

5.72 colored_matrix

	DESCRIPTION	LINKS
Origin	KOALOG	
Constraint	colored_matrix(C, L, K, MATRIX, CPROJ, LPROJ)	
Synonyms	coloured_matrix, cardinality_matrix, card_matrix.	
Arguments	<pre> C : int L : int K : int MATRIX : collection(column-int, line-int, var-dvar) CPROJ : collection(column-int, val-int, nocc-dvar) LPROJ : collection(line-int, val-int, nocc-dvar) </pre>	
Restrictions	<pre> C ≥ 0 L ≥ 0 K ≥ 0 required(MATRIX, [column, line, var]) increasing_seq(MATRIX, [column, line]) MATRIX = C * L + C + L + 1 MATRIX.column ≥ 0 MATRIX.column ≤ C MATRIX.line ≥ 0 MATRIX.line ≤ L MATRIX.var ≥ 0 MATRIX.var ≤ K required(CPROJ, [column, val, nocc]) increasing_seq(CPROJ, [column, val]) CPROJ = C * K + C + K + 1 CPROJ.column ≥ 0 CPROJ.column ≤ C CPROJ.val ≥ 0 CPROJ.val ≤ K required(LPROJ, [line, val, nocc]) increasing_seq(LPROJ, [line, val]) LPROJ = L * K + L + K + 1 LPROJ.line ≥ 0 LPROJ.line ≤ L LPROJ.val ≥ 0 LPROJ.val ≤ K </pre>	
Purpose	<div style="border: 1px solid pink; padding: 5px;"> <p>Given a matrix of domain variables, imposes a global_cardinality constraint involving cardinality variables on each column and each row of the matrix.</p> </div>	

Example

```

(
  1, 2, 4, <
    column - 0 line - 0 var - 3,
    column - 0 line - 1 var - 1,
    column - 0 line - 2 var - 3,
    column - 1 line - 0 var - 4,
    column - 1 line - 1 var - 4,
    column - 1 line - 2 var - 3
  >,
  column - 0 val - 0 nocc - 0,
  column - 0 val - 1 nocc - 1,
  column - 0 val - 2 nocc - 0,
  column - 0 val - 3 nocc - 2,
  <
    column - 0 val - 4 nocc - 0,
    column - 1 val - 0 nocc - 0,
    column - 1 val - 1 nocc - 0,
    column - 1 val - 2 nocc - 0,
    column - 1 val - 3 nocc - 1,
    column - 1 val - 4 nocc - 2
  >,
  line - 0 val - 0 nocc - 0,
  line - 0 val - 1 nocc - 0,
  line - 0 val - 2 nocc - 0,
  line - 0 val - 3 nocc - 1,
  line - 0 val - 4 nocc - 1,
  line - 1 val - 0 nocc - 0,
  <
    line - 1 val - 1 nocc - 1,
    line - 1 val - 2 nocc - 0,
    line - 1 val - 3 nocc - 0,
    line - 1 val - 4 nocc - 1,
  >
  line - 2 val - 0 nocc - 0,
  line - 2 val - 1 nocc - 0,
  line - 2 val - 2 nocc - 0,
  line - 2 val - 3 nocc - 2,
  line - 2 val - 4 nocc - 0
)

```

Typical

```

C ≥ 1
L ≥ 1
K ≥ 1
range(MATRIX.var) > 1

```

Arg. properties

- **Functional dependency**: CPROJ.nocc determined by C, L and K.
- **Functional dependency**: LPROJ.nocc determined by C, L and K.

Remark

Within [350] the colored_matrix constraint is called cardinality_matrix.

Algorithm

The filtering algorithm described in [350] is based on network flow and does not achieve arc-consistency in general. However, when the number of values is restricted to two, the algorithm [350] achieves **arc-consistency** on the variables of the matrix. This corresponds in fact to a generalisation of the problem called "Matrices composed of 0's and 1's" presented by Ford and Fulkerson [227].

See also

common keyword: `k_alldifferent` (*system of constraints*).

part of system of constraints: `global_cardinality`.

related to a common problem: `same` (*matrix reconstruction problem*).

Keywords

constraint arguments: pure functional dependency.

constraint type: system of constraints, predefined constraint, timetabling constraint.

modelling: functional dependency, matrix, matrix model.

20031017

831