



学术报告

ACADEMIC LECTURE

Multiscale Computational Electromagnetics and Microwave Imaging

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Abstract:

System-level electromagnetic design problems are multiscale and very challenging to solve. They remain a significant barrier to system design optimization for a foreseeable future. Such multiscale problems often contain three electrical scales, i.e., the fine scale (geometrical feature size much smaller than a wavelength), the coarse scale (geometrical feature size greater than a wavelength), and the intermediate scale between the two extremes. Existing commercial tools are based on single methodologies (such as finite element method or finite-difference time-domain method), and are unable to solve large multiscale problems.

We will present our recent work in solving realistic multiscale system-level EM design simulation problems in time domain. The discontinuous Galerkin method is used as the fundamental framework for interfacing multiple scales with finite-element method, spectral element method, and finite difference method. We further incorporate a nonlinear circuit solver, making it possible to perform nonlinear circuit simulation with RF interactions in a seamless manner. Numerical results show significant advantages of our multiscale method. Finally, application in super-resolution microwave imaging will be presented with experimental data.

Biography:



Qing Huo Liu is a Professor of Electrical and Computer Engineering at Duke University and is currently also with Xiamen University. He received the B.S. and M.S. degrees in physics from Xiamen University, China in 1983 and 1986, respectively, and Ph.D. degree in electrical engineering from the University of Illinois at Urbana-Champaign in 1989. His research interests include electromagnetics, acoustics, inverse problems for biomedical and subsurface sensing and imaging, and nanophotonics. He has published about 200 papers in these areas in refereed journals. He was a Research Scientist and Program Leader with Schlumberger-Doll Research, Ridgefield, CT from 1990 to 1995. From 1996 to 1999 he was a faculty member with New Mexico State University. Since June 1999 he has been with Duke University where he is now a full Professor. Currently he serves as a Deputy Editor-in-Chief of Progress in Electromagnetic Research, an Associate Editor for IEEE Transactions on Geoscience and Remote Sensing, and an Editor for Journal of Computational Acoustics. He is currently serving as a Guest Editor for a special issue in the Proceedings of IEEE on large-scale computational electromagnetics. He received the 1996 Presidential Early Career Award for Scientists and Engineers (PECASE) from the White House, the 1996 Early Career Research Award from the Environmental Protection Agency, and the 1997 CAREER Award from the National Science Foundation. He is a Fellow of the IEEE and a Fellow of the Acoustical Society of America.