5.368 soft_used_by_partition_var

DESCRIPTION LINKS GRAPH

Origin Derived from used_by_partition.

Constraint soft_used_by_partition_var(C, VARIABLES1, VARIABLES2, PARTITIONS)

Synonym soft_used_by_partition.

Type
```
VALUES : collection(val−int)
```

Arguments
```
C          : dvar
VARIABLES1 : collection(var−dvar)
VARIABLES2 : collection(var−dvar)
PARTITIONS : collection(p − VALUES)
```

Restrictions
```
C ≥ 0
C ≤ |VARIABLES2|
|VARIABLES1| ≥ |VARIABLES2|
required(VARIABLES1, var)
required(VARIABLES2, var)
required(PARTITIONS, p)
|PARTITIONS| ≥ 2
|VALUES| ≥ 1
required(VALUES, val)
distinct(VALUES, val)
```

Purpose For each integer i in $[1, |\texttt{PARTITIONS}|]$, let $N1_i$ (respectively $N2_i$) denote the number of variables of VARIABLES1 (respectively VARIABLES2) that take their value in the i^{th} partition of the collection PARTITIONS. C is the minimum number of values to change in the VARIABLES1 and VARIABLES2 collections so that for all i in $[1, |\texttt{PARTITIONS}|]$ we have $N2_i > 0 \Rightarrow N1_i \geq N2_i$.

Example
$$\left(\begin{array}{l} 2, \langle 9,1,1,8,8\rangle, \\ \langle 9,9,9,1\rangle, \\ \langle \mathtt{p}-\langle 1,2\rangle, \mathtt{p}-\langle 9\rangle, \mathtt{p}-\langle 7,8\rangle\rangle \end{array}\right)$$

In the example, the values of the collections $\langle 9,1,1,8,8\rangle$ and $\langle 9,9,9,1\rangle$ are respectively associated with the partitions $\mathtt{p}-\langle 9\rangle$, $\mathtt{p}-\langle 1,2\rangle$, $\mathtt{p}-\langle 1,2\rangle$, $\mathtt{p}-\langle 7,8\rangle$, $\mathtt{p}-\langle 7,8\rangle$ and $\mathtt{p}-\langle 9\rangle$, $\mathtt{p}-\langle 9\rangle$, $\mathtt{p}-\langle 9\rangle$, $\mathtt{p}-\langle 1,2\rangle$. Since there is a correspondence between two pairs of partitions we must unset at least $4-2$ items (4 is the number of items of the VARIABLES2 collection). Consequently, the soft_used_by_partition_var constraint holds since its first argument C is set to $4-2$.

Typical

$\texttt{C} > 0$
$|\texttt{VARIABLES1}| > 1$
$|\texttt{VARIABLES2}| > 1$
$\texttt{range}(\texttt{VARIABLES1.var}) > 1$
$\texttt{range}(\texttt{VARIABLES2.var}) > 1$
$|\texttt{VARIABLES1}| > |\texttt{PARTITIONS}|$
$|\texttt{VARIABLES2}| > |\texttt{PARTITIONS}|$

Symmetries

- Items of `VARIABLES1` are permutable.
- Items of `VARIABLES2` are permutable.
- Items of `PARTITIONS` are permutable.
- Items of `PARTITIONS.p` are permutable.
- An occurrence of a value of `VARIABLES1.var` can be replaced by any other value that also belongs to the same partition of `PARTITIONS`.
- An occurrence of a value of `VARIABLES2.var` can be replaced by any other value that also belongs to the same partition of `PARTITIONS`.

Usage

A soft `used_by_partition` constraint.

See also

hard version: `used_by_partition`.

implied by: `soft_same_partition_var`.

Keywords

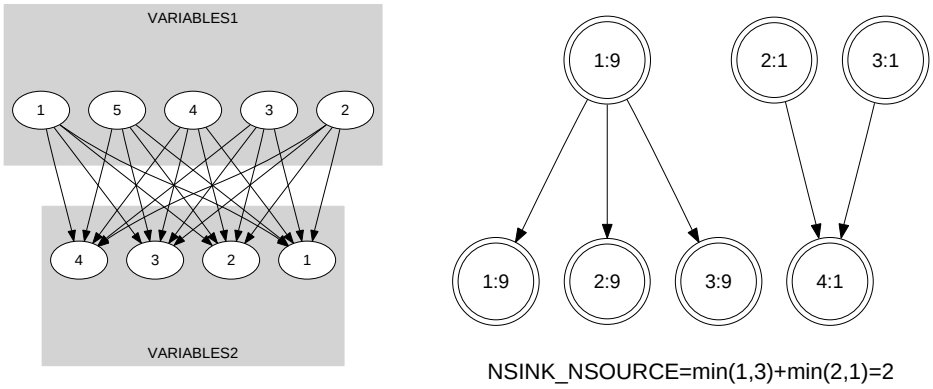
characteristic of a constraint: partition.

constraint arguments: constraint between two collections of variables.

constraint type: soft constraint, relaxation, variable-based violation measure.

Arc input(s)	VARIABLES1 VARIABLES2
Arc generator	$PRODUCT \mapsto$ collection(variables1, variables2)
Arc arity	2
Arc constraint(s)	in_same_partition(variables1.var, variables2.var, PARTITIONS)
Graph property(ies)	**NSINK_NSOURCE**$= \lvert$VARIABLES2$\rvert - $ C

Graph model Parts (A) and (B) of Figure 5.711 respectively show the initial and final graph associated with the **Example** slot. Since we use the **NSINK_NSOURCE** graph property, the source and sink vertices of the final graph are stressed with a double circle. The soft_used_by_partition_var constraint holds since the cost 2 corresponds to the difference between the number of variables of VARIABLES2 and the sum over the different connected components of the minimum number of sources and sinks.



(A) **(B)**

Figure 5.711: Initial and final graph of the soft_used_by_partition_var constraint