

## 5.71 connect\_points

	DESCRIPTION	LINKS	GRAPH
<b>Origin</b>	N. Beldiceanu		
<b>Constraint</b>	<code>connect_points(SIZE1, SIZE2, SIZE3, NGROUP, POINTS)</code>		
<b>Arguments</b>	<pre> SIZE1  : int SIZE2  : int SIZE3  : int NGROUP : dvar POINTS : collection(p-dvar) </pre>		
<b>Restrictions</b>	<pre> SIZE1 &gt; 0 SIZE2 &gt; 0 SIZE3 &gt; 0 NGROUP ≥ 0 NGROUP ≤  POINTS  SIZE1 * SIZE2 * SIZE3 =  POINTS  required(POINTS, p) </pre>		
<b>Purpose</b>	<div style="border: 1px solid pink; padding: 5px;"> <p>On a 3-dimensional grid of variables, number of groups, where a group consists of a connected set of variables that all have a same value distinct from 0.</p> </div>		

Example

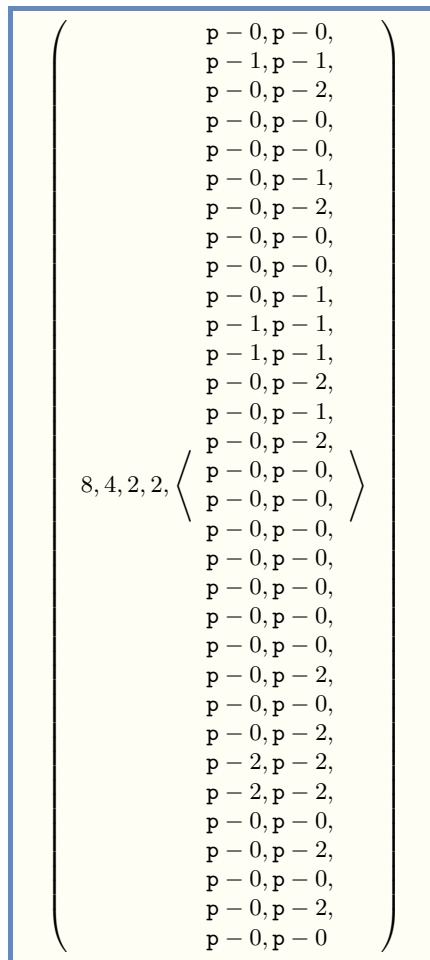


Figure 5.147 corresponds to the solution where we describe separately each layer of the grid. The connect\_points constraint holds since we have two groups (NGROUP = 2): a first one for the variables of the POINTS collection assigned to value 1, and a second one for the variables assigned to value 2.

0	0	1	1	0	2	0	0
0	0	0	1	0	2	0	0
0	0	0	1	1	1	1	1
0	2	0	1	0	2	0	0

0	0	0	0	0	0	0	0
0	0	0	0	0	2	0	0
0	2	2	2	2	2	0	0
0	2	0	0	0	2	0	0

Figure 5.147: The two layers of the solution

**Typical**

```
SIZE1 > 1  
SIZE2 > 1  
NGROUP > 0  
NGROUP < |POINTS|  
|POINTS| > 3
```

**Symmetry**

All occurrences of two distinct values of POINTS.p that are both different from 0 can be [swapped](#); all occurrences of a value of POINTS.p that is different from 0 can be [renamed](#) to any unused value that is also different from 0.

**Usage**

Wiring problems [348], [410].

**Keywords**

**characteristic of a constraint:** joker value.

**final graph structure:** strongly connected component, symmetric.

**geometry:** geometrical constraint.

**problems:** channel routing.

<b>Arc input(s)</b>	POINTS
<b>Arc generator</b>	<i>GRID</i> ([SIZE1, SIZE2, SIZE3]) $\mapsto$ <i>collection</i> (points1, points2)
<b>Arc arity</b>	2
<b>Arc constraint(s)</b>	<ul style="list-style-type: none"> <li>• points1.p <math>\neq</math> 0</li> <li>• points1.p = points2.p</li> </ul>
<b>Graph property(ies)</b>	<i>NSCC</i> = NGROUP
<b>Graph class</b>	<i>SYMMETRIC</i>

**Graph model**

Figure 5.148 gives the initial graph constructed by the *GRID* arc generator associated with the **Example** slot.

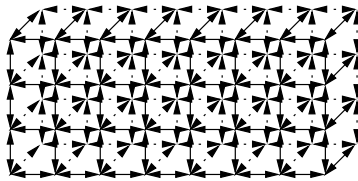


Figure 5.148: Graph generated by *GRID*( [ 8 , 4 , 2 ] )