

# Static Analysis of Microcontroller Software using SAT- and Constraint-Solving

## Motivation

Classical static analysis problems such as reaching definitions analysis or live variables analysis can not only be described by means of equation system, but it is also well-known that such analyses can equivalently be defined as set-constraints [Aik99]. Recently, there have been manifold advances in Boolean satisfiability solvers, making it possible to analyze formulae consisting of millions of variables.

## Task

The aim of this thesis is to utilize recent advances in the field of SAT/SMT and constraint solving in order to implement scalable static analyses. These techniques shall be integrated into [mc]square, which is a model checker for microcontroller assembly code. Apart from deriving encodings of classical analyses, the student shall develop and implement methods for performing value-set analysis of microcontroller assembly code.

## Fields of Study

- Computer science

## Required Knowledge

- Java
- Basic knowledge of embedded systems and microcontroller programming

## Student

- Lucas Brutschy

## Tutor

- [Dr. rer. nat. Jörg Brauer](#)

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