TECHNISCHE UNIVERSITÄT
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Computer Algebra

Summer Term 2019 - Programming Project

Due Date: Thursday, July 11, 2019, 10:00 am

The goal of this programming project is to use the theory of Gröbner bases to solve Sudokus. If you do not know what a Sudoku is you can look it up on Wikipedia. Your task is divided into two parts, namely a theoretical part where you describe the theory and practical one, where you implement a Sudoku solver in SINGULAR. Being precise your task looks as follows:

Exercise 1. Present a theoretical approach using Gröbner bases to solve an arbitrary Sudoku tableaux, where you may assume that the solution is unique. Give explicit proofs for all theoretical results you need, if they have not been shown in this lecture.

Exercise 2. Assume that a Sudoku tableaux with a unique solution is given by a matrix $A \in \mathbb{Z}^{9\times 9}$, which has 0 as an entry for every unknown. Write a SINGULAR function `Sudoku(matrix A)` which returns the solution of the Sudoku as a matrix $B \in \mathbb{Z}^{9\times 9}$. Run your code on at least two examples and add those to your code.