

5.15 allperm

	DESCRIPTION	LINKS	GRAPH
Origin	[148]		
Constraint	allperm(MATRIX)		
Synonyms	all_perm, all_permutations.		
Type	VECTOR : collection(var-dvar)		
Argument	MATRIX : collection(vec - VECTOR)		
Restrictions	required(VECTOR, var) required(MATRIX, vec) same_size(MATRIX, vec)		
Purpose	Given a matrix of domain variables, enforces that the first row is lexicographically less than or equal to all permutations of all other rows.		
Example	$\left(\left\langle \begin{array}{l} \text{vec} - \langle 1, 2, 3 \rangle, \\ \text{vec} - \langle 3, 1, 2 \rangle \end{array} \right\rangle \right)$ <p>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., $\langle 1, 2, 3 \rangle$, $\langle 1, 3, 2 \rangle$, $\langle 2, 1, 3 \rangle$, $\langle 2, 3, 1 \rangle$, $\langle 3, 1, 2 \rangle$, $\langle 3, 2, 1 \rangle$).</p>		
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 <i>symmetry-breaking</i> constraint.		
See also	common keyword: lex2, lex_chain_lesseq (<i>matrix symmetry, lexicographic order</i>), lex_lesseq (<i>lexicographic order</i>), lex_lesseq_allperm (<i>matrix symmetry, lexicographic order</i>), strict_lex2 (<i>lexicographic order</i>). part of system of constraints: lex_lesseq_allperm. used in graph description: lex_lesseq_allperm.		
Keywords	characteristic of a constraint: 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	<code>CLIQUE(<) ↦ collection(matrix1, matrix2)</code>
Arc arity	2
Arc constraint(s)	<ul style="list-style-type: none"> • <code>matrix1.key = 1</code> • <code>matrix2.key > 1</code> • <code>lex_lesseq_allperm(matrix1.vec, matrix2.vec)</code>
Graph property(ies)	<code>NARC = MATRIX - 1</code>
Graph class	<ul style="list-style-type: none"> • <code>ACYCLIC</code> • <code>BIPARTITE</code> • <code>NO_LOOP</code>

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 5.21 respectively show the initial and final graph associated with the **Example** slot.

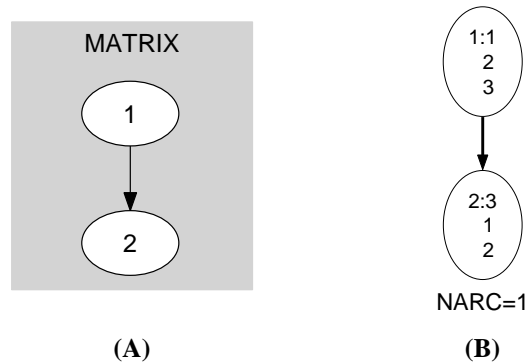


Figure 5.21: Initial and final graph of the `allperm` constraint