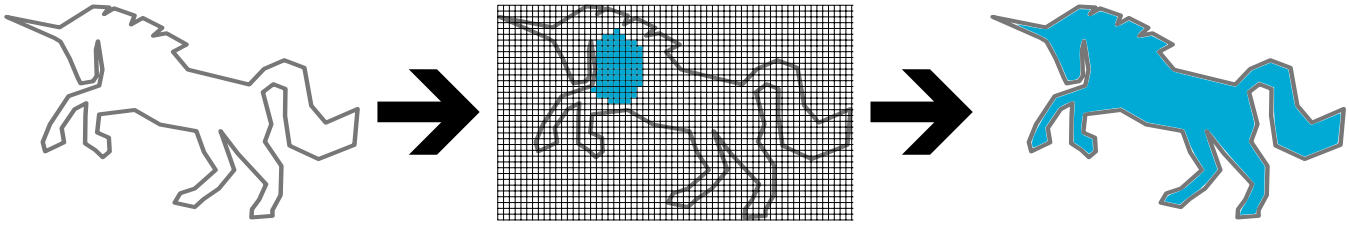
Karlsruher Institut für Technologie

Institut für Theoretische Informatik (ITI)
Anwendungsorientierte Formale Verifikation
Prof. Dr. Bernhard Beckert

Master's Thesis / Praxis der Forschung

Formal verification of a parallelized FloodFill algorithm



Context. In scientific computing today, parallelization are increasingly important techniques that guarantee that, despite the weakening of Moore's Law, it is still possible to scale for intensive computing tasks.

Problematic. At the same time, the implementations are becoming more complex and less understandable. It's easier for mistakes to creep in.

Potential. Formal methods can help to detect automatically or manually errors in implementations at different levels.

Objectif. In colaboration with the IAM-CMS lab. of material science at KIT (`http://www.iam.kit.edu/cms/`), we want to show that a distributed floodfill algorithm (based on MPI) works correctly, i.e. no runtime errors, equivalence between parallel and sequential implementation and termination.

Your Task. You can choose between bounded modelchecking using CBMC (`http://www.cprover.org/cbmc`), abstract interpretation or verification condition generation using Frama-C (`https://frama-c.com`) to achive one or more of the objectives. The proposed tool and methods are not mandatory.

Your profile. Ideally, you have a basic background in *formal systems* (e.g., from respective lectures of the KIT curricula). You are interested in applying existing Formal Methodes and have experience in C programming.

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