## 5.293 nvisible_from_end

DESCRIPTION LINKS AUTOMATON

**Origin** Derived from nvisible_from_start

**Constraint** nvisible_from_end(N, VARIABLES)

**Synonyms** nvisible, nvisible_from_right.

**Arguments**

| | | |
|---|---|---|
| N | : | dvar |
| VARIABLES | : | collection(var−dvar) |

**Restrictions**

required(VARIABLES, var)
N ≥ min(1, |VARIABLES|)
N ≤ |VARIABLES|

**Purpose** The $i^{th}$ $(1 \leq i \leq |\texttt{VARIABLES}|)$ variable of the sequence VARIABLES is *visible* if and only if all variables after the $i^{th}$ variable are strictly smaller than the $i^{th}$ variable itself. N is the total number of visible variables of the sequence of variables VARIABLES.

**Example**

$(2, \langle 1, 6, 2, 1, 4, 8, 2\rangle)$
$(1, \langle 3, 6, 2, 1, 4, 8, 8\rangle)$
$(7, \langle 9, 8, 7, 5, 4, 3, 2\rangle)$

The first nvisible_from_end constraint holds since the sequence 1 6 2 1 4 8 2 contains two visible items that respectively correspond to the seventh and sixth items.

**Typical**

|VARIABLES| > 2
range(VARIABLES.var) > 2

**Symmetry** One and the same constant can be added to the var attribute of all items of VARIABLES.

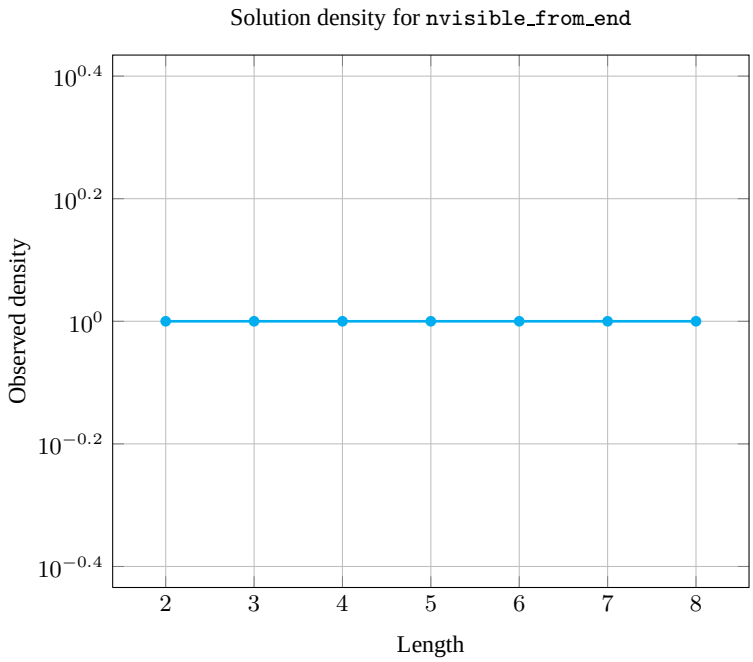
**Arg. properties**

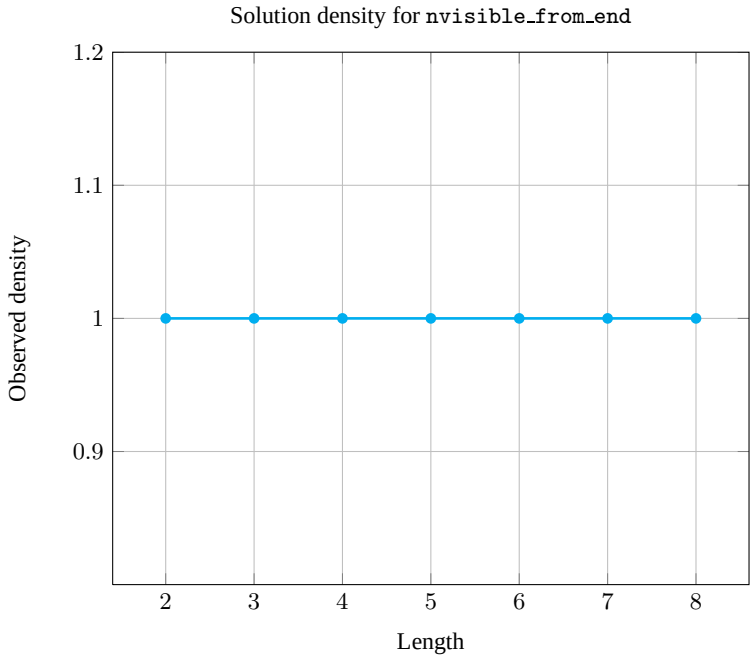
Functional dependency: N determined by VARIABLES.

**Counting**

| Length ($n$) | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| Solutions | 9 | 64 | 625 | 7776 | 117649 | 2097152 | 43046721 |

Number of solutions for nvisible_from_end: domains $0..n$

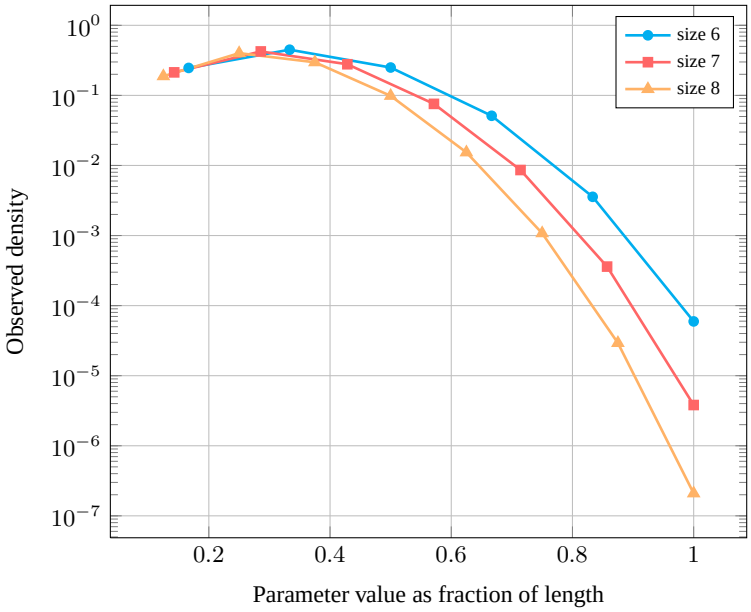

Solution density for nvisible_from_end
Observed density
$10^{0.4}$
$10^{0.2}$
$10^{0}$
$10^{-0.2}$
$10^{-0.4}$
2
3
4
5
6
7
8
Length

