XinDA

Charlie

Fast, accurate, automated and variation-aware library characterization for memory and mixed-signal designs

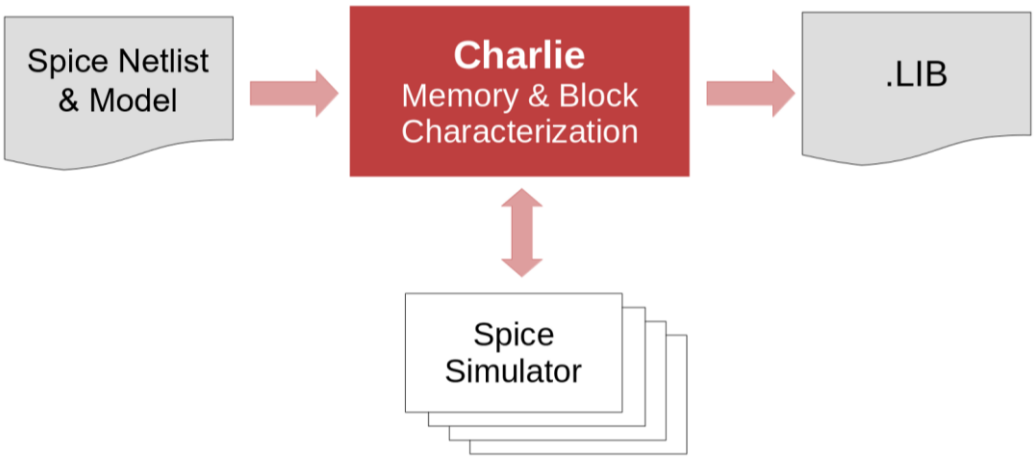
Overview

The continuous technology progression into deeper nanometer regime together with consumers' desire for low power mobile devices have drastically increased the need for cell libraries to hundreds of PVT corners and also with extensions to model the effects of process variation. This need is particularly acute in library characterization of embedded memories and mixed-signal blocks where the traditional approach of simulating the entire circuit or a circuit slice no longer meet the performance requirements.

Furthermore, the memory array poses an additional challenge due to its size and analog nature of the sense amplifiers. Charlie's innovative machine learning approach accurately captures the simulation behavior of the memory array and seamlessly integrates into the overall static timing analysis framework.

Charlie is a new generation memory and block characterization tool that produces nominal and process variation (LVF) libraries at a fraction of the runtime as existing tools that produces only nominal libraries. It achieves this by automatically applying local simulations to local variation sources, and automatically propagating the variation effects throughout the circuit.

Charlie is SPICE simulator independent and it is integrated with popular commercial SPICE and FastSPICE simulators for high performance parallel simulation.



Benefits

Performance

Charlie achieves orders of magnitude speedup over existing memory characterization solutions through divide and conquer. It partitions the input netlist, including the memory array, into manageable pieces for efficient simulation.

Multi-threaded SPICE simulations propagate transient waveforms throughout the circuit. On-chip variation (OCV) simulations are performed efficiently at the local circuit level, enabling LVF characterization at a low single-digit runtime multiple over nominal library.

Accuracy

Charlie utilizes true SPICE simulation of partitioned post-layout netlist, including detailed parasitics and considering timing impact from IR-drop, to achieve highest accuracy even at ultra-low supply voltages.

OCV simulations are performed at the partitioned circuit to ensure accurate and exhaustive exploration of transistor and random process parameter variations. Monte Carlo sampling is independent from SPICE simulation, enabling a huge number of samples required for high-sigma characterization of each library arc.

Automation

Charlie automatically generates all possible stimuli for the circuit, as well as all path measurements necessary for each library arc.

For very large partitions such as memory array or analog circuitry, Charlie automatically learns from top-level simulation and integrates into the internal vector database.

Features

- Fast and accurate library characterization of memory and mixed-signal designs, including process variation effects.
- Static analysis provides superior coverage of worst case vectors and timing paths. Advanced multi-threaded vectorless engine automates stimuli generation.
- Automatic generation of all library arcs and automatic re-characterization of existing library arcs.
- Circuit level OCV simulations ensure accurate and exhaustive exploration of transistor and random process parameter variations including high-sigma analysis.
- Built-in circuit analysis including minimum operating voltage and sense amplifier voltage differential.
- High performance parallel simulations with true SPICE accuracy. Support commercial SPICE and FastSPICE simulators.
- Automatic identification of latches, flip-flops and memory arrays.
- Advanced timing analysis including SI and Multiple-input switching (MIS).
- Support hierarchical or flat, SPICE or DSPF netlists.
- Support embedded Liberty model or black box as part of design.
- Generates Liberty NLDM, NLPM, CCS, CCSN models.
- Generates Liberty LVF process variation models including moment LVF.

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Re-imagine
Transistor Level Circuit Analysis

XinDA Design Automation is an Electronic Design Automation company headquartered in Hong Kong. XinDA re-imagines transistor level circuit analysis to create innovative software solutions that enable orders of magnitude productivity gains in memory and mixed-signal block library characterization.

 www.xindadesign.com