

5.168    **global\_contiguity**

	DESCRIPTION	LINKS	GRAPH	AUTOMATON
Origin	[271]			
Constraint	global_contiguity(VARIABLES)			
Synonym	contiguity.			
Argument	VARIABLES    :    collection(var–dvar)			
Restrictions	<code>required(VARIABLES, var)</code> <code>VARIABLES.var ≥ 0</code> <code>VARIABLES.var ≤ 1</code>			
Purpose	Enforce all variables of the VARIABLES collection to be assigned value 0 or 1. In addition, all variables assigned to value 1 appear contiguously.			
Example	<div><code>((0, 1, 1, 0))</code></div> <p>The <code>global_contiguity</code> constraint holds since the sequence 0 1 1 0 contains no more than one group of contiguous 1.</p>			
All solutions	<p>Figure 5.377 gives all solutions to the following non ground instance of the <code>global_contiguity</code> constraint: <math>V_1 \in [0, 1]</math>, <math>V_2 \in [0, 1]</math>, <math>V_3 = 1</math>, <math>V_4 \in [0, 1]</math>, <code>global_contiguity</code>(<math>\langle V_1, V_2, V_3, V_4 \rangle</math>).</p> <div><div><div>① <code>((0, 0, 1, 0))</code></div><div>② <code>((0, 0, 1, 1))</code></div><div>③ <code>((0, 1, 1, 0))</code></div><div>④ <code>((0, 1, 1, 1))</code></div><div>⑤ <code>((1, 1, 1, 0))</code></div><div>⑥ <code>((1, 1, 1, 1))</code></div></div></div>			
Typical	<code> VARIABLES  &gt; 2</code> <code>range(VARIABLES.var) &gt; 1</code> <code>atleast(2, VARIABLES, 1)</code>			
Symmetry	Items of VARIABLES can be <code>reversed</code> .			

Figure 5.377: All solutions corresponding to the non ground example of the `global_contiguity` constraint of the **All solutions** slot

Arg. properties

Contractible wrt. VARIABLES.

Usage

The article [271] introducing this constraint refers to hardware configuration problems.

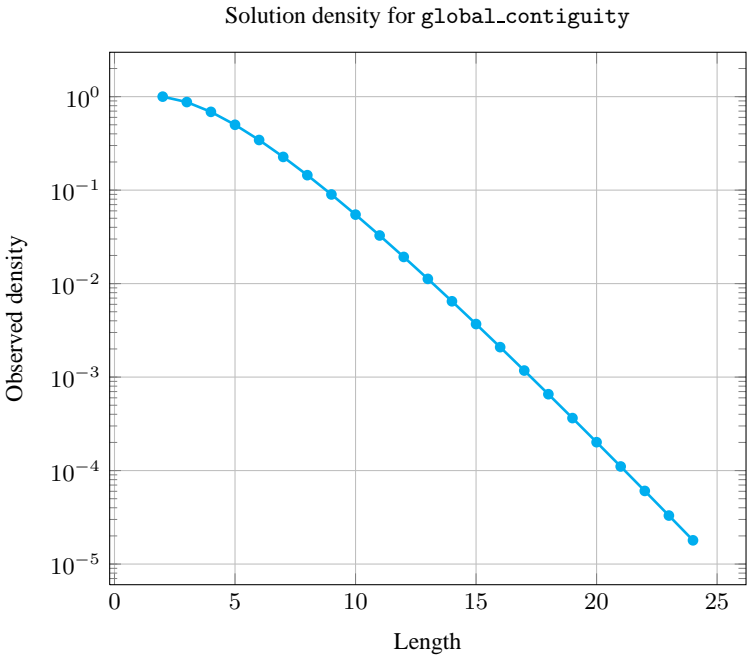
Algorithm

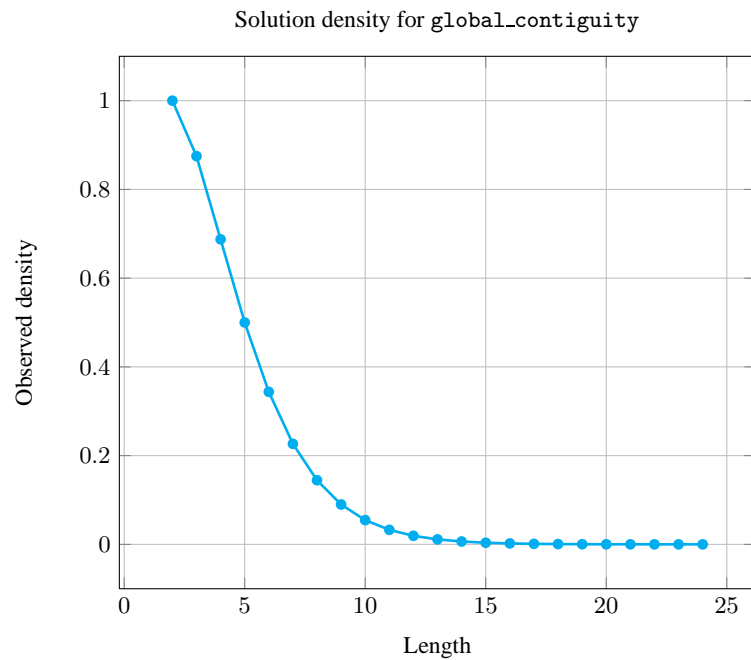
A filtering algorithm for this constraint is described in [271].

