5.269 multi_inter_distance

DESCRIPTION LINKS

Origin [302]

Constraint multi_inter_distance(VARIABLES, LIMIT, DIST)

Synonyms multi_all_min_distance, multi_all_min_dist, sliding_atmost, atmost_sliding.

Arguments

VARIABLES	:	collection(var−dvar)
LIMIT	:	int
DIST	:	int

Restrictions

required(VARIABLES, var)
LIMIT >0
DIST >0

Purpose Enforce that at most LIMIT variables of the collection VARIABLES are assigned values in any set consisting of DIST consecutive integer values.

Example $(\langle 4,0,9,4,7\rangle, 2, 3)$

The multi_inter_distance constraint holds since, for each set of DIST $=3$ consecutive values, no more than LIMIT $=2$ variables of the VARIABLES collection $\langle 4,0,9,4,7\rangle$ are assigned a value from that set:

- At most two, in fact one, variables of the VARIABLES collection are assigned a value from the set $\{0,1,2\}$.
- At most two, in fact zero, variables of the VARIABLES collection are assigned a value from the set $\{1,2,3\}$.
- At most two, in fact two, variables of the VARIABLES collection are assigned a value from the set $\{2,3,4\}$.
- At most two, in fact two, variables of the VARIABLES collection are assigned a value from the set $\{3,4,5\}$.
- At most two, in fact two, variables of the VARIABLES collection are assigned a value from the set $\{4,5,6\}$.
- At most two, in fact one, variables of the VARIABLES collection are assigned a value from the set $\{5,6,7\}$.
- At most two, in fact one, variables of the VARIABLES collection are assigned a value from the set $\{6,7,8\}$.
- At most two, in fact two, variables of the VARIABLES collection are assigned a value from the set $\{7,8,9\}$.

Typical

LIMIT $>$ 1
LIMIT $<$ |VARIABLES|
DIST $>$ 1
DIST $<$range(VARIABLES.var)

Symmetries

- Items of VARIABLES are permutable.
- One and the same constant can be added to the var attribute of all items of VARIABLES.
- LIMIT can be increased.
- MINDIST can be decreased to any value $\geq$ 1.

Arg. properties

Contractible wrt. VARIABLES.

Usage

The multi_inter_distance constraint was tested for scheduling tasks that all have the same fixed duration in the context of air traffic management.

Algorithm

P. Ouellet and C.-G. Quimper came up with a cubic time complexity algorithm achieving bound-consistency in [302].

See also

generalisation: cumulative *(*line segment*, of same length, replaced by* line segment*)*.

specialisation: all_min_dist *(*LIMIT *parameter set to* 1*)*, cardinality_atmost *(window of* DIST *consecutive values replaced by window of size* 1*)*.

Keywords

application area: air traffic management.

constraint type: predefined constraint, value constraint, scheduling constraint.

filtering: bound-consistency.

modelling: at most.