

5.87 consecutive_groups_of_ones

	DESCRIPTION	LINKS	AUTOMATON
Origin	Derived from group		
Constraint	<code>consecutive_groups_of_ones(GROUP_SIZES, VARIABLES)</code>		
Arguments	GROUP_SIZES : <code>collection(nb-int)</code> VARIABLES : <code>collection(var-dvar)</code>		
Restrictions	<pre> required(GROUP_SIZES, nb) GROUP_SIZES ≥ 1 GROUP_SIZES.nb ≥ 1 GROUP_SIZES.nb ≤ VARIABLES required(VARIABLES, var) VARIABLES ≥ 2 * GROUP_SIZES - 1 VARIABLES ≥ sum(GROUP_SIZES.nb) + GROUP_SIZES - 1 VARIABLES.var ≥ 0 VARIABLES.var ≤ 1 </pre>		
Purpose	<p>In order to define the meaning of the <code>consecutive_groups_of_ones</code> constraint, we first introduce the notions of <i>stretch</i> and <i>span</i>. Let n be the number of variables of the collection <code>VARIABLES</code> and let m be the number of items of the collection <code>GROUP_SIZES</code>. Let X_i, \dots, X_j ($1 \leq i \leq j \leq n$) be consecutive variables of the collection of variables <code>VARIABLES</code> such that the following conditions apply:</p> <ul style="list-style-type: none"> • All variables X_i, \dots, X_j are assigned value 1, • $i = 1$ or $X_{i-1} \neq 1$, • $j = n$ or $X_{j+1} \neq 1$. <p>We call such a set of variables a <i>stretch</i>. The <i>span</i> of the stretch is equal to $j - i + 1$. We now define the condition enforced by the <code>consecutive_groups_of_ones</code> constraint.</p> <p>All variables of the <code>VARIABLES</code> collection should be assigned value 0 or 1. In addition there is $GROUP_SIZES$ successive stretches of respective span <code>GROUP_SIZES[1].nb</code>, <code>GROUP_SIZES[2].nb</code>, \dots, <code>GROUP_SIZES[m].nb</code>.</p>		
Example	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> $(\langle 2, 1 \rangle, \langle 1, 1, 0, 0, 0, 1, 0 \rangle)$ </div> <p>The <code>consecutive_groups_of_ones</code> constraint holds since the sequence 1 1 0 0 0 1 0 contains a first stretch (i.e., a maximum sequence of 1) of span 2 and a second stretch of span 1.</p>		
Typical	<pre> VARIABLES > 1 range(VARIABLES.var) > 1 </pre>		
Symmetry	Items of <code>GROUP_SIZES</code> and <code>VARIABLES</code> are simultaneously reversible .		

- Usage** The `consecutive_groups_of_ones` constraint can be used in order to model the `logigraphe` problem.
- See also** **root concept:** `group`.
- Keywords** **characteristic of a constraint:** `automaton`, `automaton without counters`, `reified automaton constraint`.
constraint network structure: `Berge-acyclic constraint network`.
filtering: `arc-consistency`.
modelling exercises: `logigraphe`.
puzzles: `logigraphe`.

Automaton

Figure 5.198 depicts the automaton associated with the `consecutive_groups_of_ones` constraint. To each variable VAR_i of the collection `VARIABLES` corresponds a signature variable that is equal to VAR_i . There is no signature constraint.

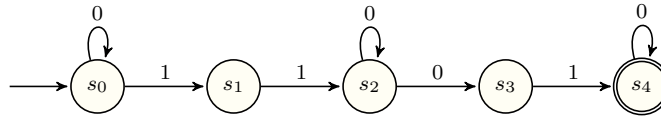


Figure 5.198: Non deterministic automaton of the `consecutive_groups_of_ones` constraint of the **Example** slot (a stretch of two 1 followed by a stretch of a single 1)

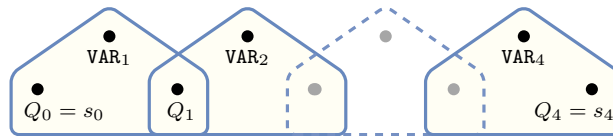


Figure 5.199: Hypergraph of the reformulation corresponding to the automaton of the `consecutive_groups_of_ones` constraint of the **Example** slot

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