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## 5.321 period\_except\_0

## **DESCRIPTION**

**LINKS** 

Origin

Derived from period.

Constraint

period\_except\_0(PERIOD, VARIABLES, CTR)

Arguments

PERIOD : dvar

VARIABLES : collection(var-dvar)

CTR : atom

Restrictions

```
\begin{array}{l} \mathtt{PERIOD} \geq 1 \\ \mathtt{PERIOD} \leq |\mathtt{VARIABLES}| \\ \mathtt{required}(\mathtt{VARIABLES}, \mathtt{var}) \\ \mathtt{CTR} \in [=, \neq, <, \geq, >, \leq] \end{array}
```

Purpose

Let us note  $V_0,V_1,\ldots,V_{m-1}$  the variables of the VARIABLES collection. PERIOD is the period of the sequence  $V_0$   $V_1\ldots V_{m-1}$  according to constraint CTR . This means that PERIOD is the smallest natural number such that  $V_i$  CTR  $V_{i+\text{PERIOD}} \vee V_i = 0 \vee V_{i+\text{PERIOD}} = 0$  holds for all  $i \in {0,1,\ldots,m-\text{PERIOD}}-1$ .

**Example** 

```
(3, \langle 1, 1, 4, 1, 1, 0, 1, 1 \rangle, =)
```

The period\_except\_0 constraint holds since, as depicted by Figure 5.669, its first argument PERIOD = 3 is equal (i.e., since CTR is set to =) 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.

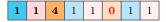


Figure 5.669: A sequence that has a period of 3 when we assume that value 0 can match to any other value

**Typical** 

```
\begin{aligned} & \texttt{PERIOD} > 1 \\ & \texttt{PERIOD} < |\texttt{VARIABLES}| \\ & |\texttt{VARIABLES}| > 2 \\ & \texttt{range}(\texttt{VARIABLES.var}) > 1 \\ & \texttt{atleast}(1, \texttt{VARIABLES}, 0) \\ & \texttt{CTR} \in [=] \end{aligned}
```

**Symmetries** 

- Items of VARIABLES can be reversed.
- Items of VARIABLES can be shifted.
- All occurrences of two distinct values of VARIABLES.var that are both different from 0 can be swapped; all occurrences of a value of VARIABLES.var that is different from 0 can be renamed to any unused value that is also different from 0.

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## Arg. properties

• Functional dependency: PERIOD determined by VARIABLES and CTR.

ullet 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.