

# Bachelor Thesis

## Optimized GPU-Accelerated Fault Simulation with Fault Grouping

In today's technology nodes a growing number of chips contain safety-critical components which are used in advanced driver assistance and in future for level 5 full self driving vehicles. The chips used in this area have demanding requirements for long-term reliability which increases the simulation runtime for test validation. Therefore electronic design automation tools are mostly compute intensive when running circuit simulations and result therefore in a bottleneck, when simulated with multi-million gate designs.

### Problem statement:

This bachelor thesis focus on implementing an optimized greedy algorithm in C++ that groups parallel computable faults together and therefore optimizes both the runtime of the greedy algorithm and the runtime of the GPU-accelerated fault simulation. Figure 1 shows a simple example of this idea. The evaluation of this work is done by comparing the new implemented algorithm with an existing approach implemented in Java [2].

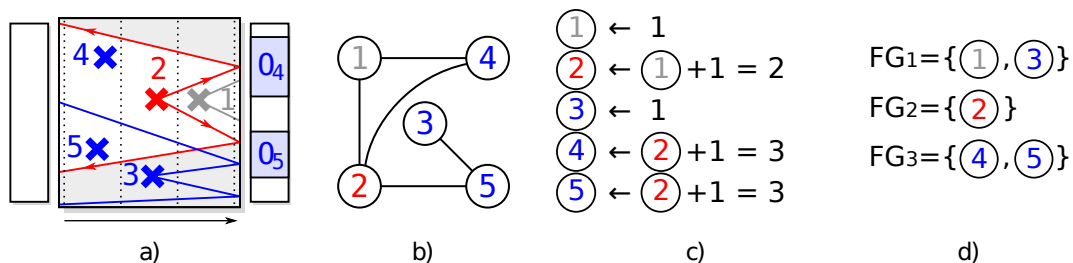


Figure 1: Fault grouping example: a) Fault set  $F := f_1, f_2, f_3, f_4, f_5$  in reverse topological order, b) output-dependencies, c) group indices and d) resulting fault groups. Obtained from [1].

### Solution aspects:

- Literature survey on the problem
- Implement and evaluate both approaches
- Using GPU-Simulation.
- Evaluation of the approach by means of simulation

### Requirements:

- Interest in working in a current research project [FAST](#) supported by the DFG
- Skills in C++, git, cmake, (a little bit Java)

### Literature:

- E. Schneider, "Multi-level simulation of nano-electronic digital circuits on GPUs" - Dissertation, University of Stuttgart 2019
- E. Schneider, S. Holst, M. A. Kochte, X. Wen and H. Wunderlich, "GPU-accelerated small delay fault simulation," 2015 Design, Automation & Test in Europe Conference & Exhibition (DATE), Grenoble, France, 2015, pp. 1174-1179.

**Supervisor:** Jan Dennis Reimer, M.Sc.

**Email:** [jan.dennis.reimer@upb.de](mailto:jan.dennis.reimer@upb.de)

**Phone:** (+49) 5251 60-3922

**Homepage:** <https://ei.uni-paderborn.de/date/>

**Office:** P1.6.08.4