5.22 allperm

DESCRIPTION LINKS GRAPH

Origin [168]

Constraint allperm(MATRIX)

Synonyms all_perm, all_permutations.

Type VECTOR : collection(var−dvar)

Argument MATRIX : collection(vec − VECTOR)

Restrictions
|VECTOR| ≥ 1
required(VECTOR, var)
required(MATRIX, vec)
same_size(MATRIX, vec)

Purpose Given a matrix $\mathcal{M}$ of domain variables, enforces that the first row is lexicographically less than or equal to all permutations of all other rows. Note that the components of a given vector of the matrix $\mathcal{M}$ may be equal.

Example $(\langle \mathtt{vec} - \langle 1,2,3\rangle, \mathtt{vec} - \langle 3,1,2\rangle\rangle)$

The allperm constraint holds since vector $\langle 1,2,3\rangle$ is lexicographically less than or equal to all the permutations of vector $\langle 3,1,2\rangle$ (i.e., $\langle 1,2,3\rangle$, $\langle 1,3,2\rangle$, $\langle 2,1,3\rangle$, $\langle 2,3,1\rangle$, $\langle 3,1,2\rangle$, $\langle 3,2,1\rangle$).

Typical
|VECTOR| > 1
|MATRIX| > 1

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

Arg. properties
Suffix-contractible wrt. MATRIX.vec (*remove items from same position*).

Usage A *symmetry-breaking* constraint.

See also **common keyword:** lex2, lex_chain_lesseq (*matrix symmetry*,*lexicographic order*), lex_lesseq (*lexicographic order*), lex_lesseq_allperm (*matrix symmetry*,*lexicographic order*), strict_lex2 (*lexicographic order*).

part of system of constraints: lex_lesseq_allperm.

used in graph description: lex_lesseq_allperm.

Keywords

characteristic of a constraint: sort based reformulation, vector.
constraint type: order constraint, system of constraints.
final graph structure: acyclic, bipartite.
modelling: matrix, matrix model.
symmetry: matrix symmetry, symmetry, lexicographic order.

Arc input(s)	MATRIX
Arc generator	$CLIQUE(<) \mapsto$ collection(matrix1, matrix2)
Arc arity	2
Arc constraint(s)	• matrix1.key $= 1$ • matrix2.key > 1 • lex_lesseq_allperm(matrix1.vec, matrix2.vec)
Graph property(ies)	NARC$= |MATRIX| - 1$
Graph class	• ACYCLIC • BIPARTITE • NO_LOOP

Graph model We generate a graph with an arc constraint lex_lesseq_allperm between the vertex corresponding to the first item of the MATRIX collection and the vertices associated with all other items of the MATRIX collection. This is achieved by specifying that (1) an arc should start from the first item (i.e., matrix1.key $= 1$) and (2) an arc should not end on the first item (i.e., matrix2.key > 1). We finally state that all these arcs should belong to the final graph. Parts (A) and (B) of Figure 5.48 respectively show the initial and final graph associated with the **Example** slot.

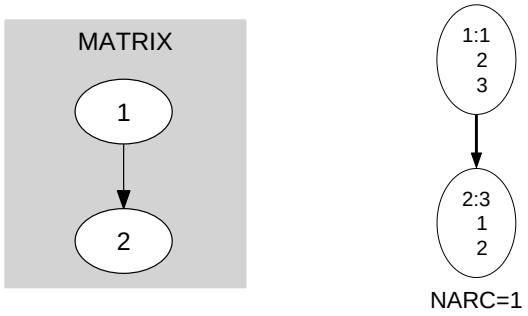

Figure 5.48: Initial and final graph of the allperm constraint