5.178 k_same

DESCRIPTION LINKS GRAPH

Origin [133]

Constraint k_same(SETS)

Type VARIABLES : collection(var−dvar)

Argument SETS : collection(set − VARIABLES)

Restrictions
required(VARIABLES, var)
|VARIABLES| > 0
required(SETS, set)
|SETS| > 1
same_size(SETS, set)

Purpose Given |SETS| sets, each containing the same number of domain variables, the k_same constraint enforces that the multisets of values assigned to each set are all identical.

Example

$$\left(\begin{array}{c} \mathtt{set}-\left\langle \begin{array}{c} \mathtt{var}-1,\\ \mathtt{var}-9,\\ \mathtt{var}-1,\\ \mathtt{var}-5,\\ \mathtt{var}-2, \end{array} \right\rangle,\\ \left\langle \mathtt{set}-\left\langle \begin{array}{c} \mathtt{var}-1\\ \mathtt{var}-9,\\ \mathtt{var}-1,\\ \mathtt{var}-1,\\ \mathtt{var}-1,\\ \mathtt{var}-2, \end{array} \right\rangle, \right\rangle\\ \mathtt{set}-\left\langle \begin{array}{c} \mathtt{var}-5\\ \mathtt{var}-5,\\ \mathtt{var}-2,\\ \mathtt{var}-1,\\ \mathtt{var}-1,\\ \mathtt{var}-9,\\ \mathtt{var}-1 \end{array} \right\rangle \end{array}\right)$$

The k_same constraint holds since:

- The first and second collections of variables are assigned to the same multiset.
- The second and third collections of variables are also assigned to the same multiset.

Typical |VARIABLES| > 1

Symmetries

- Items of SETS are permutable.
- Items of SETS.set are permutable.
- All occurrences of two distinct values of SETS.set.var can be swapped; all occurrences of a value of SETS.set.var can be renamed to any unused value.

Remark

It was shown in [133] that, finding out whether the k_same constraint has a solution or not is NP-hard when we have more than one same constraint. This was achieved by reduction from 3-dimensional-matching in the context where we have 2 same constraints.

See also

common keyword: k_same_interval, k_same_modulo, k_same_partition *(system of constraints)*.

implies: k_used_by.

part of system of constraints: same.

used in graph description: same.

Keywords

combinatorial object: permutation, multiset.

complexity: 3-dimensional-matching.

constraint type: system of constraints, decomposition.

modelling: equality between multisets.

Arc input(s)	SETS
Arc generator	$PATH \mapsto$ collection(set1, set2)
Arc arity	2
Arc constraint(s)	same(set1.set, set2.set)
Graph property(ies)	NARC$= \lvert$SETS$\rvert - 1$

Graph model Parts (A) and (B) of Figure 5.360 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 same constraint.

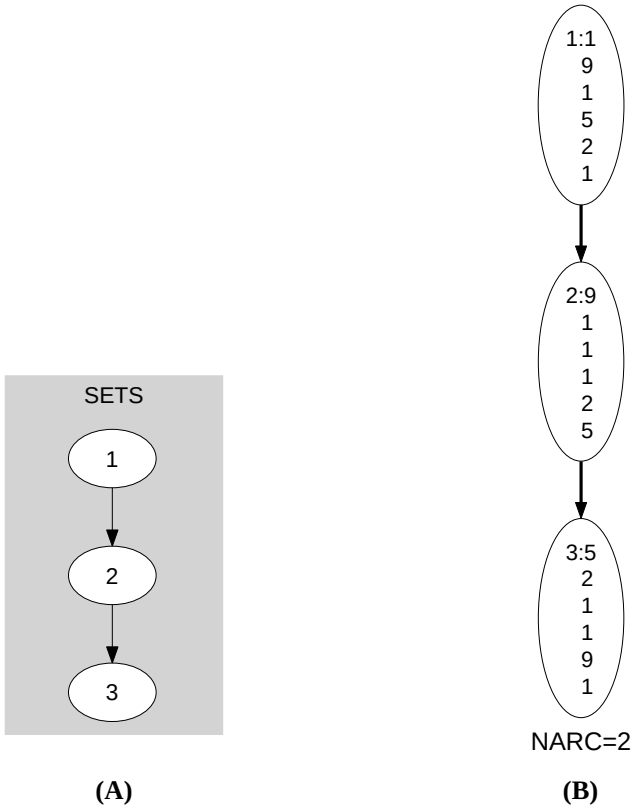

Figure 5.360: Initial and final graph of the k_same constraint