

5.212 meet_sboxes

| | DESCRIPTION | LINKS | LOGIC |
|---------------------|---|-------|-------|
| Origin | Geometry, derived from [305] | | |
| Constraint | <code>meet_sboxes(K, DIMS, OBJECTS, SBOXES)</code> | | |
| Synonym | <code>meet.</code> | | |
| Types | VARIABLES : <code>collection(v-dvar)</code> INTEGERS : <code>collection(v-int)</code> POSITIVES : <code>collection(v-int)</code> | | |
| Arguments | K : <code>int</code> DIMS : <code>sint</code> OBJECTS : <code>collection(oid-int, sid-int, x - VARIABLES)</code> SBOXES : <code>collection(sid-int, t - INTEGERS, l - POSITIVES)</code> | | |
| Restrictions | <code>required(VARIABLES, v)</code> <code> VARIABLES = K</code> <code>required(INTEGERS, v)</code> <code> INTEGERS = K</code> <code>required(POSITIVES, v)</code> <code> POSITIVES = K</code> <code>POSITIVES.v > 0</code> <code>K > 0</code> <code>DIMS ≥ 0</code> <code>DIMS < K</code> <code>required(OBJECTS, [oid, sid, x])</code> <code>OBJECTS.oid ≥ 1</code> <code>OBJECTS.oid ≤ OBJECTS </code> <code>OBJECTS.sid ≥ 1</code> <code>OBJECTS.sid ≤ SBOXES </code> <code>required(SBOXES, [sid, t, l])</code> <code>SBOXES.sid ≥ 1</code> <code>SBOXES.sid ≤ SBOXES </code> | | |

Holds if, for each pair of objects (O_i, O_j) , $i \neq j$, O_i and O_j meet with respect to a set of dimensions depicted by DIMS. Each *shape* is defined as a finite set of shifted boxes, where each shifted box is described by a box in a K-dimensional space at a given offset (from the origin of the shape) with given sizes. More precisely, a *shifted box* is an entity defined by its shape id *sid*, shift offset *t*, and sizes *l*. Then, a shape is defined as the union of shifted boxes sharing the same shape id. An *object* is an entity defined by its unique object identifier *oid*, shape id *sid* and origin *x*.

Two objects O_i and object O_j *meet* with respect to a set of dimensions depicted by DIMS if and only if the two following conditions hold:

Purpose

- For all shifted box s_i associated with O_i and for all shifted box s_j associated with O_j there exists a dimension $d \in \text{DIMS}$ such that (1) the start of s_i in dimension d is greater than or equal to the end of s_j in dimension d , or (2) the start of s_j in dimension d is greater than or equal to the end of s_i in dimension d (i.e., there is no overlap between the shifted box of O_i and the shifted box of O_j).
- There exists a shifted box s_i of O_i and there exists a shifted box s_j of O_j such that for all dimensions d (1) the end of s_i in dimension d is greater than or equal to the start of s_j in dimension d , and (2) the end of s_j in dimension d is greater than or equal to the start of s_i in dimension d (i.e., at least two shifted box of O_i and O_j are in contact).

Example

$$\left(\begin{array}{l} 2, \{0, 1\}, \\ \left\langle \begin{array}{l} \text{oid} - 1 \quad \text{sid} - 1 \quad \mathbf{x} - \langle 3, 2 \rangle, \\ \text{oid} - 2 \quad \text{sid} - 2 \quad \mathbf{x} - \langle 4, 1 \rangle, \\ \text{oid} - 3 \quad \text{sid} - 4 \quad \mathbf{x} - \langle 3, 4 \rangle \end{array} \right\rangle, \\ \begin{array}{l} \text{sid} - 1 \quad \mathbf{t} - \langle 0, 0 \rangle \quad \mathbf{l} - \langle 1, 2 \rangle, \\ \text{sid} - 2 \quad \mathbf{t} - \langle 0, 0 \rangle \quad \mathbf{l} - \langle 1, 1 \rangle, \\ \text{sid} - 2 \quad \mathbf{t} - \langle 1, 0 \rangle \quad \mathbf{l} - \langle 1, 3 \rangle, \\ \left\langle \begin{array}{l} \text{sid} - 2 \quad \mathbf{t} - \langle 0, 2 \rangle \quad \mathbf{l} - \langle 1, 1 \rangle, \\ \text{sid} - 3 \quad \mathbf{t} - \langle 0, 0 \rangle \quad \mathbf{l} - \langle 3, 1 \rangle, \\ \text{sid} - 3 \quad \mathbf{t} - \langle 0, 1 \rangle \quad \mathbf{l} - \langle 1, 1 \rangle, \\ \text{sid} - 3 \quad \mathbf{t} - \langle 2, 1 \rangle \quad \mathbf{l} - \langle 1, 1 \rangle, \\ \text{sid} - 4 \quad \mathbf{t} - \langle 0, 0 \rangle \quad \mathbf{l} - \langle 1, 1 \rangle \end{array} \right\rangle \end{array} \right)$$

Figure 5.409 shows the objects of the example. Since all the pairs of objects meet the `meet_sboxes` constraint holds.

