5.274 nequivalence

DESCRIPTION LINKS GRAPH

Origin Derived from nvalue.

Constraint nequivalence(NEQUIV, M, VARIABLES)

Arguments

NEQUIV	:	dvar
M	:	int
VARIABLES	:	collection(var−dvar)

Restrictions

required(VARIABLES, var)
NEQUIV ≥ min(1, |VARIABLES|)
NEQUIV ≤ min(M, |VARIABLES|)
NEQUIV ≤range(VARIABLES.var)
M > 0

Purpose NEQUIV is the number of distinct rests obtained by dividing the variables of the collection VARIABLES by M.

Example $(2, 3, \langle 3, 2, 5, 6, 15, 3, 3\rangle)$

Since the expressions $3 \bmod 3 = 0$, $2 \bmod 3 = 2$, $5 \bmod 3 = 2$, $6 \bmod 3 = 0$, $15 \bmod 3 = 0$, $3 \bmod 3 = 0$, and $3 \bmod 3 = 0$ involve two distinct values (values 0 and 2), the first argument NEQUIV of the nequivalence constraint is set to value 2.

Typical

NEQUIV > 1
NEQUIV < |VARIABLES|
NEQUIV <range(VARIABLES.var)
M > 1
M <maxval(VARIABLES.var)

Symmetries

- Items of VARIABLES are permutable.
- An occurrence of a value u of VARIABLES.var can be replaced by any other value v such that v is congruent to u modulo M.

Arg. properties

- Functional dependency: NEQUIV determined by M and VARIABLES.
- Contractible wrt. VARIABLES when NEQUIV = 1 and |VARIABLES| > 0.
- Contractible wrt. VARIABLES when NEQUIV = |VARIABLES|.
- Extensible wrt. VARIABLES when NEQUIV = M.

Algorithm Since constraints $X = Y$ and $X \equiv Y (\bmod M)$ are similar, one should also use a similar algorithm as the one [27, 40] provided for constraint nvalue.

See also

related: nclass *(*variable mod constant *replaced by* variable ∈ partition*)*, ninterval *(*variable mod constant *replaced by* variable/constant*)*, npair *(*variable mod constant *replaced by* pair *of* variables*)*.

specialisation: nvalue *(*variable mod constant *replaced by* variable*)*.

Keywords

constraint arguments: pure functional dependency.

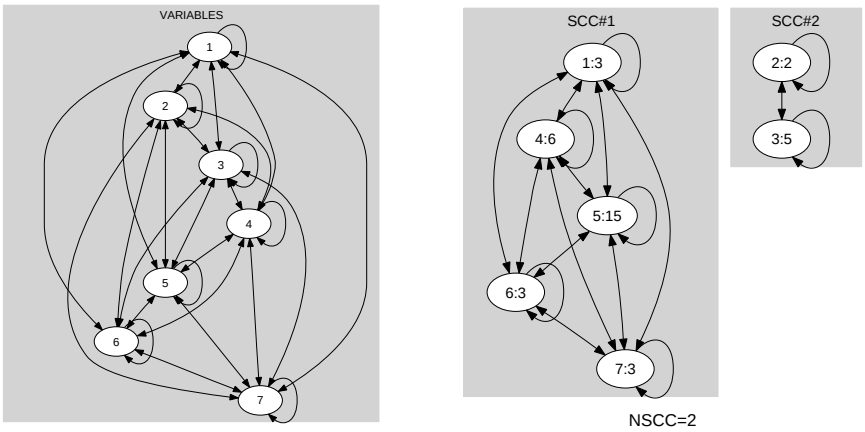
constraint type: counting constraint, value partitioning constraint.

final graph structure: strongly connected component, equivalence.

modelling: number of distinct equivalence classes, functional dependency.

Arc input(s)	VARIABLES
Arc generator	*CLIQUE*↦collection(variables1, variables2)
Arc arity	2
Arc constraint(s)	variables1.var mod M = variables2.var mod M
Graph property(ies)	NSCC= NEQUIV

Graph model Parts (A) and (B) of Figure 5.574 respectively show the initial and final graph associated with the **Example** slot. Since we use the **NSCC** graph property we show the different strongly connected components of the final graph. Each strongly connected component corresponds to one equivalence class: We have two equivalence classes that respectively correspond to values $\{3, 6, 15\}$ and $\{2, 5\}$.



(A) **(B)**

Figure 5.574: Initial and final graph of the nequivalence constraint