

5.268 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 ≥ 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](#).