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Transient Adjoint Sensitivity Simulation and its Application

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BIO

Ron Rohrer is Cecil & Ida Green Professor of Electrical and Computer Engineering in the Bobby B. Lyle School of Engineering at Southern Methodist University.

Ron received the B.S. (1960) degree from Massachusetts Institute of Technology (MIT) and the M.S. (1961) and Ph.D. (1963) degrees from the University of California (UC), Berkeley.

Ron was the founding editor (1981-1984) of the IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems and served as president (1987) of the IEEE' Circuits and Systems Society. He was elected Fellow of the IEEE in 1980 *"for theoretical contributions and practical software for computer-aided circuit design."* In 1989 he was inducted into the National Academy of Engineering *"for contributions to circuit simulation that have enabled deep submicron IC design."* He has been awarded six patents and has authored five textbooks and over 100 technical papers. His many awards include (1972-1973) Alexander Von Humboldt Senior Fellow at RWTH Aachen, the ASEE 1979 Terman Award, the IEEE CAS (1990) Van Valkenburg Award, the IEEE 1993 Education Medal *"for innovation in bringing electrical engineering practice into the classroom and merging academic research with industrial need;"* the 1996 NEC Computer and Communication Prize, a worldwide honor for pioneering contributions in electronics; the 2002 Kaufman award, presented by the EDA Consortium, the IEEE CAS 2009 Belevitch Award and the IEEE 2012 Kirchhoff Award.

ABSTRACT

When originally conceived in the late 1960s time domain transient adjoint circuit sensitivity was said to entail the storage over time of all original circuit time responses and then their subsequent convolution with associated backward-in-time responses of a closely related adjoint circuit. That was correct, but for the time it was too compute/memory intensive to be of much practical use. Consequently, in the time domain relatively inefficient incremental sensitivity prevailed through the remainder of the twentieth century. Gradually, from the turn of the century a more efficient forward-in-time adjoint sensitivity interpretation has come to the fore. Essentially it entails obtaining the sensitivities of all node voltages with respect to all parameters of interest, with a computational cost of about two to three times that of the transient simulation taken without the adjoint circuit overhead. Once such time domain sensitivities are found they can be put efficiently to work in integrated circuit analysis: accurately estimating signal droop for the timing analysis of large interconnect networks; estimating yield and guiding its enhancement; crafting dictionaries for all possible catastrophic faults; forming observability matrices that determine best measurement points and minimal time samples for efficient testing.

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Virtual

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