

5.246 max_occ_of_sorted_tuples_of_values

	DESCRIPTION	LINKS
Origin	Design.	
Constraint	<code>max_occ_of_sorted_tuples_of_values(MAX, K, VECTORS)</code>	
Type	VECTOR : <code>collection</code> (var-dvar)	
Arguments	MAX : <code>int</code> K : <code>int</code> VECTORS : <code>collection</code> (vec - VECTOR)	
Restrictions	<code>required</code> (VECTOR, var) $ \text{VECTOR} \geq 2$ <code>alldifferent</code> (VECTOR) $\text{MAX} \geq 1$ $K \geq 2$ $K < \text{VECTOR} $ <code>required</code> (VECTORS, vec) $ \text{VECTORS} \geq 1$ <code>same_size</code> (VECTORS, vec)	
Purpose	<p>MAX is equal to the maximum number of occurrences of identical vectors derived from the vectors VECTORS in the following way. To each vector $\langle v_1, v_2, \dots, v_m \rangle$ of VECTORS (with v_1, v_2, \dots, v_m distinct) let $\langle s_1, s_2, \dots, s_m \rangle$ be the corresponding sorted vector by increasing component. We generate all vectors $\langle u_1, u_2, \dots, u_K \rangle$ such that $u_1 = s_{i_1}$, $u_2 = s_{i_2}, \dots, u_K = s_{i_K}$ (with $1 \leq i_1 < i_2 < \dots < i_K \leq m$).</p>	

Example

$$\left(1, 2, \left\langle \begin{array}{l} \text{vec} - \langle 4, 2, 1 \rangle, \\ \text{vec} - \langle 2, 3, 5 \rangle, \\ \text{vec} - \langle 3, 6, 4 \rangle, \\ \text{vec} - \langle 5, 4, 7 \rangle, \\ \text{vec} - \langle 6, 5, 1 \rangle, \\ \text{vec} - \langle 7, 6, 2 \rangle, \\ \text{vec} - \langle 3, 1, 7 \rangle \end{array} \right\rangle \right)$$

Given the seven vectors of the example we respectively generate:

- the pairs $\langle 1, 2 \rangle$, $\langle 1, 4 \rangle$ and $\langle 2, 4 \rangle$ from the triple $\langle 4, 2, 1 \rangle$,
- the pairs $\langle 2, 3 \rangle$, $\langle 2, 5 \rangle$ and $\langle 3, 5 \rangle$ from the triple $\langle 2, 3, 5 \rangle$,
- the pairs $\langle 3, 4 \rangle$, $\langle 3, 6 \rangle$ and $\langle 4, 6 \rangle$ from the triple $\langle 3, 6, 4 \rangle$,
- the pairs $\langle 4, 5 \rangle$, $\langle 4, 7 \rangle$ and $\langle 5, 7 \rangle$ from the triple $\langle 5, 4, 7 \rangle$,
- the pairs $\langle 1, 5 \rangle$, $\langle 1, 6 \rangle$ and $\langle 5, 6 \rangle$ from the triple $\langle 6, 5, 1 \rangle$,
- the pairs $\langle 2, 6 \rangle$, $\langle 2, 7 \rangle$ and $\langle 6, 7 \rangle$ from the triple $\langle 7, 6, 2 \rangle$,

- the pairs $\langle 1, 3 \rangle$, $\langle 1, 7 \rangle$ and $\langle 3, 7 \rangle$ from the triple $\langle 3, 1, 7 \rangle$.

Putting these pairs together, we get the set of pairs $\{\langle 1, 2 \rangle, \langle 1, 3 \rangle, \langle 1, 4 \rangle, \langle 1, 5 \rangle, \langle 1, 6 \rangle, \langle 1, 7 \rangle, \langle 2, 3 \rangle, \langle 2, 4 \rangle, \langle 2, 5 \rangle, \langle 2, 6 \rangle, \langle 2, 7 \rangle, \langle 3, 4 \rangle, \langle 3, 5 \rangle, \langle 3, 6 \rangle, \langle 3, 7 \rangle, \langle 4, 5 \rangle, \langle 4, 6 \rangle, \langle 4, 7 \rangle, \langle 5, 6 \rangle, \langle 5, 7 \rangle, \langle 6, 7 \rangle\}$. The `max_occ_of_sorted_tuples_of_values` constraint holds since each vector has pairwise distinct components, and since `MAX` is set to one and all the generated pairs are distinct.

Typical

```
MAX = 1
K + 1 = |VECTOR|
|VECTORS| > 2
```

Arg. properties

- **Functional dependency:** `MAX` determined by `K` and `VECTORS`.
- **Contractible** wrt. `VECTORS` when `MAX = 1`.

Usage

This constraint occurs in balanced block design problems where all vectors are not necessarily sorted.

See also

common keyword: `max_occ_of_consecutive_tuples_of_values`, `max_occ_of_tuples_of_values` (*vector*).

implied by: `max_occ_of_tuples_of_values`.

Keywords

characteristic of a constraint: `vector`.

modelling: functional dependency.