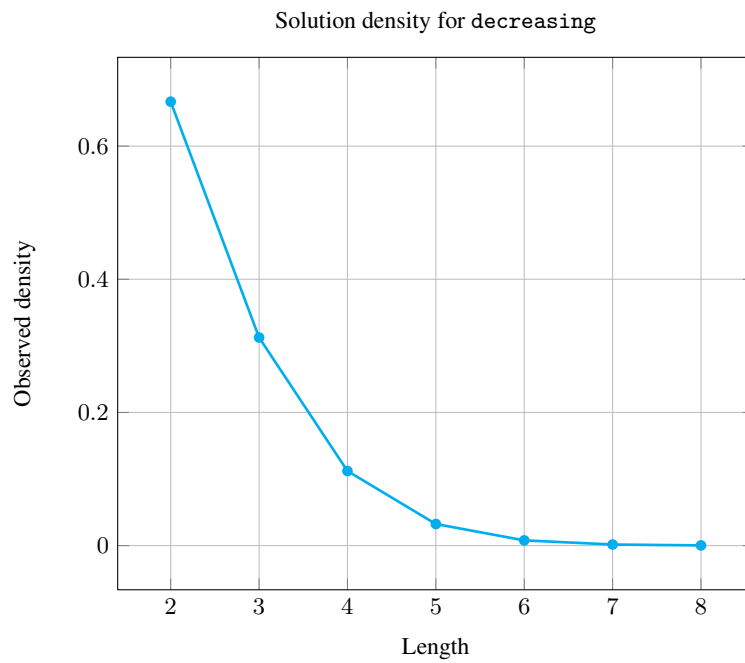
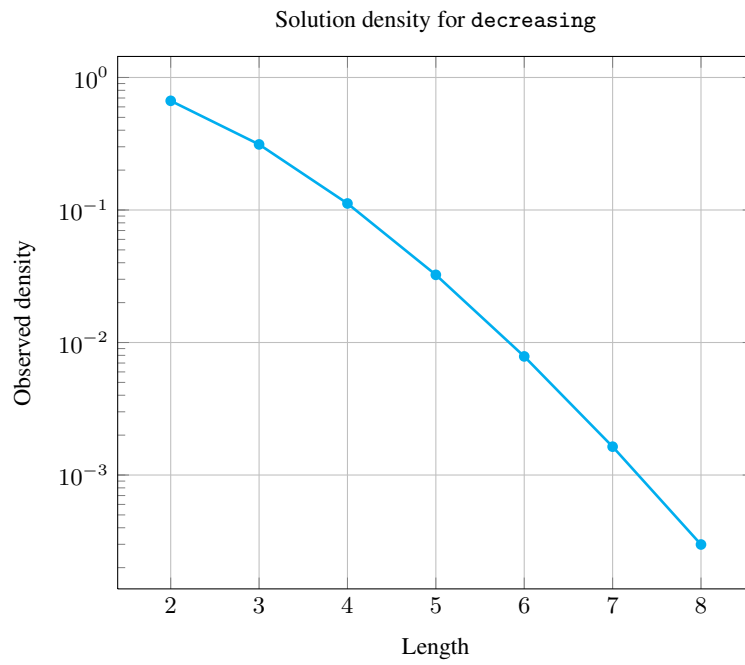


5.110 decreasing

| | DESCRIPTION | LINKS | GRAPH | AUTOMATON |
|-----------------|---------------------------------------------------------------------------------------------------------------------|-------|-------|-----------|
| Origin | Inspired by increasing . | | | |
| Constraint | <code>decreasing(VARIABLES)</code> | | | |
| Argument | VARIABLES : <code>collection(var-dvar)</code> | | | |
| Restriction | <code>required(VARIABLES, var)</code> | | | |
| Purpose | The variables of the collection VARIABLES are decreasing. | | | |
| Example | <code>((8, 4, 1, 1))</code> The decreasing constraint holds since $8 \geq 4 \geq 1 \geq 1$. | | | |
| Typical | <code> VARIABLES > 2</code> <code>range(VARIABLES.var) > 1</code> | | | |
| Symmetry | One and the same constant can be added to the <code>var</code> attribute of all items of VARIABLES. | | | |
| Arg. properties | Contractible wrt. VARIABLES. | | | |
| Counting | | | | |

| | | | | | | | |
|----------------|---|----|----|-----|-----|------|-------|
| Length (n) | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Solutions | 6 | 20 | 70 | 252 | 924 | 3432 | 12870 |

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



Systems [increasingNValue](#) in [Choco](#), [rel](#) in [Gecode](#), [decreasing](#) in [MiniZinc](#).

