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Department of

Abstract

The standard Sudoku puzzle is an 9 × 9 grid partitioned into 3 × 3 square boxes and partially filled with symbols from the set {1, 2, ..., 9}, with the goal of the puzzle being to complete the grid so that each symbol appears once and only once in each row, column, and box. We study generalized Sudoku puzzles, set on an $n \times n$ grid with cells partitioned into n boxes (sometimes called cages) of height h and width w such that $hw = n$. Throughout this work, these generalized Sudoku are referred to as (h,w)

symmetric and is indexed by edges which represent all of the conditions for any (h,w)-Sudoku, later leveraging the inherent symmetry of equivalence relations in these conditions to establish a Sudoku adjacency algebra which contains M. This allows us to explicitly construct a generalized inverse for M. This generalized inverse, along with some applied perturbation theory, is used to show that given large enough h and w, the linear system for any sufficiently sparse partial (h,w)-Sudoku is a minor perturbation of the linear system for the empty (h,w)-Sudoku, and therefore allows a