

5.265 `path_from_to`

	DESCRIPTION	LINKS	GRAPH
Origin	[4]		
Constraint	<code>path_from_to(FROM, TO, NODES)</code>		
Usual name	<code>path</code>		
Arguments	<pre>FROM : int TO : int NODES : collection(index-int, succ-svar)</pre>		
Restrictions	<pre>FROM ≥ 1 FROM ≤ NODES TO ≥ 1 TO ≤ NODES required(NODES, [index, succ]) NODES.index ≥ 1 NODES.index ≤ NODES distinct(NODES, index) NODES.succ ≥ 1 NODES.succ ≤ NODES </pre>		
Purpose	Select some arcs of a digraph G so that there is still a path between two given vertices of G .		
Example	$\left(4, 3, \left\langle \begin{array}{ll} \text{index} - 1 & \text{succ} - \emptyset, \\ \text{index} - 2 & \text{succ} - \emptyset, \\ \text{index} - 3 & \text{succ} - \{5\}, \\ \text{index} - 4 & \text{succ} - \{5\}, \\ \text{index} - 5 & \text{succ} - \{2, 3\} \end{array} \right\rangle \right)$		
	The <code>path_from_to</code> constraint holds since within the digraph G corresponding to the item of the <code>NODES</code> collection there is a path from vertex <code>FROM</code> = 4 to vertex <code>TO</code> = 3: this path starts from vertex 4, enters vertex 5, and ends up in vertex 3.		
Symmetry	Items of <code>NODES</code> are permutable .		
See also	common keyword : dom_reachability (<i>path</i>), link_set_to_booleans (<i>constraint involving set variables</i>), path , temporal_path (<i>path</i>). used in graph description : in_set .		
Keywords	combinatorial object : path . constraint arguments : constraint involving set variables. constraint type : graph constraint. filtering : linear programming.		

Arc input(s)	NODES
Arc generator	$CLIQUE \mapsto collection(nodes1, nodes2)$
Arc arity	2
Arc constraint(s)	$in_set(nodes2.index, nodes1.succ)$
Graph property(ies)	$PATH_FROM_TO(index, FROM, TO) = 1$

Graph model

Within the context of the **Example** slot, part (A) of Figure 5.489 shows the initial graph from which we choose to start. It is derived from the set associated with each vertex. Each set describes the potential values of the `succ` attribute of a given vertex. Part (B) of Figure 5.489 gives the final graph associated with the **Example** slot. Since we use the `PATH_FROM_TO` graph property we show on the final graph the following information:

- The vertices that respectively correspond to the start and the end of the required path are stressed in bold.
- The arcs on the required path are also stressed in bold.

The `path_from_to` constraint holds since there is a path from vertex 4 to vertex 3 (4 and 3 refer to the `index` attribute of a vertex).

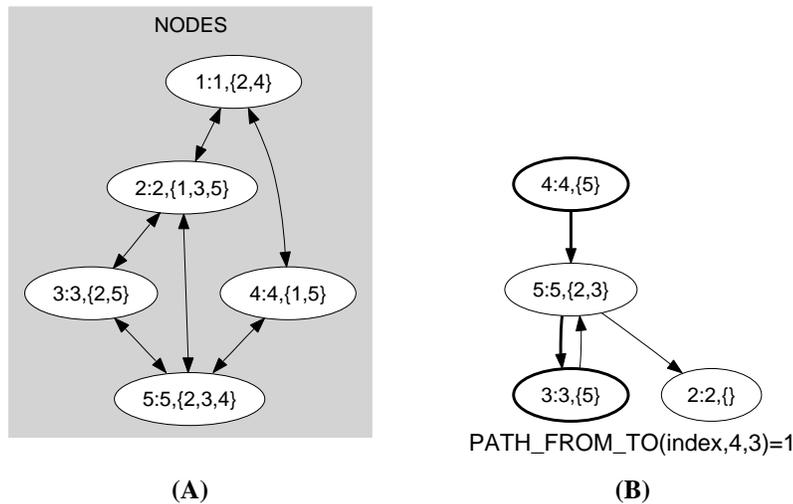


Figure 5.489: Initial and final graph of the `path_from_to` set constraint

Signature

Since the maximum value returned by the graph property `PATH_FROM_TO` is equal to 1 we can rewrite $PATH_FROM_TO(index, FROM, TO) = 1$ to $PATH_FROM_TO(index, FROM, TO) \geq 1$. Therefore we simplify `PATH_FROM_TO` to `PATH_FROM_TO`.