Informatik 11
Embedded Software

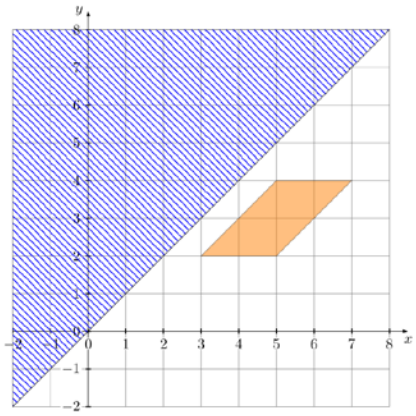
RWTH AACHEN UNIVERSITY

Bachelor's Thesis

Relational Policy Iteration for Static Analysis of PLC Programs

Problem Statement

An important program analysis is the static analysis, which determines, among other information, value sets of variables at program locations without explicitly running the program. To determine simple relationships between variables in static analysis, relational domains have been developed. One of these domains is called *Octagons*[1] and captures simple inequalities for sums and differences of two variables.



Because classical static analysis oftentimes takes a lot of steps, a technique called *policy iteration*[2] was developed, which generates a set of simpler programs with similar behaviour to the original program and uses analysis results from these programs to calculate the result for the actual program.

Task

ARCADE, a program analysis tool for industrial control software developed at i11, already contains a rudimentary implementation for policy iteration on intervals, as well as classical static analysis on Octagons. The goal of this thesis is to combine both approaches such that the policy iteration can be used with Octagons.

Qualifications

Knowledge of formal methods, especially in the context of static analysis, is greatly appreciated. Since the policy iteration has been implemented in the C++-Version of ARCADE, applicants should be well-versed in programming C++.

Advisor

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[1] Miné, A. (2006), The octagon abstract domain., in Higher-Order and Symbolic Computation., Springer, pp.31-100

[2] Costan, A.; Gaubert, S.; Goubault, E.; Martel, M. & Putot, S. (2005), A Policy Iteration Algorithm for Computing Fixed Points in Static Analysis of Programs., in Kousha Etessami & Sriram K. Rajamani, ed., 'CAV' , Springer, pp. 462-475 .