

5.328 `sum_of_weights_of_distinct_values`

	DESCRIPTION	LINKS	GRAPH
Origin	[36]		
Constraint	<code>sum_of_weights_of_distinct_values(VARIABLES, VALUES, COST)</code>		
Synonym	<code>swdv</code> .		
Arguments	VARIABLES : <code>collection(var-dvar)</code> VALUES : <code>collection(val-int, weight-int)</code> COST : <code>dvar</code>		
Restrictions	<code>required(VARIABLES, var)</code> <code>required(VALUES, [val, weight])</code> <code>VALUES.weight ≥ 0</code> <code>distinct(VALUES, val)</code> <code>COST ≥ 0</code>		
Purpose	All variables of the VARIABLES collection take a value in the VALUES collection. In addition COST is the sum of the weight attributes associated with the distinct values taken by the variables of VARIABLES.		
Example	$\left(\left\langle \langle 1, 6, 1 \rangle, \left\langle \begin{array}{ll} \text{val} - 1 & \text{weight} - 5, \\ \text{val} - 2 & \text{weight} - 3, \\ \text{val} - 6 & \text{weight} - 7 \end{array} \right\rangle, 12 \right\rangle \right)$		
	The <code>sum_of_weights_of_distinct_values</code> constraint holds since its last argument <code>COST = 12</code> is equal to the sum $5 + 7$ of the weights of the values 1 and 6 that occur within the $\langle 1, 6, 1 \rangle$ collection.		
Symmetries	<ul style="list-style-type: none"> • Items of VARIABLES are permutable. • All occurrences of two distinct values of <code>VARIABLES.var</code> can be swapped. • Items of VALUES are permutable. • All occurrences of two distinct values in <code>VARIABLES.var</code> or <code>VALUES.val</code> can be swapped; all occurrences of a value in <code>VARIABLES.var</code> or <code>VALUES.val</code> can be renamed to any unused value. 		
See also	attached to cost variant: nvalue (<i>all values have a weight of 1</i>). common keyword: global-cardinality-with-costs , minimum-weight-alldifferent , weighted-partial-alldiff (<i>weighted assignment</i>).		
Keywords	application area: assignment . constraint type: relaxation . filtering: cost filtering constraint . problems: domination , weighted assignment , facilities location problem .		

Arc input(s)	VARIABLES VALUES
Arc generator	$PRODUCT \mapsto collection(variables, values)$
Arc arity	2
Arc constraint(s)	$variables.var = values.val$
Graph property(ies)	<ul style="list-style-type: none"> • $NSOURCE = VARIABLES$ • $SUM(VALUEs, weight) = COST$

Signature

Since we use the *PRODUCT* arc generator, the number of sources of the final graph cannot exceed the number of sources of the initial graph. Since the initial graph contains $|VARIABLES|$ sources, this number is an upper bound of the number of sources of the final graph. Therefore we can rewrite $NSOURCE = |VARIABLES|$ to $NSOURCE \geq |VARIABLES|$ and simplify $NSOURCE$ to $NSOURCE$.

Parts (A) and (B) of Figure 5.592 respectively show the initial and final graph associated with the **Example** slot. Since we use the $NSOURCE$ graph property, the source vertices of the final graph are shown in a double circle. Since we also use the SUM graph property we show the vertices from which we compute the total cost in a box.

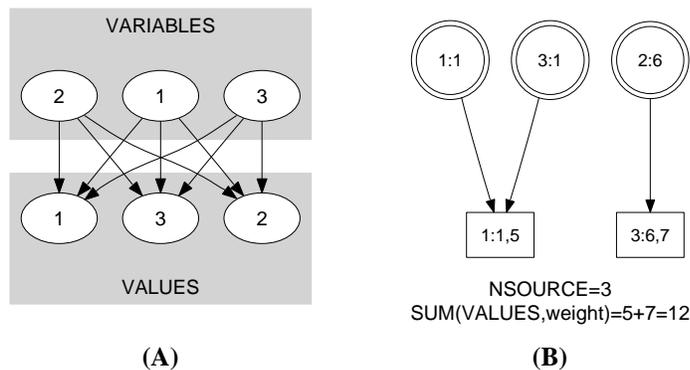


Figure 5.592: Initial and final graph of the `sum_of_weights_of_distinct_values` constraint