5.213 k_used_by_modulo

DESCRIPTION LINKS GRAPH

Origin

Derived from used_by_modulo and from k_used_by.

Constraint

k_used_by_modulo(SETS, M)

Type

VARIABLES : collection(var−dvar)

Arguments

SETS : collection(set − VARIABLES)
M : int

Restrictions

required(VARIABLES, var)
|VARIABLES| ≥ 1
required(SETS, set)
|SETS| > 1
non_increasing_size(SETS, set)
M > 0

Purpose

Given |SETS| sets of domain variables, the k_used_by_modulo constraint forces a used_by_modulo constraint between each pair of consecutive sets.

Example

$(\langle \texttt{set} - \langle 1,9,4,5,2,1\rangle, \texttt{set} - \langle 7,1,2,5\rangle, \texttt{set} - \langle 1,1\rangle\rangle, 3)$

The k_used_by_modulo constraint holds since:

- The first collection of variables is assigned 1 value in $\{0,3,\ldots,3\cdot k\}$, 3 values in $\{1,4,\ldots,1+3\cdot k\}$ and 2 values in $\{2,5,\ldots,2+3\cdot k\}$, while the second collection of variables is assigned no more values in the previous three sets of values.
- The second collection of variables is assigned 2 values in $\{0,3,\ldots,3\cdot k\}$ and 2 values in $\{2,5,\ldots,2+3\cdot k\}$, while the third collection of variables is assigned no more values in the previous three sets of values.

Typical

|VARIABLES| > 1
M > 1

Symmetries

- Items of SETS are permutable.
- Items of SETS.set are permutable.
- An occurrence of a value u of SETS.set.var can be replaced by any other value v such that v is congruent to u modulo M.

Arg. properties

Contractible wrt. SETS.

See also

common keyword: `k_used_by` (*system of constraints*).

implied by: `k_same_modulo`.

part of system of constraints: `used_by_modulo`.

used in graph description: `used_by_modulo`.

Keywords

characteristic of a constraint: modulo, sort based reformulation.

constraint type: system of constraints, decomposition.

modelling: inclusion.

Arc input(s)	SETS
Arc generator	$PATH \mapsto$ collection(set1, set2)
Arc arity	2
Arc constraint(s)	used_by_modulo(set1.set, set2.set, M)
Graph property(ies)	**NARC**$=$ |SETS| $-$ 1

Graph model Parts (A) and (B) of Figure 5.467 respectively show the initial and final graph associated with the **Example** slot. To each vertex corresponds a collection of variables, while to each arc corresponds a used_by_modulo constraint.

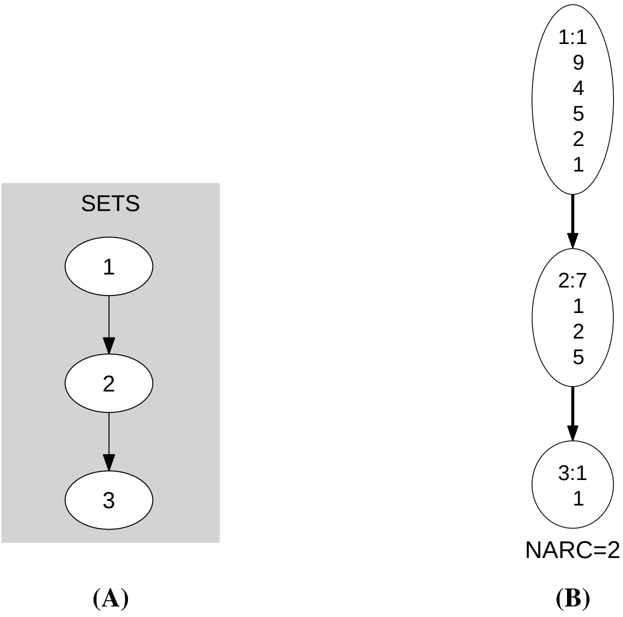

Figure 5.467: Initial and final graph of the k_used_by_modulo constraint