

**Solver: Hidato**

Given a Hidato puzzle of size 6x6, the numbers from 1 to 36 have to be filled in a rectangular grid such that consecutive numbers are in neighboring cells of the grid (diagonally touching cells count as neighboring). Some numbers are already given as hints.

The linear program is written to solve that puzzle.

- Sets:

- Set  $I$ : number from  $1 \rightarrow n$  to be filled in the grids
- Set  $J$ : all cells indexed from  $1 \rightarrow n$
- Set  $K_j$ : determine a set of neighbouring cells for each cell  $j \in J$
- Set  $G = \{(i, j) \mid \text{number } i \text{ is given to be filled in cell } j\}$

- Parameter:

- $n = \text{size} \times \text{size}$ : in this instance, the number of parameters in  $I$  and  $J$  are  $6 \times 6 = 36$

- Variables:

- $x_{i,j}$ : binary variable that takes value 1 if value  $i$  is filled in cell  $j$  and 0 otherwise

- Constraints:

$$\forall (i, j) \in G : x_{i,j} = 1$$

(in words: the variable for given numbers and given cells to be filled accordingly must be 1)

$$\forall j \in J : \sum_{i \in I} x_{i,j} = 1$$

(in words: only one number is chosen to fill in each cell  $j$ )

$$\forall i \in I : \sum_{j \in J} x_{i,j} = 1$$

(in words: only one cell is chosen for each number  $i$  to be filled in)

$$\forall i \in I : x_{i,j} \leq \sum_{k \in K_j} x_{i+1,k}$$

(in words: if value  $i$  is filled in cell  $j$  then number  $(i + 1)$  must be filled in a cell within the neighbouring cells of  $j$ )

Simulation Result for Hidato.txt

4	3	2	<b>1</b>	25	23
5	<b>6</b>	27	26	22	<b>24</b>
7	28	29	32	<b>31</b>	21
8	12	33	<b>30</b>	<b>20</b>	19
<b>9</b>	11	<b>13</b>	34	25	18
10	14	15	16	17	<b>36</b>