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Electromagnetic Macro-Modeling: An Overview of Current Successes and Future Opportunities

Abstract: An overview is provided of the concept of electromagnetic macro-modeling with emphasis on its most successful applications in the computational electromagnetics community. Use is made of a unifying mathematical framework that lends itself to the description of models obtained either through the discrete approximation of the system of interest (using, for example, a differential equation-based numerical method) or through a direct measurement of the response of the system. Model order reduction of electromagnetic systems that include frequency-dependent electromagnetic multi-ports, and macro-modeling of electromagnetic structures exhibiting geometric and/or material uncertainty are highlighted as two important applications of macro-modeling for advancing both the modeling versatility and the computational efficiency of state-of-the-art, electromagnetic, computer-aided analysis and design methodologies and tools.

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Biography

Andreas Cangellaris is M. E. Van Valkenburg Professor and Head in the Department of Electrical and Computer Engineering, at the University of Illinois, Urbana-Champaign. Professor Cangellaris received his Diploma in Electrical Engineering from the Aristotle University of Thessaloniki, Greece, in 1981, and the MS and PhD degrees in Electrical Engineering from the University of California, Berkeley, in 1983 and 1985. He has spent twenty five years in academia, first at the University of Arizona (1987-1997) and then at the University of Illinois (1997 – to date). Professor Cangellaris' current teaching and research interests include computational electromagnetics; CAD methodologies and tools for high-speed/high-frequency electronic components and systems; EMI/EMC modeling and simulation; and modeling methodologies and tools for MEMS CAD. He is a Fellow of IEEE and serves as Editor of the IEEE Press Series on Electromagnetic Field Theory. In 2005 he received the Alexander von Humboldt Research Award from Germany for his contributions to engineering applications of electromagnetic field theory.