Sensitivity Analysis of Compact Models in Nanodevice Modeling

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Statistical variability within transistors is a major obstacle in the continued scaling of Complementary Metal–oxide Semiconductor (CMOS) microchips in future nano-scale technology generations. Statistical variations between transistors mainly occur due to the random number and position of discrete dopants - chemical spices introduced in the silicon of which the microchips are made to form the structure of the individual transistors. This statistical variability means that circuits built from billions of transistors with individually-unique properties may not perform as well as expected, despite being manufactured in an identical way.

In this paper, the threshold-voltage-based BSIM4 compact model is under consideration. A detailed analysis of metamodeling procedure in this particular case has been done. Sobol' sensitivity approach is applied for a selected subset of parameters to analyze statistical variability.