c) = 1, \quad then \quad \lfloor s1(v)/2 \rfloor + s2(v) + s3(v) \geq str(c) \tag{5}$$

II. Objective

Minimize unique venues used.

$$\text{Let } \forall v \in \mathcal{V} : z(v) = \begin{cases} 1 & \text{if} \quad \sum_{\forall d \in \mathcal{D}, \forall p \in \mathcal{P}, \forall c \in \mathcal{C}} x(d, p, v, c) = 0, \\ 0 & \text{otherwise} \end{cases}$$

$$\max \sum_{v \in \mathcal{V}} z(v) \tag{6}$$