5.76 common_interval

DESCRIPTION LINKS GRAPH

Origin Derived from common.

Constraint $\texttt{common\_interval}\left(\begin{array}{l}\texttt{NCOMMON1},\\ \texttt{NCOMMON2},\\ \texttt{VARIABLES1},\\ \texttt{VARIABLES2},\\ \texttt{SIZE\_INTERVAL}\end{array}\right)$

Arguments

NCOMMON1	:	dvar
NCOMMON2	:	dvar
VARIABLES1	:	collection(var−dvar)
VARIABLES2	:	collection(var−dvar)
SIZE_INTERVAL	:	int

Restrictions

$\texttt{NCOMMON1} \geq 0$
$\texttt{NCOMMON1} \leq |\texttt{VARIABLES1}|$
$\texttt{NCOMMON2} \geq 0$
$\texttt{NCOMMON2} \leq |\texttt{VARIABLES2}|$
required(VARIABLES1, var)
required(VARIABLES2, var)
$\texttt{SIZE\_INTERVAL} > 0$

Purpose NCOMMON1 is the number of variables of the collection of variables VARIABLES1 taking a value in one of the intervals derived from the values assigned to the variables of the collection VARIABLES2: To each value v assigned to a variable of the collection VARIABLES2 we associate the interval $[\texttt{SIZE\_INTERVAL} \cdot \lfloor v/\texttt{SIZE\_INTERVAL} \rfloor, \texttt{SIZE\_INTERVAL} \cdot \lfloor v/\texttt{SIZE\_INTERVAL} \rfloor + \texttt{SIZE\_INTERVAL} - 1]$. NCOMMON2 is the number of variables of the collection of variables VARIABLES2 taking a value in one of the intervals derived from the values assigned to the variables of the collection VARIABLES1: To each value v assigned to a variable of the collection VARIABLES1 we associate the interval $[\texttt{SIZE\_INTERVAL} \cdot \lfloor v/\texttt{SIZE\_INTERVAL} \rfloor, \texttt{SIZE\_INTERVAL} \cdot \lfloor v/\texttt{SIZE\_INTERVAL} \rfloor + \texttt{SIZE\_INTERVAL} - 1]$.

Example $(3, 2, \langle 8, 6, 6, 0 \rangle, \langle 7, 3, 3, 3, 3, 7 \rangle, 3)$

In the example, the last argument $\texttt{SIZE\_INTERVAL} = 3$ defines the following family of intervals $[3 \cdot k, 3 \cdot k + 2]$, where k is an integer. As a consequence the items of collection $\langle 8, 6, 6, 0 \rangle$ respectively correspond to intervals $[6, 8]$, $[6, 8]$, $[6, 8]$ and $[0, 2]$. Similarly the items of collection $\langle 7, 3, 3, 3, 3, 7 \rangle$ respectively correspond to intervals $[6, 8]$, $[3, 5]$, $[3, 5]$, $[3, 5]$, $[3, 5]$, $[6, 8]$. The common_interval constraint holds since:

- Its first argument $\texttt{NCOMMON1} = 3$ is the number of intervals associated with the items of collection $\langle 8, 6, 6, 0 \rangle$ that also correspond to intervals associated with $\langle 7, 3, 3, 3, 3, 7 \rangle$.

- Its second argument NCOMMON2 $= 2$ is the number of intervals associated with the items of collection $\langle 7, 3, 3, 3, 3, 7\rangle$ that also correspond to intervals associated with $\langle 8, 6, 6, 0\rangle$.

Typical

$|$VARIABLES1$| > 1$
range(VARIABLES1.var) > 1
$|$VARIABLES2$| > 1$
range(VARIABLES2.var) > 1
SIZE_INTERVAL > 1
SIZE_INTERVAL $<$range(VARIABLES1.var)
SIZE_INTERVAL $<$range(VARIABLES2.var)

Symmetries

- Arguments are permutable w.r.t. permutation (NCOMMON1, NCOMMON2) (VARIABLES1, VARIABLES2) (SIZE_INTERVAL).
- Items of VARIABLES1 are permutable.
- Items of VARIABLES2 are permutable.
- An occurrence of a value of VARIABLES1.var that belongs to the k-th interval, of size SIZE_INTERVAL, can be replaced by any other value of the same interval.
- An occurrence of a value of VARIABLES2.var that belongs to the k-th interval, of size SIZE_INTERVAL, can be replaced by any other value of the same interval.

Arg. properties

- Functional dependency: NCOMMON1 determined by VARIABLES1, VARIABLES2 and SIZE_INTERVAL.
- Functional dependency: NCOMMON2 determined by VARIABLES1, VARIABLES2 and SIZE_INTERVAL.

See also

specialisation: common *(*variable/constant *replaced by* variable*)*.

Keywords

constraint arguments: constraint between two collections of variables, pure functional dependency.

final graph structure: acyclic, bipartite, no loop.

modelling: interval, functional dependency.

Arc input(s)	VARIABLES1 VARIABLES2
Arc generator	$PRODUCT \mapsto$ collection(variables1, variables2)
Arc arity	2
Arc constraint(s)	variables1.var/SIZE_INTERVAL = variables2.var/SIZE_INTERVAL
Graph property(ies)	• **NSOURCE**= NCOMMON1 • **NSINK**= NCOMMON2
Graph class	• ACYCLIC • BIPARTITE • NO_LOOP

Graph model Parts (A) and (B) of Figure 5.199 respectively show the initial and final graph associated with the **Example** slot. Since we use the **NSOURCE** and **NSINK** graph properties, the source and sink vertices of the final graph are stressed with a double circle. Since the graph has only 3 sources and 2 sinks the variables NCOMMON1 and NCOMMON2 are respectively equal to 3 and 2. Note that the vertices corresponding to the variables that take values 0 or 3 were removed from the final graph since there is no arc for which the associated arc constraint holds.

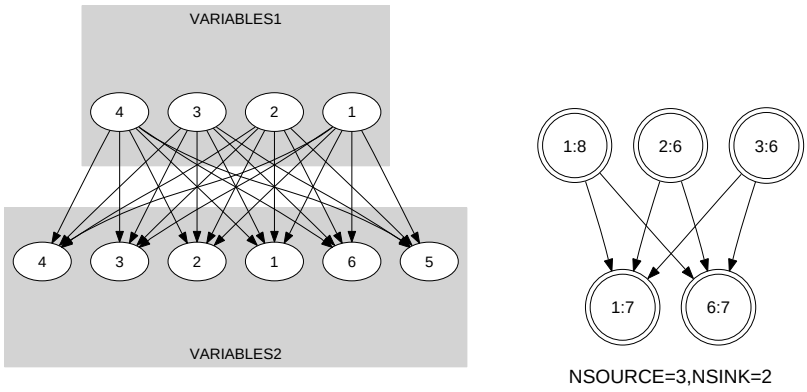

Figure 5.199: Initial and final graph of the common_interval constraint