5.247 max_occ_of_sorted_tuples_of_values

DESCRIPTION LINKS

Origin Design.

Constraint max_occ_of_sorted_tuples_of_values(MAX, K, VECTORS)

Type
```
VECTOR : collection(var−dvar)
```

Arguments
```
MAX      : int
K        : int
VECTORS  : collection(vec − VECTOR)
```

Restrictions
```
required(VECTOR, var)
|VECTOR| ≥ 2
alldifferent(VECTOR)
MAX ≥ 1
K ≥ 2
K < |VECTOR|
required(VECTORS, vec)
|VECTORS| ≥ 1
same_size(VECTORS, vec)
```

Purpose MAX is equal to the maximum number of occurrences of identical vectors derived from the vectors VECTORS in the following way. To each vector $\langle v_1, v_2, \ldots, v_m \rangle$ of VECTORS (with $v_1, v_2, \ldots, v_m$ distinct) let $\langle s_1, s_2, \ldots, s_m \rangle$ be the corresponding sorted vector by increasing component. We generate all vectors $\langle u_1, u_2, \ldots, u_K \rangle$ such that $u_1 = s_{i_1}$, $u_2 = s_{i_2}, \ldots, u_K = s_{i_K}$ (with $1 \leq i_1 < i_2 < \cdots < i_K \leq m$).

Example

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

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

$\texttt{MAX} = 1$
$\texttt{K} + 1 = |\texttt{VECTOR}|$
$|\texttt{VECTORS}| > 2$

Arg. properties

- Functional dependency: `MAX` determined by `K` and `VECTORS`.
- Contractible wrt. `VECTORS` when $\texttt{MAX} = 1$.

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.