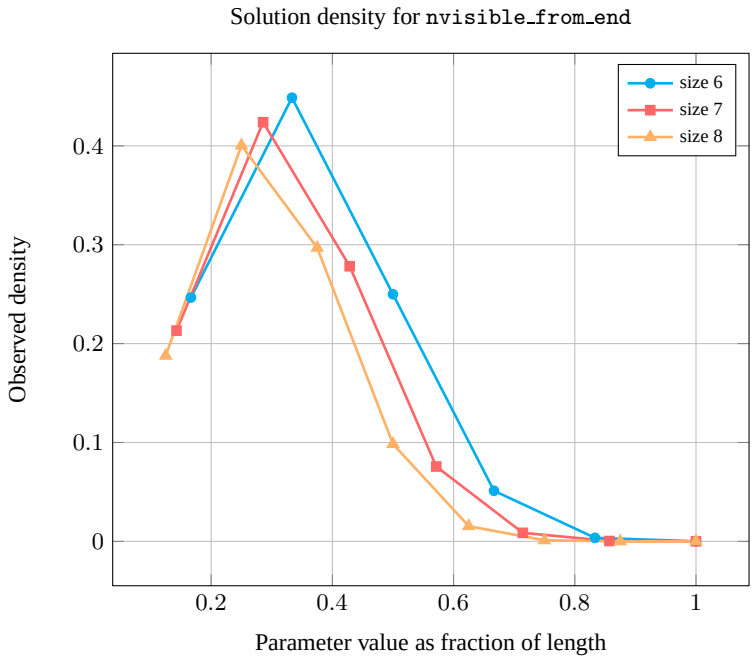

Solution density for nvisible_from_end
Observed density
1.2
1.1
1
0.9
2
3
4
5
6
7
8
Length

| Length ($n$) | | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Total | | 9 | 64 | 625 | 7776 | 117649 | 2097152 | 43046721 |
| Parameter value | 1 | 6 | 30 | 225 | 2275 | 29008 | 446964 | 8080425 |
| | 2 | 3 | 30 | 305 | 3675 | 52794 | 889056 | 17238570 |
| | 3 | - | 4 | 90 | 1610 | 29400 | 583548 | 12780180 |
| | 4 | - | - | 5 | 210 | 6020 | 158760 | 4238367 |
| | 5 | - | - | - | 6 | 420 | 18060 | 661500 |
| | 6 | - | - | - | - | 7 | 756 | 46410 |
| | 7 | - | - | - | - | - | 8 | 1260 |
| | 8 | - | - | - | - | - | - | 9 |

Solution count for `nvisible_from_end`: domains $0..n$

Solution density for `nvisible_from_end`






**See also**

**implies:** `atleast_nvalue`.

**related:** `nvisible_from_start` *(count from the start of the sequence rather than from the end)*.

**Keywords**

**combinatorial object:** sequence.

**constraint arguments:** pure functional dependency.

**modelling:** functional dependency.

**Automaton** Figure 5.626 depicts the automaton associated with the nvisible_from_end constraint.

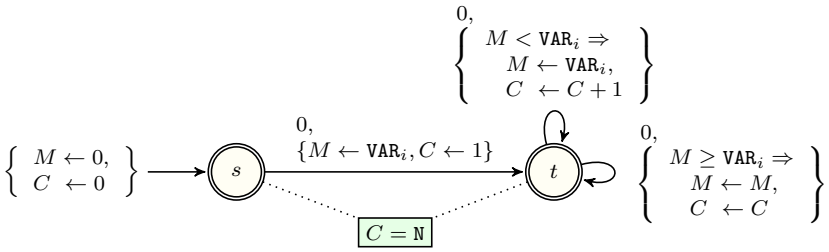



Figure 5.626: Automaton of the nvisible_from_end constraint with two counters $M$ and $C$, where $M$ records the largest value encountered so far, and $C$ the number of visible values from the right hand side of the sequence $\mathtt{VAR}_1, \mathtt{VAR}_2, \ldots, \mathtt{VAR}_n$ (i.e., the sequence $\mathtt{VAR}_n, \mathtt{VAR}_{n-1}, \ldots, \mathtt{VAR}_1$ is passed to the automaton)

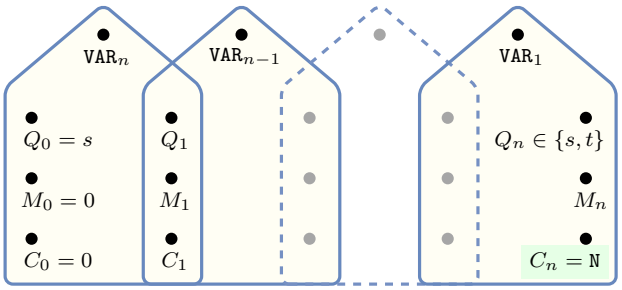



Figure 5.627: Hypergraph of the reformulation corresponding to the automaton (with two counters) of the nvisible_from_end constraint (since all states of the automaton are accepting there is no restriction on the last variable $Q_n$)