See also [common keyword: strictly_increasing \(order constraint\)](#).

comparison swapped: increasing.

implied by: all_equal, strictly_decreasing.

implies: multi_global_contiguity, no_peak, no_valley.

Keywords

characteristic of a constraint: automaton, automaton without counters, reified automaton constraint.

constraint network structure: sliding cyclic(1) constraint network(1).

constraint type: decomposition, order constraint.

filtering: arc-consistency.

final graph structure: acyclic, bipartite, no loop.

| | |
|----------------------------|-----------------------------------------------------------------------------------------------------|
| Arc input(s) | VARIABLES |
| Arc generator | $PATH \mapsto \text{collection}(\text{variables1}, \text{variables2})$ |
| Arc arity | 2 |
| Arc constraint(s) | $\text{variables1.var} \geq \text{variables2.var}$ |
| Graph property(ies) | $NARC = \text{VARIABLES} - 1$ |
| Graph class | <ul style="list-style-type: none"> • ACYCLIC • BIPARTITE • NO_LOOP |

Graph model

Parts (A) and (B) of Figure 5.242 respectively show the initial and final graph associated with the **Example** slot. Since we use the **NARC** graph property, the arcs of the final graph are stressed in bold.

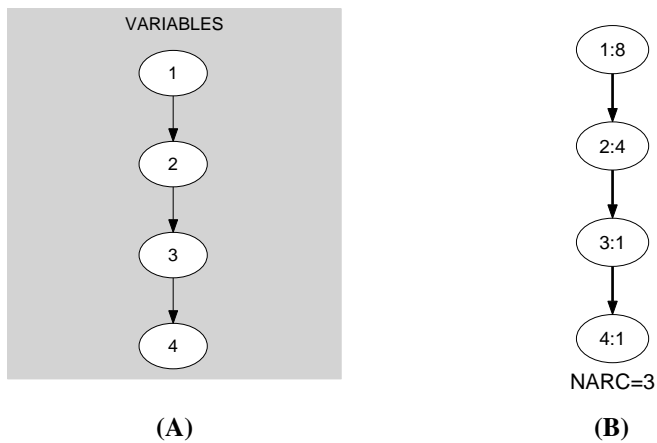


Figure 5.242: Initial and final graph of the decreasing constraint

Automaton

Figure 5.243 depicts the automaton associated with the decreasing constraint. To each pair of consecutive variables $(\text{VAR}_i, \text{VAR}_{i+1})$ of the collection VARIABLES corresponds a 0-1 signature variable S_i . The following signature constraint links VAR_i , VAR_{i+1} and S_i : $\text{VAR}_i \geq \text{VAR}_{i+1} \Leftrightarrow S_i$.



Figure 5.243: Automaton of the decreasing constraint

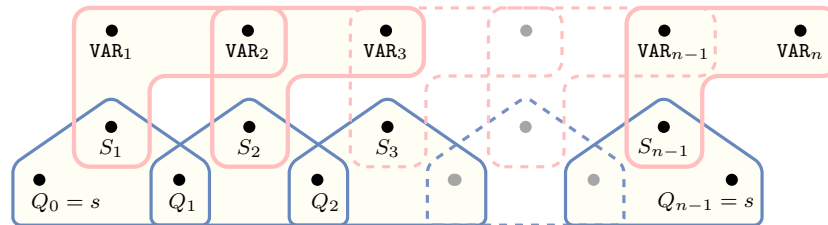


Figure 5.244: Hypergraph of the reformulation corresponding to the automaton of the decreasing constraint

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