5.219   lex2

DESCRIPTION   LINKS

Origin   [168]

Constraint   `lex2(MATRIX)`

Synonyms   `double_lex`, `row_and_column_lex`.

Type   `VECTOR  :  collection(var−dvar)`

Argument   `MATRIX  :  collection(vec − VECTOR)`

Restrictions $|\text{VECTOR}| \geq 1$
                        `required(VECTOR, var)`
                        `required(MATRIX, vec)`
                        `same_size(MATRIX, vec)`

Purpose   Given a matrix of domain variables, enforces that both adjacent rows, and adjacent columns are lexicographically ordered (adjacent rows and adjacent columns can be equal).

Example $(\langle \text{vec} − \langle 2, 2, 3\rangle , \text{vec} − \langle 2, 3, 1\rangle\rangle)$

The `lex2` constraint holds since:

- The first row $\langle 2, 2, 3\rangle$ is lexicographically less than or equal to the second row $\langle 2, 3, 1\rangle$.
- The first column $\langle 2, 2\rangle$ is lexicographically less than or equal to the second column $\langle 2, 3\rangle$.
- The second column $\langle 2, 3\rangle$ is lexicographically less than or equal to the third column $\langle 3, 1\rangle$.

Typical $|\text{VECTOR}| > 1$
                        $|\text{MATRIX}| > 1$

Symmetry   One and the same constant can be added to the `var` attribute of all items of `MATRIX.vec`.

Usage   A *symmetry-breaking* constraint.

Remark   The idea of this *symmetry-breaking* constraint can already be found in the following articles of A. Lubiw [267, 268].

                        In block designs you sometimes want repeated blocks, so using the non-strict order would be required in this case.

Reformulation　　The `lex2` constraint can be expressed as a conjunction of two `lex_chain_lesseq` constraints: A first `lex_chain_lesseq` constraint on the `MATRIX` argument and a second `lex_chain_lesseq` constraint on the transpose of the `MATRIX` argument.

Systems　　lex2 in **MiniZinc**.

See also　　**common keyword:** `allperm`, `lex_lesseq` *(matrix symmetry, lexicographic order)*.

　　implied by: `strict_lex2`.

　　implies: `lex_chain_lesseq`.

　　part of system of constraints: `lex_chain_lesseq`.

Keywords　　**constraint type:** predefined constraint, system of constraints, order constraint.

　　modelling: matrix, matrix model.

　　symmetry: symmetry, matrix symmetry, lexicographic order.