

## 5.224 `lex_chain_greater`

	DESCRIPTION	LINKS	GRAPH
Origin	Derived from <code>lex_chain_less</code>		
Constraint	<code>lex_chain_greater(VECTORS)</code>		
Usual name	<code>lex_chain</code>		
Type	VECTOR : <code>collection</code> (var-dvar)		
Argument	VECTORS : <code>collection</code> (vec - VECTOR)		
Restrictions	$ \text{VECTOR}  \geq 1$ <code>required</code> (VECTOR, var) <code>required</code> (VECTORS, vec) <code>same_size</code> (VECTORS, vec)		
Purpose	<p>For each pair of consecutive vectors <math>\text{VECTOR}_i</math> and <math>\text{VECTOR}_{i+1}</math> of the VECTORS collection we have that <math>\text{VECTOR}_i</math> is lexicographically strictly greater than <math>\text{VECTOR}_{i+1}</math>. Given two vectors, <math>\vec{X}</math> and <math>\vec{Y}</math> of <math>n</math> components, <math>\langle X_0, \dots, X_{n-1} \rangle</math> and <math>\langle Y_0, \dots, Y_{n-1} \rangle</math>, <math>\vec{X}</math> is <i>lexicographically strictly greater than</i> <math>\vec{Y}</math> if and only if <math>X_0 &gt; Y_0</math> or <math>X_0 = Y_0</math> and <math>\langle X_1, \dots, X_{n-1} \rangle</math> is lexicographically strictly greater than <math>\langle Y_1, \dots, Y_{n-1} \rangle</math>.</p>		
Example	$(\langle \text{vec} - \langle 5, 2, 6, 3 \rangle, \text{vec} - \langle 5, 2, 6, 2 \rangle, \text{vec} - \langle 5, 2, 3, 9 \rangle \rangle)$		
	<p>The <code>lex_chain_greater</code> constraint holds since:</p> <ul style="list-style-type: none"> <li>• The first vector <math>\langle 5, 2, 6, 3 \rangle</math> of the VECTORS collection is lexicographically strictly greater than the second vector <math>\langle 5, 2, 6, 2 \rangle</math> of the VECTORS collection.</li> <li>• The second vector <math>\langle 5, 2, 6, 2 \rangle</math> of the VECTORS collection is lexicographically strictly greater than the third vector <math>\langle 5, 2, 3, 9 \rangle</math> of the VECTORS collection.</li> </ul>		
Typical	$ \text{VECTOR}  > 1$ $ \text{VECTORS}  > 1$		
Arg. properties	<ul style="list-style-type: none"> <li>• <code>Contractible</code> wrt. VECTORS.</li> <li>• <code>Suffix-extensible</code> wrt. VECTORS.vec (<i>add items at same position</i>).</li> </ul>		
Usage	<p>This constraint was motivated for breaking symmetry: more precisely when one wants to lexicographically order the consecutive columns of a matrix of decision variables. A further motivation is that using a set of lexicographic ordering constraints between two vectors does usually not allows to come up with a complete pruning.</p>		
Algorithm	<p>A filtering algorithm achieving <code>arc-consistency</code> for a chain of lexicographical ordering constraints is presented in [95].</p>		

**See also**

**common keyword:** [lex\\_between](#), [lex\\_greatereq](#), [lex\\_less](#),  
[lex\\_lesseq](#) (*lexicographic order*).  
**implies:** [lex\\_alldifferent](#), [lex\\_chain\\_greatereq](#).  
**part of system of constraints:** [lex\\_greater](#).  
**used in graph description:** [lex\\_greater](#).

**Keywords**

**application area:** floor planning problem.  
**characteristic of a constraint:** vector.  
**constraint type:** decomposition, order constraint, system of constraints.  
**filtering:** arc-consistency.  
**heuristics:** heuristics and lexicographical ordering.  
**modelling:** degree of diversity of a set of solutions.  
**modelling exercises:** degree of diversity of a set of solutions.  
**symmetry:** symmetry, matrix symmetry, lexicographic order.

Arc input(s)	VECTORS
Arc generator	$\text{PATH} \mapsto \text{collection}(\text{vectors1}, \text{vectors2})$
Arc arity	2
Arc constraint(s)	$\text{lex\_greater}(\text{vectors1.vec}, \text{vectors2.vec})$
Graph property(ies)	$\text{NARC} =  \text{VECTORS}  - 1$

**Graph model** Parts (A) and (B) of Figure 5.497 respectively show the initial and final graph associated with the **Example** slot. Since we use the **NARC** graph property, the arcs of the final graph are stressed in bold. The **lex\_chain\_greater** constraint holds since all the arc constraints of the initial graph are satisfied.

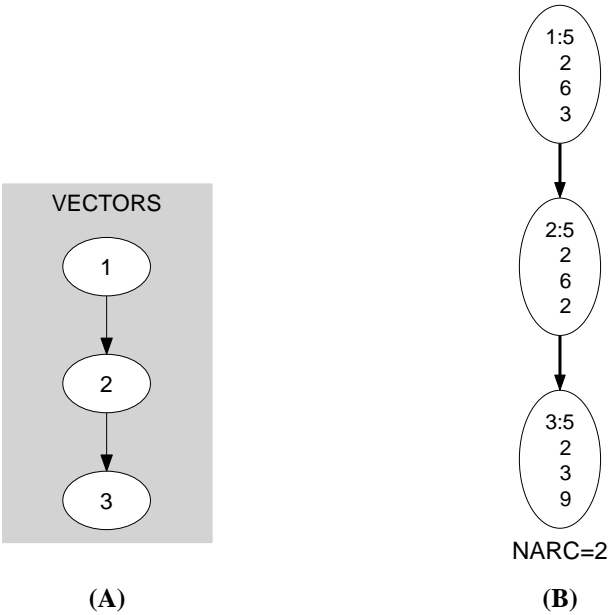


Figure 5.497: Initial and final graph of the **lex\_chain\_greater** constraint

**Signature** Since we use the *PATH* arc generator on the **VECTORS** collection the number of arcs of the initial graph is equal to  $|\text{VECTORS}| - 1$ . For this reason we can rewrite  $\text{NARC} = |\text{VECTORS}| - 1$  to  $\text{NARC} \geq |\text{VECTORS}| - 1$  and simplify  $\overline{\text{NARC}}$  to  $\text{NARC}$ .

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