Counting

Length ( <i>n</i> )	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Solutions	4	7	11	16	22	29	37	46	56	67	79	92	106	121	137	154	172	191	211	232	254	277	301

Number of solutions for global\_contiguity: domains 0..1



**See also**

**common keyword:** `group`, `inflexion` (*sequence*).

**implies:** `consecutive_values`, `multi_global_contiguity`, `no_valley`.

**related:** `roots`.

**Keywords**

**characteristic of a constraint:** `convex`, `automaton`, `automaton without counters`, `automaton with same input symbol`, `reified automaton constraint`.

**combinatorial object:** `sequence`.

**constraint network structure:** `Berge-acyclic constraint network`.

**filtering:** `arc-consistency`.

**final graph structure:** `connected component`.

**Cond. implications**

`global_contiguity(VARIABLES)`  
 with  $|VARIABLES| > 2$   
**implies** `some_equal(VARIABLES)`.

Arc input(s)	VARIABLES
Arc generator	<i>PATH</i> $\mapsto$ collection(variables1, variables2) <i>LOOP</i> $\mapsto$ collection(variables1, variables2)
Arc arity	2
Arc constraint(s)	<ul style="list-style-type: none"><li>• variables1.var = variables2.var</li><li>• variables1.var = 1</li></ul>
Graph property(ies)	<i>NCC</i> $\leq$ 1

**Graph model** Each **connected component** of the final graph corresponds to one set of contiguous variables that all take value 1.

Parts (A) and (B) of Figure 5.378 respectively show the initial and final graph associated with the **Example** slot. The `global_contiguity` constraint holds since the final graph does not contain more than one **connected component**. This **connected component** corresponds to 2 contiguous variables that are both assigned to 1.

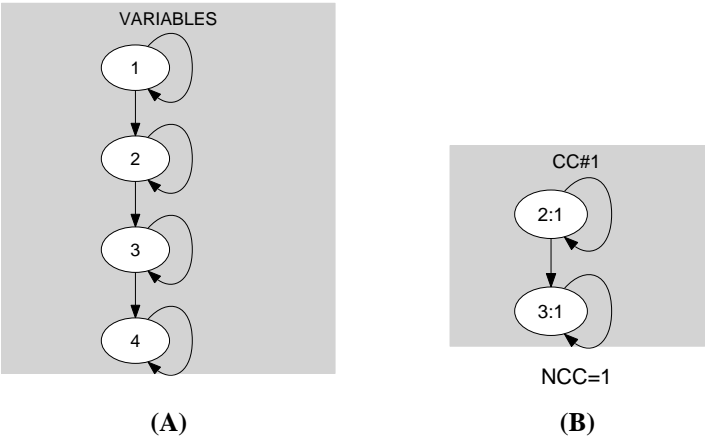


Figure 5.378: Initial and final graph of the `global_contiguity` constraint

**Automaton**

Figure 5.379 depicts the automaton associated with the `global_contiguity` constraint. To each variable  $\text{VAR}_i$  of the collection `VARIABLES` corresponds a signature variable that is equal to  $\text{VAR}_i$ . There is no signature constraint.

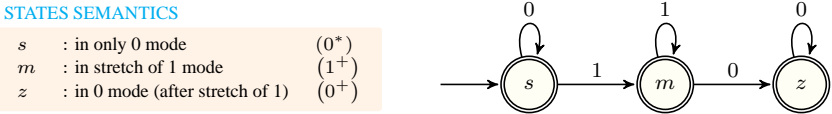


Figure 5.379: Automaton of the `global_contiguity` constraint

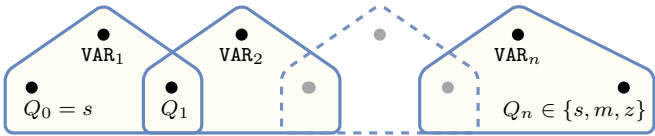


Figure 5.380: Hypergraph of the reformulation corresponding to the automaton of the `global_contiguity` constraint

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