5.168 global_contiguity

DESCRIPTION LINKS GRAPH AUTOMATON

Origin [271]

Constraint global_contiguity(VARIABLES)

Synonym contiguity.

Argument VARIABLES : collection(var−dvar)

Restrictions
required(VARIABLES, var)
VARIABLES.var ≥ 0
VARIABLES.var ≤ 1

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 (⟨0, 1, 1, 0⟩)

The global_contiguity constraint holds since the sequence 0 1 1 0 contains no more than one group of contiguous 1.

All solutions Figure 5.360 gives all solutions to the following non ground instance of the global_contiguity constraint: $V_1 \in [0,1]$, $V_2 \in [0,1]$, $V_3 = 1$, $V_4 \in [0,1]$, global_contiguity($\langle V_1, V_2, V_3, V_4 \rangle$).

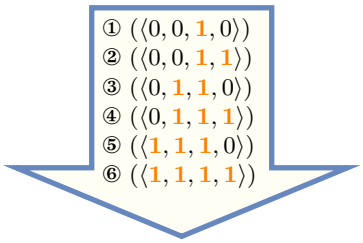


Figure 5.360: All solutions corresponding to the non ground example of the global_contiguity constraint of the **All solutions** slot

Typical
|VARIABLES| > 2
range(VARIABLES.var) > 1
atleast(2, VARIABLES, 1)

Symmetry Items of VARIABLES can be reversed.

Arg. properties

Contractible wrt. `VARIABLES`.

Usage

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

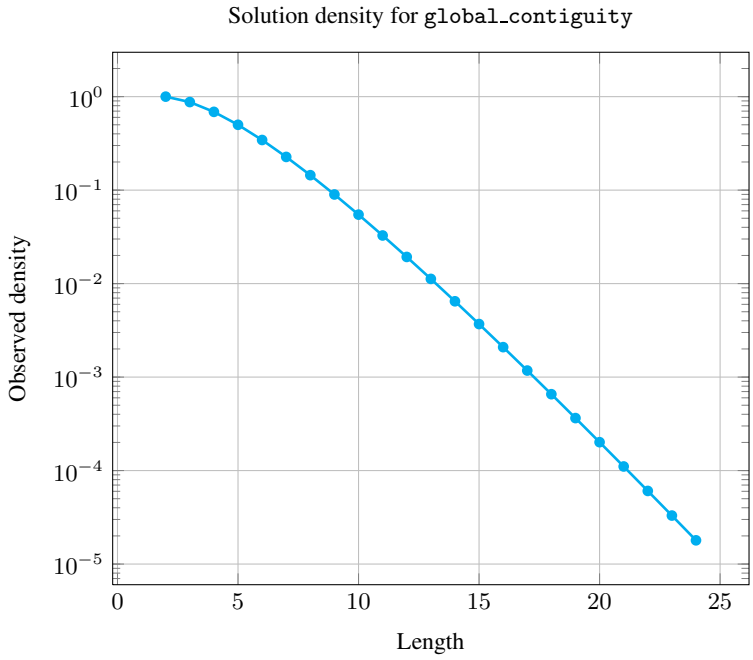
Algorithm

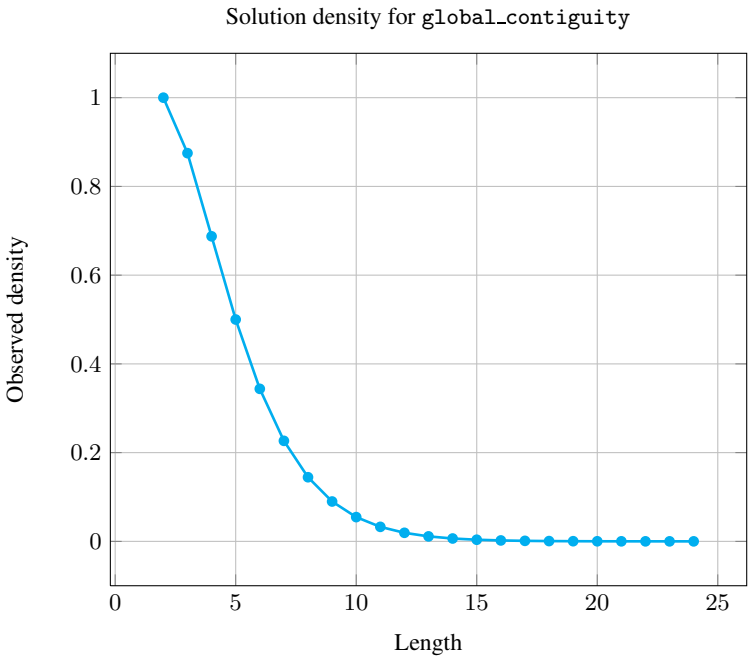
A filtering algorithm for this constraint is described in [271].

Counting

Length (n)	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 $|\text{VARIABLES}| > 2$
implies some_equal(VARIABLES).

Arc input(s)	VARIABLES
Arc generator	$PATH \mapsto$ collection(variables1, variables2) $LOOP \mapsto$ collection(variables1, variables2)
Arc arity	2
Arc constraint(s)	• variables1.var = variables2.var • variables1.var = 1
Graph property(ies)	**NCC** ≤ 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 5.361 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.

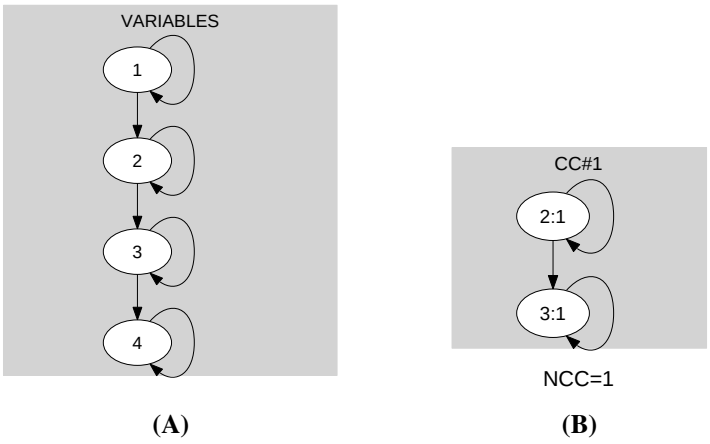


Figure 5.361: Initial and final graph of the global_contiguity constraint

Automaton

Figure 5.362 depicts the automaton associated with the global_contiguity constraint. To each variable $\texttt{VAR}_i$ of the collection VARIABLES corresponds a signature variable that is equal to $\texttt{VAR}_i$. There is no signature constraint.

STATES SEMANTICS

s	: in only 0 mode	(0^*)
m	: in stretch of 1 mode	(1^+)
z	: in 0 mode (after stretch of 1)	(0^+)

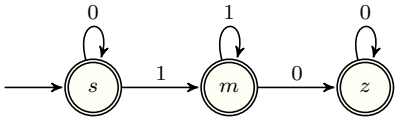


Figure 5.362: Automaton of the global_contiguity constraint

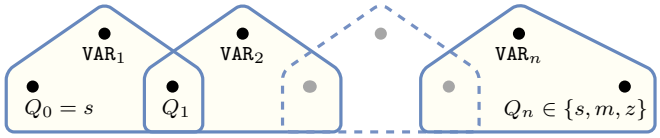


Figure 5.363: Hypergraph of the reformulation corresponding to the automaton of the global_contiguity constraint