5.276 relaxed_sliding_sum

DESCRIPTION LINKS GRAPH

Origin CHIP

Constraint relaxed_sliding_sum(ATLEAST, ATMOST, LOW, UP, SEQ, VARIABLES)

Arguments

ATLEAST	:	int
ATMOST	:	int
LOW	:	int
UP	:	int
SEQ	:	int
VARIABLES	:	collection(var−dvar)

Restrictions

ATLEAST ≥ 0
ATMOST $\geq$ ATLEAST
ATMOST $\leq |\text{VARIABLES}| - \text{SEQ} + 1$
UP $\geq$ LOW
SEQ > 0
SEQ $\leq |\text{VARIABLES}|$
required(VARIABLES, var)

Purpose There are between ATLEAST and ATMOST sequences of SEQ consecutive variables of the collection VARIABLES such that the sum of the variables of the sequence is in [LOW, UP].

Example

$$\left(\begin{array}{c} 3,4,3,7,4,\left\langle\begin{array}{c}\text{var}-2,\\ \text{var}-4,\\ \text{var}-2,\\ \text{var}-0,\\ \text{var}-0,\\ \text{var}-3,\\ \text{var}-4\end{array}\right\rangle \end{array}\right)$$

Within the sequence 2 4 2 0 0 3 4 we have exactly 3 subsequences of SEQ $=$ 4 consecutive values such that their sum is located within the interval [LOW, UP] $=$ [3, 7]: subsequences 4 2 0 0, 2 0 0 3 and 0 0 3 4. Consequently the relaxed_sliding_sum constraint holds since the number of such subsequences is located within the interval [ATLEAST, ATMOST] $=$ [3, 4].

Symmetries

- ATLEAST can be decreased to any value ≥ 0.
- ATMOST can be increased to any value $\leq |\text{VARIABLES}| - \text{SEQ} + 1$.
- Items of VARIABLES can be reversed.

Algorithm [29].

See also **hard version:** sliding_sum.
used in graph description: sum_ctr *(the sliding constraint)*.

Keywords **characteristic of a constraint:** hypergraph.
combinatorial object: sequence.
constraint type: sliding sequence constraint, soft constraint, relaxation.

Arc input(s)	VARIABLES
Arc generator	$PATH \mapsto$ collection
Arc arity	SEQ
Arc constraint(s)	• sum_ctr(collection, $\geq$, LOW) • sum_ctr(collection, $\leq$, UP)
Graph property(ies)	• NARC$\geq$ ATLEAST • NARC$\leq$ ATMOST

Graph model Within the context of the **Example** slot, the corresponding final directed hypergraph is given by Figure 5.505. For each vertex of the graph we show its corresponding position within the collection of variables. The constraint associated with each arc corresponds to a conjunction of two sum_ctr constraints involving 4 consecutive variables. We did not put vertex 1 since the single arc constraint that mentions vertex 1 does not hold (i.e., the sum $2 + 4 + 2 + 0 = 8$ is not located in interval $[3, 7]$). However, the directed hypergraph contains 3 arcs, so the relaxed_sliding_sum constraint is satisfied since it was requested to have between 3 and 4 arcs.

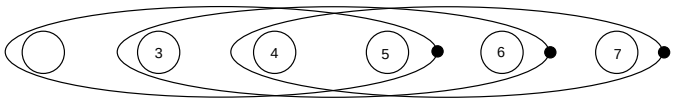

Figure 5.505: Final directed hypergraph associated with the example