ECE Speaker Series

Department of Electrical and Computer Engineering

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Challenges and Opportunities in High Fidelity Computational Electromagnetics Simulation

Maxwell's equations are of interest as they form the theoretical nucleus around which much of modern technology has developed. Over the past one and a half centuries after they were first aggregated, this system of equations provides a description of electric and magnetic phenomena, from static to dynamic. As a result, electromagnetic theory has strong predictive power and electromagnetic simulation tools are rapidly becoming indispensable to design devices for modern technology driven era. For a good part of the last century, the design of devices that exploited the physics behind these equations was largely done experimentally. However, with rapid rise in computational horsepower and the advent of powerful algorithms, the solution to these equations for realistic problems seems to be with reach. Over the years, we have been instrumental in introducing several in key algorithms that are designed to extend the reach of computational electromagnetic tools; our goals have been to develop methods that enable simulations from DC to daylight with high fidelity; this involves intriguing theoretical and numerical challenges to help bridge scales. This talk will focus on both recent and no-so recent efforts in my group in address this class of problems. Several examples illustrating the efficacy of these methods and their application to a range of problems will be presented.

April 17, 2017 at 10:00am in Egr Bldg 2, Rm W122

B. Shanker (SM'03–F'09) received the B.Tech. degree in mechanical engineering from the Indian Institute of Technology, Madras, India, in 1989, and the M.S. and Ph.D. degrees in engineering science from the Pennsylvania State University, State College, PA, USA, in 1992 and 1993, respectively. He is a Professor with the Department of Electrical and Computer Engineering, Michigan State University, East Lansing, MI, USA, and the Department of Physics and Astronomy. He was appointed Associate Chair of the Department of Computational Mathematics, Science and Engineering, Michigan State University, in 2015. His research interests include all aspects of computational electromagnetics (frequency and time domain integral equation based methods, multi-scale fast multiple methods, fast transient methods, higher order finite element and integral equation methods), propagation in complex media, mesoscale electromagnetics, and particle and molecular dynamics as applied to multiphysics and multiscale problems.

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