

We develop an algorithm to efficiently generate Sudoku puzzles with a unique solution of varying difficulty. Using MATLAB and its pseudo-random number generator, which we assume to be random; the algorithm creates unique Sudoku boards based on permutations of a randomly generated seed block. We apply all possible permuting operations that preserve a proper Sudoku board in a randomization procedure. Boards undergo rotationally symmetric entry elimination which is defined to maintain solvability and a unique solution. We construct a difficulty metric to be a function of given entries, solver iterations, and logical deduction methods, which is evaluated after each successive entry elimination. The entry elimination procedure terminates upon reaching a user-specific difficulty level.

Unfortunately, our algorithm for generating unique Sudoku puzzles can produce only a small subset of all possible Sudoku boards. However, we define our difficulty metric and elimination procedure to be extensible to any number of deduction methods. Thus, assuming we use an algorithm that generates all possible boards, the application of our metric and elimination procedure is still valid since it yields puzzles with a unique solution of varying difficulty.