Electronic Design Automation
TUM Department of Electrical and Computer Engineering
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Ingenieurspraxis

Implementation of a Switching Activity Estimator in the PyMTL3 Framework

In System on Chip (SoC) design, power consumption gets increasingly important (e.g. due to increasing complexity of the devices and contrary, due to the growing number of mobile applications). Although precise gate-level simulation methods exist, they are not feasible for larger designs. Therefore, less accurate, but faster methods have been developed. For dynamic power dissipation, the switching activity of a design is crucial (beside technological parameters). Here, methods use Monte-Carlo principles to obtain average power estimates by simulating a large number of random inputs (called statistical-based methods) [1].

Various platforms exist for the developement of the SoC itself. On one side, classic, commercial tools exist for the design and synthesis flow. Hardware description languages (HDL), like VHDL or Verilog, exist for an efficient modeling and design process. In recent research, also open source solutions in EDA are developed. For example, the PyMTL(3) framework should provide hardware modeling capabilities on various levels of system design [2]. This Python(3)-based framework consists of an own HDL, an API to the elaborated design and the possibility to develop custom extension programs (passes called) for further investigation. This includes for example already various passes for simulations.

In previous work, the concept of the incorporation of a statistical-based switching activity estimator into the PyMTL3 framework has been developed. The objective of this project should now be to implement this concept.

[1] NAJM, Farid N.; XAKELLIS, Michael G. Statistical Estimation of the, Switching Activity in VLSI Circuits. VLSI Design, 1998, 7. Jg., Nr. 3, S. 243-254.
[2] Jiang, S., Pan, P., Ou, Y., & Batten, C. (2020). PyMTL3: a Python framework for open-source hardware modeling, generation, simulation, and verification. IEEE Micro, 40(4), 58-66.

Prerequisites

- Very good experience in Python programming
- Interest in extending an open-source hardware developement framework
- Knowledge in HDLs and CMOS power consumption
- Ability to work independently

Contact

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Advisors

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