

5.24 arith

	DESCRIPTION	LINKS	GRAPH	AUTOMATON
Origin	Used in the definition of several automata			
Constraint	<code>arith(VARIABLES, RELOP, VALUE)</code>			
Synonym	<code>rel.</code>			
Arguments	VARIABLES : <code>collection(var-dvar)</code> RELOP : <code>atom</code> VALUE : <code>int</code>			
Restrictions	<code>required(VARIABLES, var)</code> RELOP \in [<code>=</code> , <code>≠</code> , <code><</code> , <code>≥</code> , <code>></code> , <code>≤</code>]			
Purpose	Enforce for all variables <code>var</code> of the <code>VARIABLES</code> collection to have <code>var RELOP VALUE</code> .			
Example	$((\langle 4, 5, 7, 4, 5 \rangle, <, 9)$			
	The <code>arith</code> constraint holds since all values of the collection $\langle 4, 5, 7, 4, 5 \rangle$ are strictly less than 9.			
Typical	<code> VARIABLES > 1</code>			
Symmetries	<ul style="list-style-type: none"> • Items of <code>VARIABLES</code> are permutable. • An occurrence of a value of <code>VARIABLES.var</code> can be replaced by any value of <code>VARIABLES.var</code>. 			
Systems	<code>eq</code> in Choco , <code>neq</code> in Choco , <code>geq</code> in Choco , <code>gt</code> in Choco , <code>leq</code> in Choco , <code>lt</code> in Choco , <code>rel</code> in Gecode , <code>#<</code> in SICStus , <code>#=<</code> in SICStus , <code>#></code> in SICStus , <code>#>=</code> in SICStus , <code>#=</code> in SICStus , <code>#\=</code> in SICStus .			
Used in	<code>arith_sliding</code> .			
See also	common keyword: <code>among</code> , <code>count</code> (<i>value constraint</i>). generalisation: <code>arith_or</code> (variable <code>RELOP VALUE</code> replaced by variable <code>RELOP VALUE</code> \vee variable <code>RELOP VALUE</code>). system of constraints: <code>arith_sliding</code> .			
Keywords	characteristic of a constraint: <code>automaton</code> , <code>automaton without counters</code> , <code>reified automaton constraint</code> . constraint network structure: Berge-acyclic constraint network. constraint type: decomposition, value constraint. filtering: arc-consistency. modelling: domain definition.			

Arc input(s)	VARIABLES
Arc generator	$SELF \mapsto \text{collection}(\text{variables})$
Arc arity	1
Arc constraint(s)	variables.var RELOP VALUE
Graph property(ies)	$NARC = \text{VARIABLES} $

Graph model

Parts (A) and (B) of Figure 5.42 respectively show the initial and final graph associated with the **Example** slot. Since we use the **NARC** graph property, the loops of the final graph are stressed in bold.



Figure 5.42: Initial and final graph of the arith constraint

Automaton

Figure 5.43 depicts the automaton associated with the `arith` constraint. To each variable VAR_i of the collection `VARIABLES` corresponds a 0-1 signature variable S_i . The following signature constraint links VAR_i and S_i : $\text{VAR}_i \text{ RELOP VALUE} \Leftrightarrow S_i$. The automaton enforces for each variable VAR_i the condition $\text{VAR}_i \text{ RELOP VALUE}$.



Figure 5.43: Automaton of the `arith` constraint

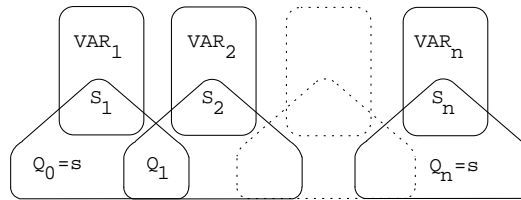


Figure 5.44: Hypergraph of the reformulation corresponding to the automaton of the `arith` constraint

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