

5.320 `period_except_0`

	DESCRIPTION	LINKS
Origin	Derived from <code>period</code> .	
Constraint	<code>period_except_0(PERIOD, VARIABLES, CTR)</code>	
Arguments	PERIOD : <code>dvar</code> VARIABLES : <code>collection(var-dvar)</code> CTR : <code>atom</code>	
Restrictions	$PERIOD \geq 1$ $PERIOD \leq VARIABLES $ <code>required(VARIABLES, var)</code> $CTR \in [=, \neq, <, \geq, >, \leq]$	
Purpose	<div style="border: 1px solid pink; padding: 5px;"> Let us note V_0, V_1, \dots, V_{m-1} the variables of the <code>VARIABLES</code> collection. <code>PERIOD</code> is the <i>period</i> of the sequence $V_0 V_1 \dots V_{m-1}$ according to constraint <code>CTR</code>. This means that <code>PERIOD</code> is the smallest natural number such that $V_i \text{ CTR } V_{i+PERIOD} \vee V_i = 0 \vee V_{i+PERIOD} = 0$ holds for all $i \in 0, 1, \dots, m - PERIOD - 1$. </div>	
Example	<div style="border: 1px solid blue; padding: 5px; display: inline-block;"> $(3, \langle 1, 1, 4, 1, 1, 0, 1, 1 \rangle, =)$ </div> <p>The <code>period_except_0</code> constraint holds since, as depicted by Figure 5.650, its first argument <code>PERIOD = 3</code> is equal (i.e., since <code>CTR</code> is set to <code>=</code>) to the period of the sequence 1 1 4 1 1 0 1 1; value 0 is assumed to be equal to any other value.</p> <div style="text-align: center;"> </div>	
Typical	$PERIOD > 1$ $PERIOD < VARIABLES $ $ VARIABLES > 2$ <code>range(VARIABLES.var) > 1</code> <code>atleast(1, VARIABLES, 0)</code> $CTR \in [=]$	
Symmetries	<ul style="list-style-type: none"> Items of <code>VARIABLES</code> can be <code>reversed</code>. Items of <code>VARIABLES</code> can be <code>shifted</code>. All occurrences of two distinct values of <code>VARIABLES.var</code> that are both different from 0 can be <code>swapped</code>; all occurrences of a value of <code>VARIABLES.var</code> that is different from 0 can be <code>renamed</code> to any unused value that is also different from 0. 	

Figure 5.650: A sequence that has a period of 3 when we assume that value 0 can match to any other value

Arg. properties

- **Functional dependency**: PERIOD determined by VARIABLES and CTR.
- **Contractible** wrt. VARIABLES when $CTR \in [=]$ and PERIOD = 1.
- **Prefix-contractible** wrt. VARIABLES.
- **Suffix-contractible** wrt. VARIABLES.

Usage

Useful for timetabling problems where a person should repeat some work pattern over an over except when he is unavailable for some reason. The value 0 represents the fact that he is unavailable, while the other values are used in the work pattern.

Algorithm

See [54].

See also

hard version: period.

implied by: period.

Keywords

characteristic of a constraint: joker value.

combinatorial object: periodic, sequence.

constraint arguments: pure functional dependency.

constraint type: predefined constraint, timetabling constraint, scheduling constraint.

modelling: functional dependency.