

## 5.236 longest\_change

	DESCRIPTION	LINKS	GRAPH	AUTOMATON
Origin	Derived from <a href="#">change</a> .			
Constraint	<code>longest_change(SIZE, VARIABLES, CTR)</code>			
Arguments	SIZE : <a href="#">dvar</a> VARIABLES : <a href="#">collection</a> ( <a href="#">var</a> — <a href="#">dvar</a> ) CTR : <a href="#">atom</a>			
Restrictions	SIZE $\geq 0$ SIZE $\leq  \text{VARIABLES} $ <a href="#">required</a> (VARIABLES, <a href="#">var</a> ) CTR $\in [=, \neq, <, \geq, >, \leq]$			
Purpose	SIZE is the maximum number of consecutive variables of the collection VARIABLES for which constraint CTR holds in an uninterrupted way (0 if the constraint CTR does not hold at all). We count a change when $X \text{ CTR } Y$ holds; $X$ and $Y$ are two consecutive variables of the collection VARIABLES.			
Example	<div> <math>(4, \langle 8, 8, 3, 4, 1, 1, 5, 5, 2 \rangle, \neq)</math> </div> <p>The <code>longest_change</code> constraint holds since its first argument <code>SIZE = 4</code> is fixed to the length of the longest subsequence of consecutive values of the collection <math>\langle 8, 8, 3, 4, 1, 1, 5, 5, 2 \rangle</math> such that two consecutive values are distinct (i.e., subsequence 8 3 4 1).</p>			
Typical	$ \text{VARIABLES}  > 2$ <a href="#">range</a> (VARIABLES. <a href="#">var</a> ) $> 1$ CTR $\in [\neq]$			
Symmetry	One and the same constant can be <a href="#">added</a> to the <a href="#">var</a> attribute of all items of VARIABLES.			
Arg. properties	<a href="#">Functional dependency</a> : SIZE determined by VARIABLES and CTR.			
See also	<a href="#">root concept</a> : <a href="#">change</a> .			
Keywords	<a href="#">characteristic of a constraint</a> : <a href="#">automaton</a> , <a href="#">automaton with counters</a> . <a href="#">constraint arguments</a> : reverse of a constraint, <a href="#">pure functional dependency</a> . <a href="#">constraint network structure</a> : <a href="#">sliding cyclic(1) constraint network(3)</a> . <a href="#">constraint type</a> : <a href="#">timetabling constraint</a> . <a href="#">filtering</a> : <a href="#">glue matrix</a> . <a href="#">modelling</a> : <a href="#">functional dependency</a> .			

Arc input(s)	VARIABLES
Arc generator	$PATH \mapsto \text{collection}(\text{variables1}, \text{variables2})$
Arc arity	2
Arc constraint(s)	$\text{variables1.var CTR variables2.var}$
Graph property(ies)	$MAX\_NCC = SIZE$

**Graph model** In order to specify the `longest_change` constraint, we use `MAX_NCC`, which is the number of vertices of the largest connected component. Since the initial graph corresponds to a path, this will be the length of the longest path in the final graph.

Parts (A) and (B) of Figure 5.520 respectively show the initial and final graph associated with the **Example** slot. Since we use the `MAX_NCC` graph property we show the largest connected component of the final graph. It corresponds to the longest period of uninterrupted changes: sequence 8, 3, 4, 1 that involves 4 consecutive variables.

