5.171 graph_isomorphism

DESCRIPTION LINKS

Origin [277]

Constraint graph_isomorphism(NODES_PATTERN, NODES_TARGET, FUNCTION)

Arguments

NODES_PATTERN	:	collection(index−int, succ−sint)
NODES_TARGET	:	collection(index−int, succ−sint)
FUNCTION	:	collection(image−dvar)

Restrictions

required(NODES_PATTERN, [index, succ])
NODES_PATTERN.index $\geq$ 1
NODES_PATTERN.index $\leq$ |NODES_PATTERN|
distinct(NODES_PATTERN, index)
NODES_PATTERN.succ $\geq$ 1
NODES_PATTERN.succ $\leq$ |NODES_PATTERN|
required(NODES_TARGET, [index, succ])
NODES_TARGET.index $\geq$ 1
NODES_TARGET.index $\leq$ |NODES_TARGET|
distinct(NODES_TARGET, index)
NODES_TARGET.succ $\geq$ 1
NODES_TARGET.succ $\leq$ |NODES_TARGET|
|NODES_TARGET| = |NODES_PATTERN|
required(FUNCTION, [image])
FUNCTION.image $\geq$ 1
FUNCTION.image $\leq$ |NODES_TARGET|
distinct(FUNCTION, image)
|FUNCTION| = |NODES_PATTERN|

Purpose

Given two directed graphs PATTERN and TARGET enforce a one to one correspondence, defined by the function FUNCTION, between the vertices of the graph PATTERN and the vertices of the graph TARGET so that:

1. if there is an arc from u to v in the graph PATTERN, then there is also an arc from the image of u to the image of v in the graph TARGET,
2. if there is no arc from u to v in the graph PATTERN, then there is also no arc from the image of u to the image of v in the graph TARGET.

Both, the PATTERN and TARGET are fixed, and the vertices of both graphs are respectively defined by the two collections of vertices NODES_PATTERN and NODES_TARGET.

Example

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

Figure 5.368 gives the pattern (see Part (A)) and target graph (see Part (B)) of the **Example** slot as well as the one to one correspondence (see Part (C)) between the pattern graph and the target graph. The `graph_isomorphism` constraint since the pattern and target graphs have the same number of vertices and arcs and since:

- To the arc from vertex 1 to vertex 4 in the pattern graph corresponds the arc from vertex 4 to 1 in the target graph.
- To the arc from vertex 1 to vertex 2 in the pattern graph corresponds the arc from vertex 4 to 2 in the target graph.
- To the arc from vertex 2 to vertex 1 in the pattern graph corresponds the arc from vertex 2 to 4 in the target graph.
- To the arc from vertex 2 to vertex 4 in the pattern graph corresponds the arc from vertex 2 to 1 in the target graph.
- To the arc from vertex 2 to vertex 3 in the pattern graph corresponds the arc from vertex 2 to 3 in the target graph.

Typical $|\texttt{NODES\_PATTERN}| > 1$

Symmetries

- Items of `NODES_PATTERN` are permutable.
- Items of `NODES_TARGET` are permutable.

Algorithm A constraint approach is described in [395].

See also **related:** `subgraph_isomorphism`.

Keywords **constraint arguments:** constraint involving set variables.

constraint type: predefined constraint, graph constraint.

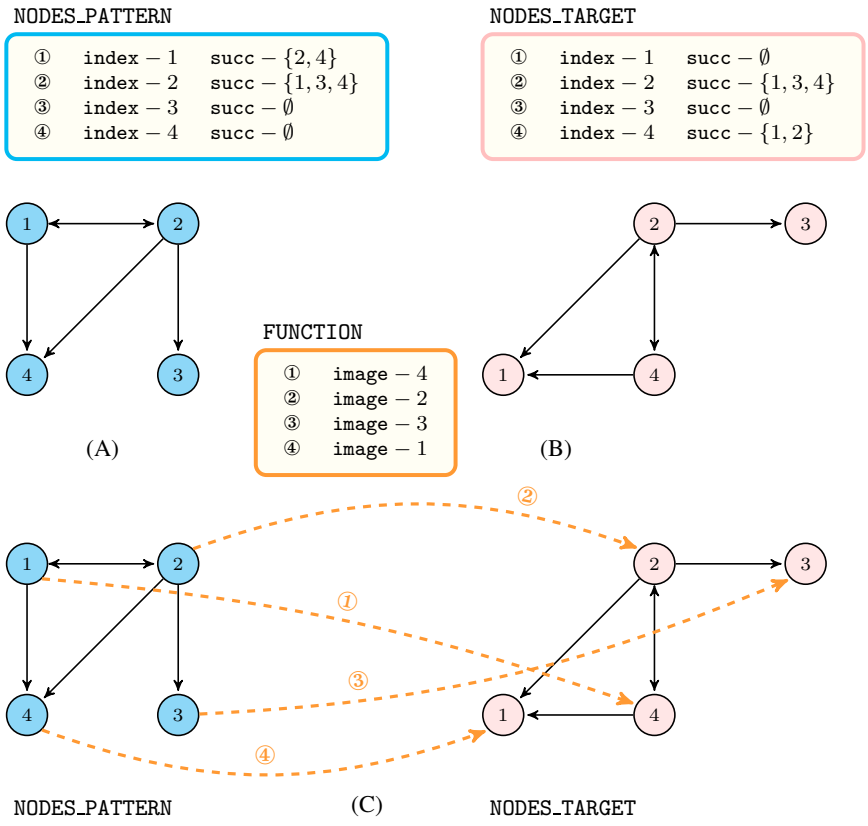

Figure 5.368: Illustration of the **Example** slot: (A) The pattern graph, (B) the target graph and (C) the correspondence, denoted by thick dashed arcs, between the vertices of the pattern graph and the vertices of the target graph