Symmetries

- Items of OBJECTS are [permutable](#).
- Items of SBOXES are [permutable](#).
- Items of OBJECTS.x, SBOXES.t and SBOXES.l are [permutable](#) (same permutation used).

Remark

One of the eight relations of the *Region Connection Calculus* [305].

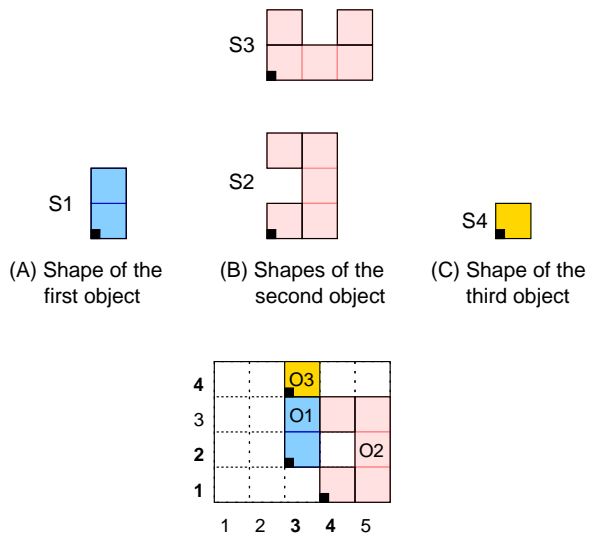
See also

common keyword: [contains_sboxes](#), [coveredby_sboxes](#), [covers_sboxes](#), [disjoint_sboxes](#), [equal_sboxes](#), [inside_sboxes](#) (*rcc8*), [non_overlap_sboxes](#) (*geometrical constraint, logic*), [overlap_sboxes](#) (*rcc8*).

Keywords

constraint type: [logic](#).

geometry: geometrical constraint, rcc8.



(D) Three objects for which each pair of objects meet

Figure 5.409: The three objects of the example

Logic

- $\text{origin}(O1, S1, D) \stackrel{\text{def}}{=} O1.x(D) + S1.t(D)$
- $\text{end}(O1, S1, D) \stackrel{\text{def}}{=} O1.x(D) + S1.t(D) + S1.l(D)$
- $\text{non_overlap_sboxes}(\text{Dims}, O1, S1, O2, S2) \stackrel{\text{def}}{=} \begin{array}{l} \exists D \in \text{Dims} \\ \bigvee \left(\begin{array}{l} \text{end}(O1, S1, D) \leq \\ \text{origin} \left(\begin{array}{l} O2, \\ S2, \\ D \end{array} \right), \\ \text{end}(O2, S2, D) \leq \\ \text{origin} \left(\begin{array}{l} O1, \\ S1, \\ D \end{array} \right) \end{array} \right) \end{array}$
- $\text{meet_sboxes}(\text{Dims}, O1, S1, O2, S2) \stackrel{\text{def}}{=} \begin{array}{l} \exists D \in \text{Dims} \\ \bigvee \left(\begin{array}{l} \text{end}(O1, S1, D) = \\ \text{origin}(O2, S2, D), \\ \text{end}(O2, S2, D) = \\ \text{origin}(O1, S1, D) \end{array} \right) \end{array}$
- $\text{meet_objects}(\text{Dims}, O1, O2) \stackrel{\text{def}}{=} \begin{array}{l} \left(\begin{array}{l} \forall S1 \in \text{sboxes}([O1.\text{sid}]) \\ \forall S2 \in \text{sboxes}([O2.\text{sid}]) \\ \text{non_overlap_sboxes} \left(\begin{array}{l} \text{Dims}, \\ O1, \\ S1, \\ O2, \\ S2 \end{array} \right), \\ \exists S1 \in \text{sboxes}([O1.\text{sid}]) \\ \exists S2 \in \text{sboxes}([O2.\text{sid}]) \\ \text{meet_sboxes} \left(\begin{array}{l} \text{Dims}, \\ O1, \\ S1, \\ O2, \\ S2 \end{array} \right) \end{array} \right) \end{array}$
- $\text{all_meet}(\text{Dims}, \text{OIDS}) \stackrel{\text{def}}{=} \begin{array}{l} \forall O1 \in \text{objects}(\text{OIDS}) \\ \forall O2 \in \text{objects}(\text{OIDS}) \\ O1.\text{oid} < \Rightarrow \\ O2.\text{oid} \\ \text{meet_objects} \left(\begin{array}{l} \text{Dims}, \\ O1, \\ O2 \end{array} \right) \end{array}$
- $\text{all_meet}(\text{DIMENSIONS}, \text{OIDS})$

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