

Sudoku Solver Algorithm Report

1. Difficulty of Approach

The implemented Sudoku solver algorithm is moderately ambitious, utilizing a depth-first search approach combined with constraint propagation and the Minimum Remaining Values (MRV) heuristic. It balances complexity and efficiency to solve standard Sudoku puzzles.

2. Description of Algorithm

The algorithm uses depth-first search to explore possible solutions, backtracking when a dead end is reached. Constraint propagation ensures that each number is unique in its row, column, and 3x3 grid. The MRV heuristic optimizes the search process by choosing the next cell to be filled based on the fewest remaining legal values, reducing the search space.

3. Optimisations and Complexity

The optimisations include enhanced constraint propagation and the MRV heuristic. These significantly reduce the number of computations by narrowing down the search space, leading to a faster solution. The complexity of the algorithm is primarily affected by the depth-first search, which in the worst case can explore an exponential number of possibilities, but is mitigated by the other optimisations.

4. Reflections and Suggestions for Further Work

The approach is effective for standard Sudoku puzzles but may struggle with more complex variants. Further work could involve implementing more advanced strategies like naked pairs, hidden singles, or X-Wing, which can solve tougher puzzles. Additionally, parallel processing could be explored to further improve performance.