## 5.181 in_relation

DESCRIPTION LINKS GRAPH

**Origin** Constraint explicitly defined by tuples of values.

**Constraint** in_relation(VARIABLES, TUPLES_OF_VALS)

**Synonyms** case, extension, extensional, extensional_support, extensional_supportva, extensional_supportmdd, extensional_supportstr, feastupleac, table.

**Types**

| | | |
|---|---|---|
| TUPLE_OF_VARS | : | collection(var−dvar) |
| TUPLE_OF_VALS | : | collection(val−int) |

**Arguments**

| | | |
|---|---|---|
| VARIABLES | : | TUPLE_OF_VARS |
| TUPLES_OF_VALS | : | collection(tuple − TUPLE_OF_VALS) |

**Restrictions**

required(TUPLE_OF_VARS, var)
|TUPLE_OF_VARS| ≥ 1
|TUPLE_OF_VALS| ≥ 1
|TUPLE_OF_VALS| = |VARIABLES|
required(TUPLE_OF_VALS, val)
required(TUPLES_OF_VALS, tuple)

**Purpose** Enforce the tuple of variables VARIABLES to take its value out of a set of tuples of values TUPLES_OF_VALS. The *value* of a tuple of variables $\langle V_1, V_2, \ldots, V_n \rangle$ is a tuple of values $\langle U_1, U_2, \ldots, U_n \rangle$ if and only if $V_1 = U_1 \wedge V_2 = U_2 \wedge \cdots \wedge V_n = U_n$.

**Example** $\left( \begin{array}{l} \langle 5,3,3 \rangle, \\ \langle \texttt{tuple} - \langle 5,2,3 \rangle, \texttt{tuple} - \langle 5,2,6 \rangle, \texttt{tuple} - \langle 5,3,3 \rangle \rangle \end{array} \right)$

The in_relation constraint holds since its first argument $\langle 5,3,3 \rangle$ corresponds to the third item of the collection of tuples TUPLES_OF_VALS.

**Typical** |TUPLE_OF_VARS| > 1

**Symmetries**

- Items of TUPLES_OF_VALS are permutable.
- Items of VARIABLES and TUPLES_OF_VALS.tuple are permutable (*same permutation used*).
- All occurrences of two distinct tuples of values in VARIABLES or TUPLES_OF_VALS.tuple can be swapped; all occurrences of a tuple of values in VARIABLES or TUPLES_OF_VALS.tuple can be renamed to any unused tuple of values.

**Arg. properties** Extensible wrt. TUPLES_OF_VALS.

**Usage** Quite often some constraints cannot be easily expressed, neither by a formula, nor by a regular pattern. In this case one has to define the constraint by specifying in extension the combinations of allowed values.

**Remark** The `in_relation` constraint is called `extensional_support` in **JaCoP** (`http://www.jacop.eu/`). Within **SICStus Prolog** the constraint can be applied to more than a single tuple of variables and is called `table`. Within [83] this constraint is called `extension`.

The `in_relation` constraint is called `table` in **MiniZinc** (`http://www.minizinc.org/`).

**Systems** `feasPairAC` in **Choco**, `infeasPairAC` in **Choco**, `relationPairAC` in **Choco**, `feasTupleAC` in **Choco**, `infeasTupleAC` in **Choco**, `relationTupleAC` in **Choco**, `extensional` in **Gecode**, `extensionalsupportVA` in **JaCoP**, `extensionalsupportMDD` in **JaCoP**, `extensionalsupportSTR` in **JaCoP**, `table` in **MiniZinc**, `case` in **SICStus**, `relation` in **SICStus**, `table` in **SICStus**.

**Used in** `cond_lex_cost`, `cond_lex_greater`, `cond_lex_greatereq`, `cond_lex_less`, `cond_lex_lesseq`.

**See also** **common keyword:** `element` *(data constraint)*.

**cost variant:** `cond_lex_cost` *(*`COST` *parameter added)*.

**used in graph description:** `vec_eq_tuple`.

**Keywords** **characteristic of a constraint:** tuple, derived collection.

**combinatorial object:** relation.

**constraint type:** data constraint, extension.

**filtering:** arc-consistency.

| | |
|---|---|
| **Derived Collection** | col( TUPLES_OF_VARS−collection(vec − TUPLE_OF_VARS), [item(vec − VARIABLES)] ) |
| **Arc input(s)** | TUPLES_OF_VARS TUPLES_OF_VALS |
| **Arc generator** | $PRODUCT \mapsto$ collection(tuples_of_vars, tuples_of_vals) |
| **Arc arity** | 2 |
| **Arc constraint(s)** | vec_eq_tuple(tuples_of_vars.vec, tuples_of_vals.tuple) |
| **Graph property(ies)** | **NARC**$\geq 1$ |

**Graph model** Parts (A) and (B) of Figure 5.423 respectively show the initial and final graph associated with the **Example** slot. Since we use the **NARC** graph property, the unique arc of the final graph is stressed in bold.

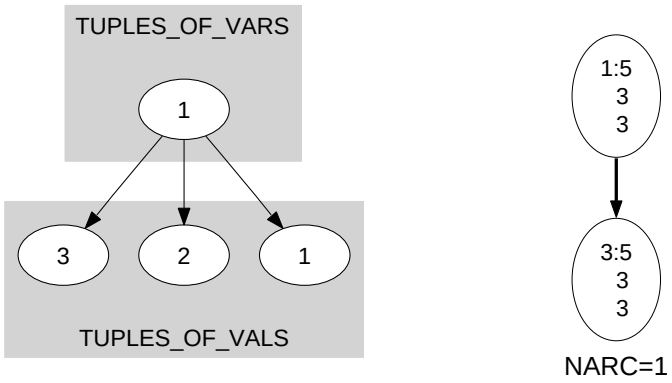


Figure 5.423: Initial and final graph of the in_relation constraint