Abstracts

Global modeling of active microwave devices incorporating a novel large-signal time-domain full-hydrodynamic physical simulator using wavelet-based adaptive grids

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A novel large-signal time-domain simulation approach for full-hydrodynamic physical modeling of semiconductor devices using Wavelet-based adaptive grids is presented. The non-uniform grids of the main variables are conceived at a given time by applying biorthogonal Wavelet transforms to the current variable solutions followed by thresholding. A general criterion is mathematically defined for grid updating of each variable within the simulation. This criterion allows grid updating only when needed. In addition, few rules have been defined to take care of the fact that boundary conditions as well as descritization have to be handled differently for each new grid. Grids of the main variables are combined into one non-uniform grid whenever a new variable grid is conceived. The proposed technique is validated by simulating a submicrometer MESFET. The results of the proposed technique are compared with the results of a regular grid case showing more than 60% simulation time reduction while maintaining the same degree of accuracy. This is a first step toward applying Wavelets to global modeling of active microwave devices aiming to reduce the simulation time.

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