AUTOMATED REASONING

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SUDOKU

WELL-KNOWN.
SEE THE MINIZINC MODELING
Observe the definition of predicates in Minizinc

KNAPSACK

WELL-KNOWN.
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HAMMING CODES

Given $n, k, d \in \mathbb{N}$, is there a Code made of k different n-tuples (of bits) such that each pair of them has a distance of at least d?

For instance $n = 5, k = 4, d = 3$:

0	0	0	0	0
0	0	1	1	1
1	1	0	1	0
1	1	1	0	1

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Observe the importance of symmetry breaking.

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For instance $n = 5, k = 4, d = 3$:

$$\begin{array}{ccccc} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 & 1 \end{array}$$

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Observe the importance of symmetry breaking.

TIMETABLE

There are q courses, and each course $i \in \{1, \ldots, q\}$ consists of

- k_i lectures, and p periods $1, \ldots, p$.
- For all $i \in \{1, \ldots, q\}$ all lectures $\ell \in \{1, \ldots, k_i\}$ must be assigned to a period $j \in \{1, \ldots, p\}$ in such a way that the following constraints are satisfied:
  1. Conflicts: There is a conflict matrix M such that $M[i, j] = 1$ if courses i and j have common students. Lectures of courses i and j must be all scheduled at different times
  2. Availabilities: There is an availability binary matrix A such that $A[i, j] = 1$ then lectures of course i cannot be scheduled at period j.
  3. Rooms: There are r rooms available. At most r lectures can be scheduled at period k, for each $k \in \{1, \ldots, p\}$.

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Traveling Salesman Problem

Input: a complete directed graph with a weight on each edge.
Problem: find the Hamiltonian circuit of minimum cost.
It is crucial to use the global constraint `circuit` that constraints the elements of x to define a circuit where $x[i] = j$ mean that j is the successor of i.
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