Application of satisfiability

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Four propositions we need to assert:

1. every row contains every number.
2. every column contains every number.
3. every 3×3 block contains every number.
4. each cell contains no more than one number.

Compound proposition ← 1 ∧ 2 ∧ 3 ∧ 4

For 1:

Asserting that row 'i' contains number n, we have:

$$\bigvee_{j=1}^{n} p(i,j,n)$$

Asserting that row 'i' contains all n numbers, we have:

$$\bigwedge_{n=1}^{9} \bigvee_{j=1}^{9} p(i,j,n)$$

Asserting that all rows contains all n numbers, we have:

$$\bigwedge_{i=1}^{9} \bigwedge_{n=1}^{9} \bigvee_{j=1}^{9} p(i,j,n)$$

For 2:

Asserting that all columns contain all n numbers, we have:

$$\bigwedge_{j=1}^{9} \bigwedge_{n=1}^{9} \bigvee_{i=1}^{9} p(i,j,n)$$

3×3 block | i → 1 to 3, j = 1 to 3

For 3:

Asserting that row i of a given 3×3 block contains

$$\bigvee_{}^{3} (3 \quad 3$$

for ③

Asserting that row i of a given 3×3 block contains number n, we have: $\bigvee_{j=1}^{3} p(3r+i, 3s+j, n)$

Asserting that column j of a given 3×3 block contains number n, we have: $\bigvee_{i=1}^{3} \bigvee_{j=1}^{3} p(3r+i, 3s+j, n)$

Asserting that a given 3×3 block contains all numbers we have: $\bigwedge_{n=1}^{9} \bigvee_{i=1}^{3} \bigvee_{j=1}^{3} p(3r+i, 3s+j, n)$

To assert every 3×3 block contains all numbers we have: $\bigwedge_{r=0}^{2} \bigwedge_{s=0}^{2} \bigvee_{n=1}^{9} \bigvee_{i=1}^{3} \bigvee_{j=1}^{3} p(3r+i, 3s+j, n)$

for ④

For all $n \neq m$, if $p(i, j, n) \rightarrow \neg p(i, j, m)$