Current Distinguished Lecturers

Dr. Walter R. Curtice

"Nonlinear FET Modeling, A Mixture of Art and Science"

Abstract

It is a significant challenge for microwave scientists to develop large-signal models for GaAs MESFETs since the models must be simple enough to execute rapidly in circuit simulation software but sufficiently sophisticated to accurately describve the complex behavior of these devices. The purpose of this presentation is to review the nonlinear FET modeling work directed toward development of computer aided design techniques. Emphasis will be given to microwave applications, although FET models for digital circuits will also be described.

The presentation has three major parts:

- Introduction to active device modeling,
- Equivalent circuit models: complexity, calibration, verification,
- Applications of GaAs FET models in commercial simulators for the design and optimization of hybrid and MMIC circuits

Biography

Walter R. Curtice received the BEE, MS and Ph.D degrees from Cornell University in 1958, 1960 and 1962 respectively.

After graduation, he joined Raytheon where he worked on linear-beam and cross-field devices. He became a Visiting Assistant Professor at the University of Michigan, Ann Arbor in 1967 and Associate Professor in 1969.

In 1973, Dr. Curtice joined RCA Laboratories in Princeton, NJ as a Member of Technical Staff in the Microwave Technology Center. Initially involved with Si IMPATT and TRAPATT devices, he then developed the two-dimensional Electron Temperature Model for GaAs FETs and later an improved model for GaAs FET IC simulation. More recently, he directed the nonlinear device modeling effort. In 1984, he received the RCA Laboratories Outstanding Achievement Award for his work on computer simulation of FETs.

In 1987, Dr. Curtice joined the Microwave Semiconductor Corporation, and became an independent consultant in 1989.

He has written over 50 technical papers and holds 10 U.S. patents.

Dr. Curtice is a Fellow of the IEEE (1988) and a member of Tau Beta Pi, Eta Kappa Nu and Sigma Xi. He has been active in IEEE Societies, is Chairman of the Princeton Section and Section Representative to METSAC (IEEE Metropolitan Sections Activities Council of New York and New Jersey).

Current Distinguished Lecturers

Prof. Vittorio Rizzoli

"Simulation and Design of Nonlinear Microwave Circuits"

Abstract

This lecture presents an overview of modern CAD techniques that are available or under development for tackling several fundamental aspects of the simulation and design problems for nonlinear analogue microwave circuits, with emphasis on software methodology. An attempt will be made to cover the contributions of many research groups working in the field, particularly in Europe, though with no claim of completeness.

Multitone excitation, including frequency domain, mixed-mode and Volterra series methods and their convergence will be discussed first, followed by an analysis of frequency conversion in nonlinear devices. A generalized CAD approach to noise analysis will be outlined, with the linearized mixer as a special case. The simulation of autonomous circuits and their global stability analysis will be considered.

Modern optimization methods for nonlinear circuits and algorithms for the fast computation of exact sensitivities will be reviewed. The application of vector and parallel processing will be examined, illustrated by a few typical large-size simulation and design problems.

Biography

Vittorio Rizzoli received his degrees in Electrical Engineering from the University of Bologna, Italy.

From 1971 to 1973 he was with the Centro Onde Millimetriche in Pontecchio Marconi, Bologna and the Stanford Park Division of Hewlett Packard.

In 1974 he became an Associate Professor and in 1980 a Full Professor of Electromagnetic Fields and Circuits at the University of Bologna. His activities included work on the theory of electromagnetic propagation in optical fibers and simulation of active and passive microwave IC's. More recently, he worked on algorithms and software tools for the computer-aided design of nonlinear circuits, and has developed the first general-purpose harmonic-balance simulator with optimization capabilities.

He has authored or co-authored over 70 technical papers in the fields of electromagnetic propagation, microwave circuit CAD and related subjects.

Dr. Rizzoli is a member of the IEEE, and a member of the editorial boards of the *IEEE Transactions on Microwave Theory and Techniques* and John Wiley's *International Journal of Microwave and Millimeter-wave Computer Aided Engineering*. Since 1987 he has been a member of the Technical Program Committee of the European Microwave Conference.

Current Distinguished Lecturers

Prof. John R. Whinnery

"Some Relations between Microwaves and Optics"

Abstract

Following Maxwell's explanations of light as an electromagnetic phenomenon, and the confirming experience of Hertz, Lord Rayleigh, J. J. Thomas and others provided many analyses of the interrelationships between light and electricity. Sources of short "radio" waves were limited, however, until the development of microwaves during World War II. The many quasi-optical techniques used with microwaves are now well-known, but the development of these provide a number of interesting case histories.

In addition to the ties based upon field theory, there were important interchanges in circuit concepts. Schelkunoff demonstrated the important interchanges in circuit concepts. Schelkunoff demonstrated the importance of impedence concepts in wave problems, the scattering matrix approach found use with lumped-element circuits, and filter concepts were interchyanged between the two fields. More recently, systems concepts based upon chirp radar and spread- spectrum techniques have played a role in the development of the ultra-short optical pulses. These pulses in turn have been used in the study of materials in the millimeter-wave region. So, in addition to well-known ties, there are some not so well known. It is likely there will be more of these, and thus a need for continuing interaction between the two fields.

Biography

John R. Whinnery received his BSEE and Ph.D degrees from the University of California, Berkeley, in 1937 and 1948 respectively.

From 1937 to 1946, while at General Electric, Schenectady, NY, working on microwave applications to radar, he was active in war training and a part-time lecturer at Union College in 1945–46. In 1946 he joined the faculty of the University of California, Berkeley as Lecturer, became Associate and Full Professor and was appointed University Professor in 1980. From 1952 to 1956 he directed the Electronics Research Laboratory, was Chairman of the Electrical Engineering Department from 1956 to 1959 and Dean of the College of Engineering from 1959 to 1963. On leave from the University he was with Hughes Aircraft Company in 1951–52, Bell Laboratories in 1963–64 and was a Visiting Professor at UC, Santa Cruz and at Stanford University. In 1959 he was a J.S. Guggenheim Fellow at the ETH Zurich, Switzerland, in 1973–74 a Research Professor in the Miller Institute at UC Berkeley and in 1986 an S. Fairchild Distinguished Scholar at the California Institute of Technology. In May 1986 he was invited to the People's Republic of China to receive the award of Honorary Professor of Chengdu Institute of Radio Engineering.

Among his many honors are elections as a Fellow of the American Academy of Arts and Sciences, the American Association for the Advancement of Science, the Optical Society of America and the IEEE. He is a Life member of the IEEE and the American Society for Engineering Education. He is the recipient of many distinguished awards including the IEEE Education Medal, Microwave Career Award, Centennial Medal and Medal of Honor Award as well as the Lamme Medal from the ASEE.