5.32 arith_or

DESCRIPTION LINKS GRAPH AUTOMATON

Origin Used in the definition of several automata

Constraint arith_or(VARIABLES1, VARIABLES2, RELOP, VALUE)

Arguments

VARIABLES1	:	collection(var−dvar)
VARIABLES2	:	collection(var−dvar)
RELOP	:	atom
VALUE	:	int

Restrictions

required(VARIABLES1, var)
required(VARIABLES2, var)
|VARIABLES1| = |VARIABLES2|
RELOP ∈ [=, ≠, <, ≥, >, ≤]

Purpose Enforce for all pairs of variables $\texttt{var1}_i, \texttt{var2}_i$ of the VARIABLES1 and VARIABLES2 collections to have $\texttt{var1}_i$ RELOP VALUE ∨ $\texttt{var2}_i$ RELOP VALUE.

Example $(\langle 0,1,0,0,1\rangle, \langle 0,0,0,1,0\rangle, =, 0)$

The constraint arith_or holds since, for all pairs of variables $\texttt{var1}_i, \texttt{var2}_i$ of the VARIABLES1 and VARIABLES2 collections, there is at least one variable that is equal to 0.

Typical

|VARIABLES1| > 0
RELOP ∈ [=]

Symmetries

- Arguments are permutable w.r.t. permutation (VARIABLES1, VARIABLES2) (RELOP) (VALUE).
- Items of VARIABLES1 and VARIABLES2 are permutable (*same permutation used*).

Arg. properties Contractible wrt. VARIABLES1 and VARIABLES2 (*remove items from same position*).

See also **specialisation:** arith(variable RELOP VALUE ∨ variable RELOP VALUE *replaced by* variable RELOP VALUE).

Keywords

characteristic of a constraint: automaton, automaton without counters, reified automaton constraint.

constraint network structure: Berge-acyclic constraint network.

constraint type: decomposition, value constraint.

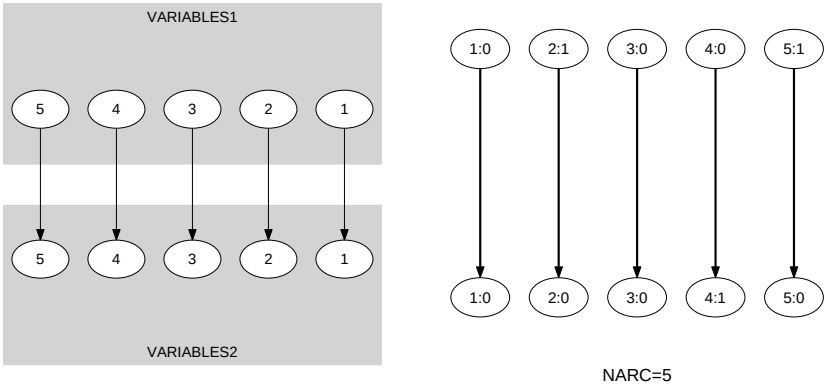
filtering: arc-consistency.

final graph structure: acyclic, bipartite, no loop.

modelling: disjunction.

Arc input(s)	VARIABLES1 VARIABLES2
Arc generator	$PRODUCT(=) \mapsto$ collection(variables1, variables2)
Arc arity	2
Arc constraint(s)	variables1.var RELOP VALUE $\vee$ variables2.var RELOP VALUE
Graph property(ies)	**NARC**= |VARIABLES1|
Graph class	• ACYCLIC • BIPARTITE • NO_LOOP

Graph model Parts (A) and (B) of Figure 5.75 respectively show the initial and final graphs associated with the **Example** slot. Since we use the **NARC** graph property, the arcs of the final graph are stressed in bold.



(A) **(B)**

Figure 5.75: Initial and final graph of the arith_or constraint

Automaton

Figure 5.76 depicts the automaton associated with the arith_or constraint. Let $\texttt{VAR1}_i$ and $\texttt{VAR2}_i$ be the i^{th} variables of the VARIABLES1 and VARIABLES2 collections. To each pair of variables $(\texttt{VAR1}_i, \texttt{VAR2}_i)$ corresponds a signature variable S_i. The following signature constraint links $\texttt{VAR1}_i$, $\texttt{VAR2}_i$ and S_i: $\texttt{VAR1}_i$ RELOP VALUE $\vee$ $\texttt{VAR2}_i$ RELOP VALUE $\Leftrightarrow$ S_i. The automaton enforces for each pair of variables $\texttt{VAR1}_i$,$\texttt{VAR2}_i$ the condition $\texttt{VAR1}_i$ RELOP VALUE $\vee$ $\texttt{VAR2}_i$ RELOP VALUE.

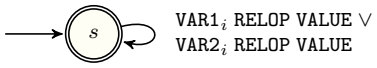


Figure 5.76: Automaton of the arith_or constraint

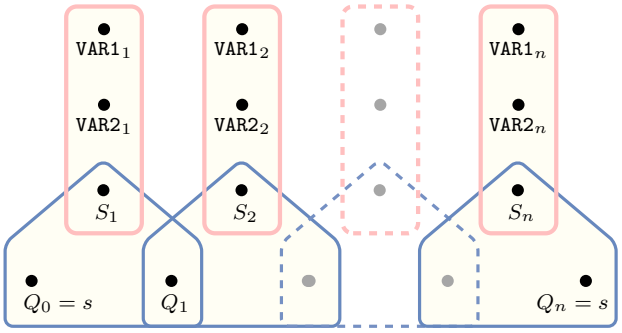


Figure 5.77: Hypergraph of the reformulation corresponding to the automaton of the arith_or constraint