5.291 nvectors

DESCRIPTION LINKS GRAPH

Origin

Inspired by nvector and count.

Constraint

nvectors(VECTORS, RELOP, LIMIT)

Synonym

npoints.

Type

VECTOR : collection(var−dvar)

Arguments

VECTORS : collection(vec − VECTOR)
RELOP : atom
LIMIT : dvar

Restrictions

$|\mathtt{VECTOR}| \geq 1$
required(VECTORS, vec)
same_size(VECTORS, vec)
$\mathtt{RELOP} \in [=, \neq, <, \geq, >, \leq]$

Purpose

Let N be the number of distinct tuples of values taken by the vectors of the VECTORS collection. Enforce condition N RELOP LIMIT to hold.

Example

$$\left(\left\langle\begin{array}{l}\mathtt{vec}-\langle 5,6\rangle,\\ \mathtt{vec}-\langle 5,6\rangle,\\ \mathtt{vec}-\langle 9,3\rangle,\\ \mathtt{vec}-\langle 5,6\rangle,\\ \mathtt{vec}-\langle 9,3\rangle\end{array}\right\rangle, =, 2\right)$$

The nvectors constraint holds since the number of distinct tuples of values (i.e., tuples $\langle 5,6\rangle$ and $\langle 9,3\rangle$) occurring within the collection VECTORS is equal (i.e., RELOP is set to $=$) to its third argument $\mathtt{LIMIT} = 2$.

Typical

$|\mathtt{VECTOR}| > 1$
$|\mathtt{VECTORS}| > 1$
$\mathtt{RELOP} \in [=, <, \geq, >, \leq]$
$\mathtt{LIMIT} > 1$
$\mathtt{LIMIT} < |\mathtt{VECTORS}|$

Symmetries

- Items of VECTORS are permutable.
- Items of VECTORS.vec are permutable (*same permutation used*).
- All occurrences of two distinct values of VECTORS.vec can be swapped; all occurrences of a value of VECTORS.vec can be renamed to any unused value.

Arg. properties

- Contractible wrt. VECTORS when RELOP $\in [<, \leq]$.
- Extensible wrt. VECTORS when RELOP $\in [\geq, >]$.

Reformulation

The nvectors(VECTORS, RELOP , LIMIT) constraint can be expressed in term of the conjunction nvector(NV, VECTORS) $\wedge$ NV RELOP LIMIT.

See also

specialisation: nvector *(replace a comparison with the number of distinct vectors by an equality with the number of distinct vectors).*

Keywords

characteristic of a constraint: vector.

constraint type: counting constraint, value partitioning constraint.

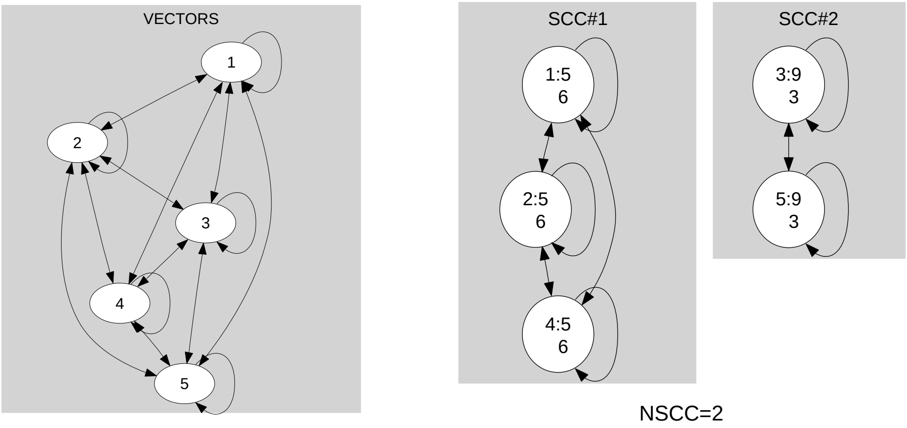
final graph structure: strongly connected component, equivalence.

modelling: number of distinct equivalence classes.

problems: domination.

Arc input(s)	`VECTORS`
Arc generator	*CLIQUE*↦`collection(vectors1, vectors2)`
Arc arity	2
Arc constraint(s)	`lex_equal(vectors1.vec, vectors2.vec)`
Graph property(ies)	**NSCC** `RELOP LIMIT`
Graph class	`EQUIVALENCE`

Graph model Parts (A) and (B) of Figure 5.606 respectively show the initial and final graph associated with the **Example** slot. Since we use the **NSCC** graph property we show the different strongly connected components of the final graph. Each strongly connected component corresponds to a tuple of values that is assigned to some vectors of the `VECTORS` collection. The 2 following tuple of values $\langle 5, 6\rangle$ and $\langle 9, 3\rangle$ are used by the vectors of the `VECTORS` collection.



(A) **(B)**

Figure 5.606: Initial and final graph of the `nvectors` constraint