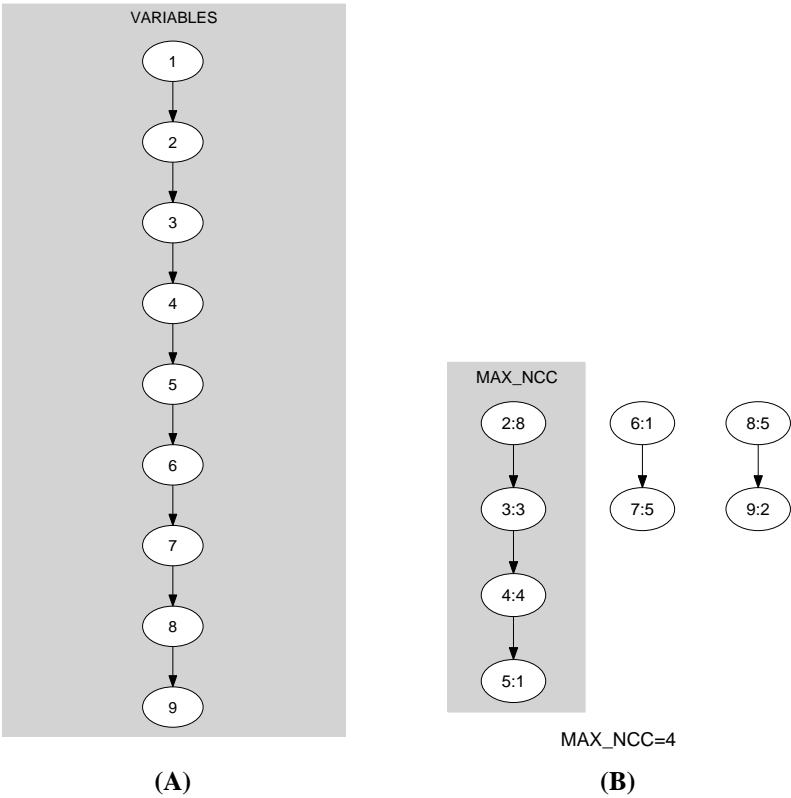


Figure 5.520: Initial and final graph of the `longest_change` constraint

**Automaton**

Figure 5.521 depicts the automaton associated with the `longest_change` constraint. To each pair of consecutive variables ( $\text{VAR}_i, \text{VAR}_{i+1}$ ) of the collection `VARIABLES` corresponds a 0-1 signature variable  $S_i$ . The following signature constraint links  $\text{VAR}_i, \text{VAR}_{i+1}$  and  $S_i$ :  $\text{VAR}_i \text{ CTR } \text{VAR}_{i+1} \Leftrightarrow S_i$ .

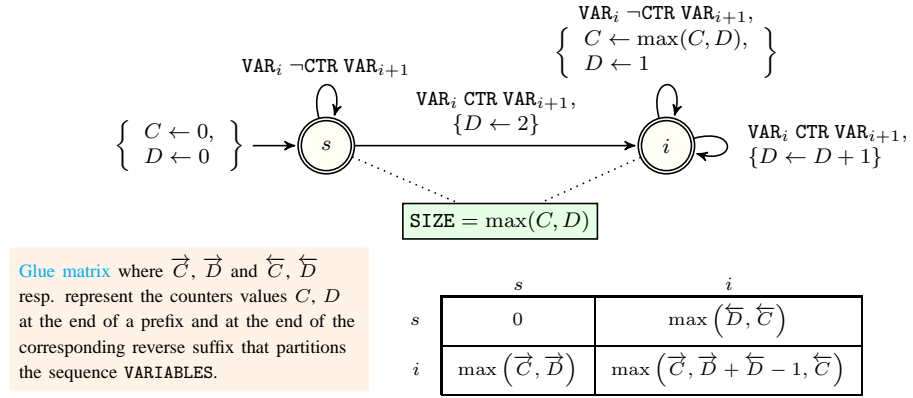


Figure 5.521: Automaton of the `longest_change` constraint and its glue matrix

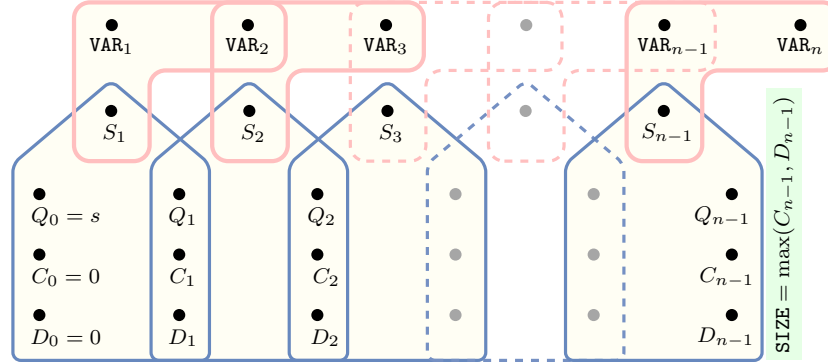


Figure 5.522: Hypergraph of the reformulation corresponding to the automaton of the `longest_change` constraint

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