5.316 path_from_to

DESCRIPTION LINKS GRAPH

Origin [5]

Constraint path_from_to(FROM, TO, NODES)

Usual name path

Arguments

FROM	:	int
TO	:	int
NODES	:	collection(index−int, succ−svar)

Restrictions

FROM ≥ 1
FROM $\leq$ |NODES|
TO ≥ 1
TO $\leq$ |NODES|
required(NODES, [index, succ])
NODES.index ≥ 1
NODES.index $\leq$ |NODES|
distinct(NODES, index)
NODES.succ ≥ 1
NODES.succ $\leq$ |NODES|

Purpose Select some arcs of a digraph G so that there is still a path between two given vertices of G.

Example

$$\left\langle 4, 3, \left\langle \begin{array}{ll} \text{index} - 1 & \text{succ} - \emptyset, \\ \text{index} - 2 & \text{succ} - \emptyset, \\ \text{index} - 3 & \text{succ} - \{5\}, \\ \text{index} - 4 & \text{succ} - \{5\}, \\ \text{index} - 5 & \text{succ} - \{2, 3\} \end{array} \right\rangle \right\rangle$$

The path_from_to constraint holds since within the digraph G corresponding to the item of the NODES collection there is a path from vertex FROM $= 4$ to vertex TO $= 3$: this path starts from vertex 4, enters vertex 5, and ends up in vertex 3.

Typical

FROM $\neq$ TO
|NODES| > 2

Symmetry Items of NODES are permutable.

See also **common keyword:** dom_reachability *(path)*, link_set_to_booleans *(constraint involving set variables)*, path, temporal_path *(path)*.

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 5.640 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 5.640 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).

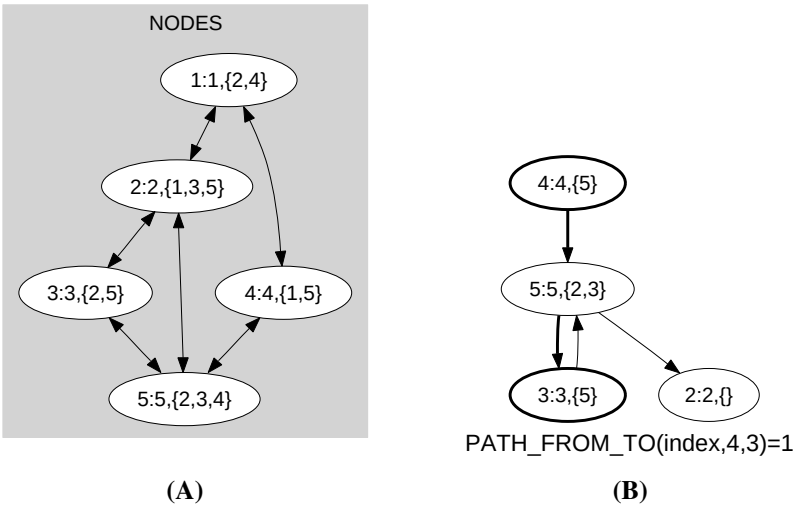

Figure 5.640: Initial and final graph of the path_from_to set constraint

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) ≥ 1. Therefore we simplify PATH_FROM_TO to PATH_FROM_TO.