5.29 among_var

DESCRIPTION LINKS GRAPH

Origin Generalisation of among

Constraint among_var(NVAR, VARIABLES, VALUES)

Arguments

NVAR	:	dvar
VARIABLES	:	collection(var−dvar)
VALUES	:	collection(val−dvar)

Restrictions

NVAR ≥ 0
NVAR $\leq$ |VARIABLES|
required(VARIABLES, var)
required(VALUES, val)

Purpose NVAR is the number of variables of the collection VARIABLES that are equal to one of the variables of the collection VALUES.

Example $(3, \langle 4, 5, 5, 4, 1\rangle, \langle 1, 5, 8, 1\rangle)$

The among_var constraint holds since exactly 3 values of the collection of variables $\langle 4, 5, 5, 4, 1\rangle$ occurs within the collection $\langle 1, 5, 8, 1\rangle$.

All solutions Figure 5.77 gives all solutions to the following non ground instance of the among_var constraint: NVAR $\in [\mathbf{3}, \mathbf{4}]$, $\mathtt{V}_1 \in [1, 2]$, $\mathtt{V}_2 \in [8, 9]$, $\mathtt{V}_3 \in [5, 6]$, $\mathtt{V}_4 \in [2, 3]$, among_var(NVAR, $\langle \mathtt{V}_1, \mathtt{V}_2, \mathtt{V}_3, \mathtt{V}_4\rangle$, $\langle \mathbf{0}, \mathbf{2}, \mathbf{4}, \mathbf{6}, \mathbf{8}\rangle$).

① $(\mathbf{3}, \langle 1, \mathbf{8}, \mathbf{6}, \mathbf{2}\rangle, \langle \mathbf{0}, \mathbf{2}, \mathbf{4}, \mathbf{6}, \mathbf{8}\rangle)$
② $(\mathbf{3}, \langle \mathbf{2}, \mathbf{8}, 5, \mathbf{2}\rangle, \langle \mathbf{0}, \mathbf{2}, \mathbf{4}, \mathbf{6}, \mathbf{8}\rangle)$
③ $(\mathbf{4}, \langle \mathbf{2}, \mathbf{8}, \mathbf{6}, \mathbf{2}\rangle, \langle \mathbf{0}, \mathbf{2}, \mathbf{4}, \mathbf{6}, \mathbf{8}\rangle)$
④ $(\mathbf{3}, \langle \mathbf{2}, \mathbf{8}, \mathbf{6}, 3\rangle, \langle \mathbf{0}, \mathbf{2}, \mathbf{4}, \mathbf{6}, \mathbf{8}\rangle)$
⑤ $(\mathbf{3}, \langle \mathbf{2}, 9, \mathbf{6}, \mathbf{2}\rangle, \langle \mathbf{0}, \mathbf{2}, \mathbf{4}, \mathbf{6}, \mathbf{8}\rangle)$

Figure 5.77: All solutions corresponding to the non ground example of the among_var constraint of the **All solutions** slot, where the number of variables assigned a value in $\{\mathbf{0}, \mathbf{2}, \mathbf{4}, \mathbf{6}, \mathbf{8}\}$ is equal to NVAR $\in [\mathbf{3}, \mathbf{4}]$

Typical

|VARIABLES| > 1
|VALUES| > 1
|VARIABLES| $>$ |VALUES|

Symmetries

- Items of VARIABLES are permutable.
- Items of VALUES are permutable.
- All occurrences of two distinct values in VARIABLES.var or VALUES.val can be swapped; all occurrences of a value in VARIABLES.var or VALUES.val can be renamed to any unused value.
- An occurrence of a value of VARIABLES.var that belongs to VALUES.val (resp. does not belong to VALUES.val) can be replaced by any other value in VALUES.val (resp. not in VALUES.val).

Arg. properties

- Functional dependency: NVAR determined by VARIABLES and VALUES.
- Contractible wrt. VARIABLES when NVAR $= 0$.
- Contractible wrt. VARIABLES when NVAR $=$ |VARIABLES|.
- Aggregate: NVAR$(+)$, VARIABLES(union), VALUES(union).

Systems among in **Choco**, count in **Gecode**, amongvar in **JaCoP**.

See also

implied by: among.

related: common.

specialisation: among *(*variable *replaced by* constant *within list of* values VALUES*)*.

uses in its reformulation: min_n.

Keywords

constraint arguments: pure functional dependency.

constraint type: counting constraint.

final graph structure: acyclic, bipartite, no loop.

modelling: functional dependency.

Arc input(s)	VARIABLES VALUES
Arc generator	$PRODUCT \mapsto$ collection(variables, values)
Arc arity	2
Arc constraint(s)	variables.var = values.val
Graph property(ies)	NSOURCE= NVAR
Graph class	• ACYCLIC • BIPARTITE • NO_LOOP

Graph model Parts (A) and (B) of Figure 5.78 respectively show the initial and final graph associated with the **Example** slot. Since we use the NSOURCE graph property, the source vertices of the final graph are stressed with a double circle. Since the final graph has only 3 sources the variables NVAR is fixed to 3.

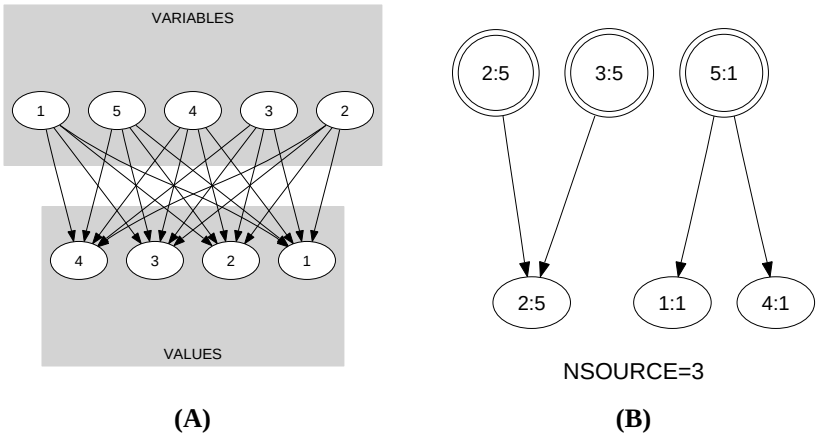

Figure 5.78: Initial and final graph of the among_var constraint