

5.17 among_diff_0

	DESCRIPTION	LINKS	GRAPH	AUTOMATON
Origin	Used in the automaton of <code>nvalue</code> .			
Constraint	<code>among_diff_0(NVAR, VARIABLES)</code>			
Arguments	NVAR : <code>dvar</code> VARIABLES : <code>collection(var-dvar)</code>			
Restrictions	$NVAR \geq 0$ $NVAR \leq VARIABLES $ <code>required(VARIABLES, var)</code>			
Purpose	<div style="border: 1px solid pink; padding: 5px;"> NVAR is the number of variables of the collection VARIABLES that take a value different from 0. </div>			
Example	<div style="border: 1px solid blue; padding: 5px; display: inline-block;"> $(3, \langle 0, 5, 5, 0, 1 \rangle)$ </div> The <code>among_diff_0</code> constraint holds since exactly 3 values of the collection of values $\langle 0, 5, 5, 0, 1 \rangle$ are different from 0.			
Typical	$NVAR > 0$ $NVAR < VARIABLES $ $ VARIABLES > 1$ <code>atleast(1, VARIABLES, 0)</code>			
Symmetries	<ul style="list-style-type: none"> • Items of VARIABLES are <code>permutable</code>. • An occurrence of a value of VARIABLES.var that is different from 0 can be <code>replaced</code> by any other value that is also different from 0. 			
See also	common keyword: <code>nvalue</code> (<i>counting constraint</i>). generalisation: <code>among</code> (<i>variable $\neq 0$ replaced by variable \in values</i>).			
Keywords	characteristic of a constraint: joker value, automaton, automaton with counters. constraint network structure: alpha-acyclic constraint network(2). constraint type: value constraint, counting constraint. filtering: arc-consistency.			

Arc input(s)	VARIABLES
Arc generator	$SELF \mapsto \text{collection}(\text{variables})$
Arc arity	1
Arc constraint(s)	$\text{variables.var} \neq 0$
Graph property(ies)	$NARC = NVAR$

Graph model

Since this is a unary constraint we employ the *SELF* arc generator in order to produce an initial graph with a single loop on each vertex.

Parts (A) and (B) of Figure 5.27 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.

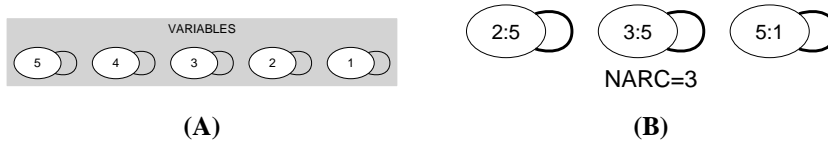


Figure 5.27: Initial and final graph of the *among_diff_0* constraint

Automaton

Figure 5.28 depicts the automaton associated with the `among_diff_0` 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 : $VAR_i \neq 0 \Leftrightarrow S_i$. The automaton counts the number of variables of the `VARIABLES` collection that take a value different from 0 and finally assigns this number to `NVAR`.

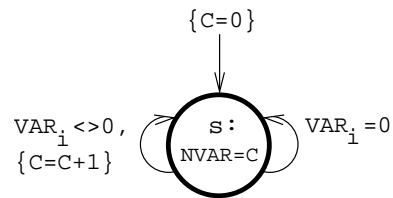


Figure 5.28: Automaton of the `among_diff_0` constraint

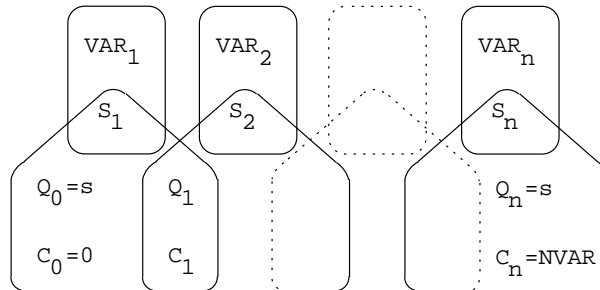


Figure 5.29: Hypergraph of the reformulation corresponding to the automaton of the `among_diff_0` constraint

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