5.119 diffn_column

DESCRIPTION LINKS GRAPH

Origin CHIP: option guillotine cut (column) of diffn.

Constraint diffn_column(ORTHOTOPES, DIM)

Type
```
ORTHOTOPE : collection(ori−dvar, siz−dvar, end−dvar)
```

Arguments
```
ORTHOTOPES : collection(orth − ORTHOTOPE)
DIM        : int
```

Restrictions
$|\texttt{ORTHOTOPE}| > 0$
require_at_least(2, ORTHOTOPE, [ori, siz, end])
$\texttt{ORTHOTOPE.siz} \geq 0$
$\texttt{ORTHOTOPE.ori} \leq \texttt{ORTHOTOPE.end}$
required(ORTHOTOPES, orth)
same_size(ORTHOTOPES, orth)
$\texttt{DIM} > 0$
$\texttt{DIM} \leq |\texttt{ORTHOTOPE}|$
diffn(ORTHOTOPES)

Purpose

Extension of the generalised multi-dimensional non-overlapping diffn constraint. Holds if, for each pair of orthotopes (O_1, O_2) the following conditions hold:

- O_1 and O_2 do not overlap. Two orthotopes do not overlap if one of the orthotopes has zero size or if there exists at least one dimension where their projections do not overlap.
- Let P_1 and P_2 respectively denote the projections of O_1 and O_2 onto dimension DIM. If P_1 and P_2 overlap then the size of their intersection is equal to the size of O_1 in dimension DIM, as well as to the size of O_2 in dimension DIM.

Example

$$\left\langle \begin{array}{l} \texttt{orth} - \langle \texttt{ori} - 1\ \texttt{siz} - 3\ \texttt{end} - 4, \texttt{ori} - 3\ \texttt{siz} - 2\ \texttt{end} - 5\rangle, \\ \texttt{orth} - \left\langle \begin{array}{lll} \texttt{ori} - 9 & \texttt{siz} - 1 & \texttt{end} - 10, \\ \texttt{ori} - 4 & \texttt{siz} - 3 & \texttt{end} - 7 \end{array} \right\rangle, \\ \texttt{orth} - \langle \texttt{ori} - 4\ \texttt{siz} - 2\ \texttt{end} - 6, \texttt{ori} - 3\ \texttt{siz} - 4\ \texttt{end} - 7\rangle, \\ \texttt{orth} - \langle \texttt{ori} - 1\ \texttt{siz} - 3\ \texttt{end} - 4, \texttt{ori} - 6\ \texttt{siz} - 1\ \texttt{end} - 7\rangle, \\ \texttt{orth} - \langle \texttt{ori} - 6\ \texttt{siz} - 2\ \texttt{end} - 8, \texttt{ori} - 1\ \texttt{siz} - 4\ \texttt{end} - 5\rangle, \\ \texttt{orth} - \left\langle \begin{array}{lll} \texttt{ori} - 10 & \texttt{siz} - 1 & \texttt{end} - 11, \\ \texttt{ori} - 1 & \texttt{siz} - 1 & \texttt{end} - 2 \end{array} \right\rangle, \\ \texttt{orth} - \left\langle \begin{array}{lll} \texttt{ori} - 9 & \texttt{siz} - 1 & \texttt{end} - 10, \\ \texttt{ori} - 1 & \texttt{siz} - 1 & \texttt{end} - 2 \end{array} \right\rangle, \\ \texttt{orth} - \langle \texttt{ori} - 6\ \texttt{siz} - 2\ \texttt{end} - 8, \texttt{ori} - 6\ \texttt{siz} - 1\ \texttt{end} - 7\rangle \end{array} \right\rangle, 1$$

Figure 5.285 represents the respective position of the eight rectangles of the example. The coordinates of the leftmost lowest corner of each rectangle are stressed in bold.

The `diffn_column` constraint holds since (1) the eight rectangles do not overlap and since (2) when their projection onto dimension `DIM` $= 1$ overlap the size of their intersection is equal to the size of the corresponding rectangles in dimension `DIM` $= 1$.

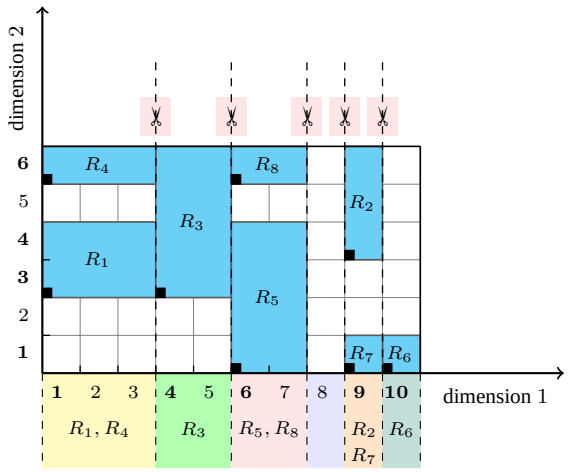

Figure 5.285: Illustration of the **Example** slot: eight non-overlapping rectangles such that, for each pair of rectangles R_i, R_j $(1 \leq i < j \leq 8)$, if the projections onto dimension 1 of rectangles R_i and R_j intersect then the size of their intersection is equal to the size of R_i in dimension 1 and to the size of R_j in dimension 1 (i.e. complete vertical strips along the border of any rectangle can be cut without crossing any rectangle)

Typical

$|$`ORTHOTOPE`$| > 1$
`ORTHOTOPE.siz` > 0
$|$`ORTHOTOPES`$| > 1$

Symmetries

- Items of `ORTHOTOPES` are permutable.
- One and the same constant can be added to the `ori` and `end` attributes of all items of `ORTHOTOPES.orth`.

Arg. properties

Contractible wrt. `ORTHOTOPES`.

See also

common keyword: `diffn` *(geometrical constraint,orthotope)*, `diffn_include` *(geometrical constraint,orthotope,positioning constraint)*.

implies: `diffn_include`.

used in graph description: `two_orth_column`.

Keywords

constraint type: decomposition.

geometry: geometrical constraint, positioning constraint, orthotope, guillotine cut.

Arc input(s)	ORTHOTOPES
Arc generator	$CLIQUE(<) \mapsto$ collection(orthotopes1, orthotopes2)
Arc arity	2
Arc constraint(s)	two_orth_column(orthotopes1.orth, orthotopes2.orth, DIM)
Graph property(ies)	**NARC**$= \lvert$ORTHOTOPES$\rvert * (\lvert$ORTHOTOPES$\rvert - 1)/2$

Graph model Since showing all items produces too big graphs, parts (A) and (B) of Figure 5.286 respectively show the initial and final graph associated with the first three items of the **Example** slot. Since we use the **NARC** graph property, the arcs of the final graph are stressed in bold.

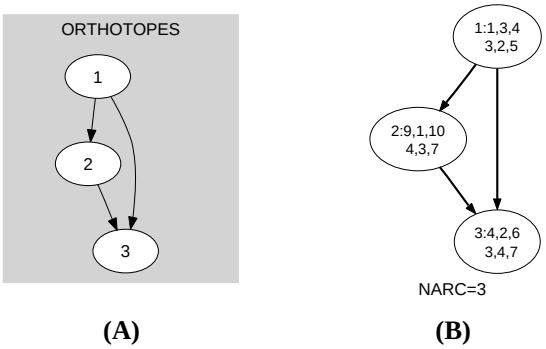

Figure 5.286: Initial and final graph of the diffn_column constraint