5.290 nvalues_except_0

DESCRIPTION LINKS GRAPH

Origin

Derived from `nvalues`.

Constraint

`nvalues_except_0(VARIABLES, RELOP, LIMIT)`

Arguments

`VARIABLES`	:	`collection(var−dvar)`
`RELOP`	:	`atom`
`LIMIT`	:	`dvar`

Restrictions

`required(VARIABLES, var)`
`RELOP` $\in [=, \neq, <, \geq, >, \leq]$

Purpose

Let N be the number of distinct values, different from 0, assigned to the variables of the `VARIABLES` collection. Enforce condition N `RELOP LIMIT` to hold.

Example

$(\langle 4, 5, 5, 4, 0, 1\rangle, =, 3)$

The `nvalues_except_0` constraint holds since the number of distinct values, different from 0, occurring within the collection $\langle 4, 5, 5, 4, 0, 1\rangle$ is equal (i.e., `RELOP` is set to $=$) to its third argument `LIMIT` $= 3$.

Typical

$|$`VARIABLES`$| > 1$
`LIMIT` > 1
`LIMIT` $<$ $|$`VARIABLES`$|$
`atleast(1, VARIABLES, 0)`
`RELOP` $\in [=, <, \geq, >, \leq]$

Symmetries

- Items of `VARIABLES` are permutable.
- All occurrences of two distinct values of `VARIABLES.var` that are both different from 0 can be swapped; all occurrences of a value of `VARIABLES.var` that is different from 0 can be renamed to any unused value that is also different from 0.

Arg. properties

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

Reformulation

The `nvalues_except_0`$(\langle V_1, V_2, \ldots, V_{|\texttt{VARIABLES}|}\rangle$, `RELOP` , `LIMIT`) constraint can be expressed in term of the conjunction `nvalue`$(NV1, \langle 0, V_1, V_2, \ldots, V_{|\texttt{VARIABLES}|}\rangle) \wedge NV1 - 1$ `RELOP LIMIT`.

Used in

`cycle_or_accessibility`.

See also

common keyword: `assign_and_nvalues` *(number of distinct values)*,
`nvalue`, `nvalues` *(counting constraint,number of distinct values)*.

Keywords

characteristic of a constraint: joker value.

constraint type: counting constraint, value partitioning constraint.

final graph structure: strongly connected component.

modelling: number of distinct values.

Arc input(s)	`VARIABLES`
Arc generator	$CLIQUE \mapsto \mathtt{collection}(\mathtt{variables1}, \mathtt{variables2})$
Arc arity	2
Arc constraint(s)	• $\mathtt{variables1.var} \neq 0$ • $\mathtt{variables1.var} = \mathtt{variables2.var}$
Graph property(ies)	**NSCC** `RELOP` `LIMIT`

Graph model Parts (A) and (B) of Figure 5.622 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 value distinct from 0 that is assigned to some variables of the `VARIABLES` collection. Beside value 0, the 3 following values 1, 4 and 5 are assigned to the variables of the `VARIABLES` collection.

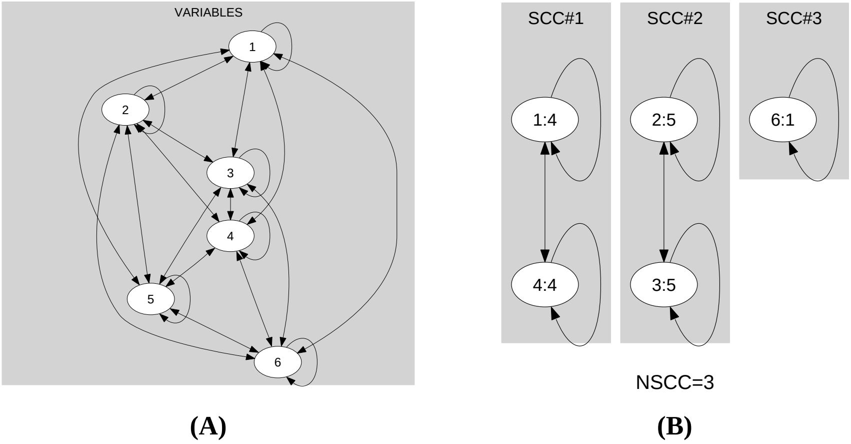

Figure 5.622: Initial and final graph of the `nvalues_except_0` constraint