THE CHINESE UNIVERSITY OF HONG KONG
Department of Electronic Engineering
Seminar

Method for High Performance Signaling Analysis of Nonlinear Circuits And Systems

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Date: 22 Aug 2023 (Tuesday)
Time: 2:00 p.m.
Place: Rm 222, Ho Sin Hang Engineering Building, CUHK

Abstract

Worst-case eye and bit error rate (BER) are important figures of merit to evaluate the signaling performance of a communication system. Analyzing the worst-case eye and BER of a linear-time-invariant system has been extensively studied. However, signaling analysis of nonlinear circuits and systems is challenging because it cannot rely on linear time invariant (LTI) principles. While an exhaustive approach requires nonlinear simulations of 2m bit patterns for a channel of m-bit memory, where m can be larger than 100 in today's high-speed and high-performance design. In this work, we develop a fast and accurate method to analyze the worst-case eye of large-scale nonlinear circuits. Only O(k) nonlinear simulations are required, with k much less than 2m and independent of 2m. While performing O(k) nonlinear simulations only, we find a method to determine the probability density function of the nonlinear responses, from which accurate BER results can be obtained. An error assessment method is also developed to evaluate the true error of the nonlinear signaling analysis without the need for knowing the entire nonlinear responses of the channel. Simulations of large-scale real-world nonlinear circuits have demonstrated the accuracy, efficiency, and capacity of the proposed method. A BER as low as 10-56 is accurately predicted.

Biography

Yuhang Dou (Member, IEEE) received the B.S. degree from the Nanjing University of Science and Technology, Nanjing, China, in 2012, and the Ph.D. degree from The Chinese University of Hong Kong, Hong Kong, in 2019. She was a Post-Doctoral Fellow with the School of Electrical and Computer Engineering, Purdue University,West Lafayette, IN, USA. In December 2022, she joined Xiamen University, Xiamen, China, as an Associate Professor with the School of Electronic Science and Engineering.

Her research interests include fast signal integrity analysis of large-scale nonlinear circuits and systems, minimal order model of large-scale electromagnetic problems, physics-based circuit-domain modeling methods for radiation and high-speed microwave problems, parallel computing, and integrated passive device (IPD) design.

Dr. Dou was a recipient of the First Runner Up Awards of the IEEE Hong Kong AP/MTT Postgraduate Conference in 2015 and 2018, and of the Second Runner Up Awards in 2016. She was also recipient of an Honorable Mention Award from the 2015 IEEE NEMO Conference.

***** ALL ARE WELCOME *****

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