5.377 stretch_path_partition

DESCRIPTION LINKS

Origin Derived from stretch_path.

Constraint stretch_path_partition(VARIABLES, PARTLIMITS)

Synonym stretch.

Type VALUES : collection(val−int)

Arguments

VARIABLES	:	collection(var−dvar)
PARTLIMITS	:	collection(p − VALUES, lmin−int, lmax−int)

Restrictions

|VALUES| ≥ 1
required(VALUES, val)
distinct(VALUES, val)
|VARIABLES| > 0
required(VARIABLES, var)
|PARTLIMITS| > 0
required(PARTLIMITS, [p, lmin, lmax])
PARTLIMITS.lmin ≥ 0
PARTLIMITS.lmin ≤ PARTLIMITS.lmax
PARTLIMITS.lmin ≤ |VARIABLES|

Purpose

In order to define the meaning of the `stretch_path_partition` constraint, we first introduce the notions of *stretch* and *span*. Let n be the number of variables of the collection `VARIABLES`. Let $X_i, \ldots, X_j$ $(1 \leq i \leq j \leq n)$ be consecutive variables of the collection of variables `VARIABLES` such that the following conditions apply:

- All variables $X_i, \ldots, X_j$ take their values in the same partition of the `PARTLIMITS` collection (i.e., $\exists l \in [1, |\texttt{PARTLIMITS}|]$ such that $\forall k \in [i, j] : X_k \in \texttt{PARTLIMITS}[l].p$),
- $i = 1$ or X_{i-1} is different from X_i,
- $j = n$ or X_{j+1} is different from X_j.

We call such a set of variables a *stretch*. The *span* of the stretch is equal to $j - i + 1$, while the *value* of the stretch is l. We now define the condition enforced by the `stretch_path_partition` constraint.

Each item $\texttt{PARTLIMITS}[l] = (\texttt{p} - values, \texttt{lmin} - s, \texttt{lmax} - t)$ of the `PARTLIMITS` collection enforces the minimum value s as well as the maximum value t for the span of a stretch of value l over consecutive variables of the `VARIABLES` collection.

Note that:

1. Having an item $\texttt{PARTLIMITS}[l] = (\texttt{p} - values, \texttt{lmin} - s, \texttt{lmax} - t)$ with s strictly greater than 0 does not mean that values of $values$ should be assigned to one of the variables of collection `VARIABLES`. It rather means that, when a value of $values$ is used, all stretches of value l must have a span that belong to interval $[s, t]$.
2. A variable of the collection `VARIABLES` may be assigned a value that is not defined in the attribute `p` of the `PARTLIMITS` collection.

Example

$$\left(\begin{array}{l} \langle 1, 2, 0, 0, 2, 2, 2, 0 \rangle, \\ \left\langle \begin{array}{lll} \texttt{p} - \langle 1, 2 \rangle & \texttt{lmin} - 2 & \texttt{lmax} - 4, \\ \texttt{p} - \langle 3 \rangle & \texttt{lmin} - 0 & \texttt{lmax} - 2 \end{array} \right\rangle \end{array} \right)$$

The `stretch_path_partition` constraint holds since the sequence 1 2 0 0 2 2 2 0 contains two stretches 1 2, and 2 2 2 respectively verifying the following conditions:

- The span of the first stretch 1 2 is located within interval $[2, 4]$ (i.e., the limit associated with item $\texttt{PARTLIMITS}[1]$).
- The span of the second stretch 2 2 2 is located within interval $[2, 4]$ (i.e., the limit associated with item $\texttt{PARTLIMITS}[1]$).

Typical

$|\texttt{VARIABLES}| > 1$
$\texttt{range}(\texttt{VARIABLES.var}) > 1$
$|\texttt{VARIABLES}| > |\texttt{PARTLIMITS}|$
$|\texttt{PARTLIMITS}| > 1$
$\texttt{sum}(\texttt{PARTLIMITS.lmin}) \leq |\texttt{VARIABLES}|$
$\texttt{PARTLIMITS.lmax} \leq |\texttt{VARIABLES}|$

Symmetries

- Items of VARIABLES can be reversed.
- Items of PARTLIMITS are permutable.
- Items of PARTLIMITS.p are permutable.
- All occurrences of two distinct tuples of values in VARIABLES.var or PARLIMITS.p.val can be swapped; all occurrences of a tuple of values in VARIABLES.var or PARLIMITS.p.val can be renamed to any unused tuple of values.

See also

common keyword: pattern *(sliding sequence constraint)*.

specialisation: stretch_path *(*variable ∈ partition *replaced by* variable*)*.

Keywords

characteristic of a constraint: automaton, automaton without counters, reified automaton constraint, partition.

combinatorial object: sequence.

constraint network structure: Berge-acyclic constraint network.

constraint type: timetabling constraint, sliding sequence constraint.

filtering: arc-consistency.

final graph structure: consecutive loops are connected.