Universität Rostock
Traditio et Innovatio

FAKULTÄT FÜR
INFORMATIK UND
ELEKTROTECHNIK

Universität Rostock | Fakultät für Informatik und Elektrotechnik
18059 Rostock, Albert-Einstein-Straße 21

Universität Rostock
Fakultät für Informatik
und Elektrotechnik
Institut für Angewandte
Mikroelektronik und Datentechnik

Specialization Module/Master project/Software Lab Project

Quantization of Search Space Coverage

[Problem Description]

When designing complex embedded systems, a plethora of choices have to be explored and evaluated. There are typically two approaches to perform such design space exploration: heuristically and formally. While the former includes mainly meta-heuristic approaches such as evolutionary algorithms, in the latter technique, all possible combinations have to be either checked or safely pruned from the search space. Heuristic population-based approaches typically have an advantage when many valid solutions exist as they can cover large regions of the search space in parallel. However, they perform worse when only few feasible solutions exist as they tend to miss the valid region of the search space. Another disadvantage is that it is hard to prove infeasibility of a given problem and to keep track of already searched regions. Formal methods, such as SAT and ASP, on the contrary, can prove if a solution does not exist and tend to find valid regions faster even if only a fraction of solutions is feasible. Furthermore, the search space is explored systematically, such that no solution is visited and evaluated twice – visited regions are saved by the solver through conflict clauses. However, for complex real-world problems, a complete coverage of the search space is infeasible as the search space is simply too large.

Whenever the solving is interrupted before all decisions have been evaluated, a fraction of search space has not been visited. This fraction is an important information for the development of new exploration techniques. Obtaining it is, however, not a trivial problem. Different conflict clauses that are added to prune regions of the search space might overlap and can thus not simply added together.

In this work, it is therefore to be determined how the coverage of the search can be calculated for a specific problem when the solver is interrupted before completion. A proof of concept implementation shall be given to show the functionality of the approach.

[Prerequisites]

- Selected Topics in Embedded Systems Design or similar module
- Basic understanding in SAT, ASP, or ILP

Supervisor: M.Sc. Kai Neubauer