

Seminar on

Sub-Wavelength Imaging Using Computational Electromagnetics Through Equivalent Sources

by

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Abstract

A computational technique based on near-field to far field transformation is presented. This can be more versatile and accurate than the conventional modal expansions. The established method for near-field to far-field transformation has been the modal expansion method. The primary drawback of the technique is that when a Fourier transform is used, the fields outside the measurement region area is assumed to be zero, particularly in the planar and cylindrical case. Consequently the far-fields are accurately determined only over a particular angular sector which is dependent on the measurement configuration. A simple and accurate integral equation solution which represents an alternate method for computing far-fields from measured near-fields is presented. The basic idea is to replace the radiating antenna by equivalent electric and/or magnetic currents which reside on a fictitious surface and encompasses the antenna. These equivalent currents are assumed to radiate identical fields as the original antenna in the region of interest. Using the surface equivalence principle different types of the E-field integral equation (EFIE) have been developed. The method of moments (MoM) has been utilized to transform the integral equation into a matrix one and the conjugate gradient (CG) procedure has been applied to solve it numerically. Hence, this procedure is not limited by the Nyquist sampling criteria nor by the presence of evanescent waves which may make source reconstruction using current procedures unstable. Accurate far-fields over large elevation and azimuthal ranges have been calculated from simple measurements based on planar and spherical scanning.

Biography

Tapan K. Sarkar received the B.Tech. degree from the Indian Institute of Technology, Kharagpur, in 1969, the M.Sc.E. degree from the University of New Brunswick, Fredericton, NB, Canada, in 1971, and the M.S. and Ph.D. degrees from Syracuse University, Syracuse, NY, in 1975. From 1975 to 1976, he was with the TACO Division of the General Instruments Corporation. He was with the Rochester Institute of Technology, Rochester, NY, from 1976 to 1985. He was a Research Fellow at the Gordon McKay Laboratory, Harvard University, Cambridge, MA, from 1977 to 1978. He is now a Professor in the Department of Electrical and Computer Engineering, Syracuse University. His current research interests deal with numerical solutions of operator equations arising in electromagnetics and signal processing with application to system design. He obtained one of the “best solution” awards in May 1977 at the Rome Air Development Center (RADC) Spectral Estimation Workshop. He received the Best Paper Award of the IEEE Transactions on Electromagnetic Compatibility in 1979 and in the 1997 National Radar Conference. He has authored or coauthored more than 300 journal articles and numerous conference papers and 32 chapters in books and fifteen books, including his most recent ones, *Iterative and Self Adaptive Finite-Elements in Electromagnetic Modeling* (Boston, MA: Artech House, 1998), *Wavelet Applications in Electromagnetics and Signal Processing* (Boston, MA: Artech House, 2002), *Smart Antennas* (IEEE Press and John Wiley & Sons, 2003), *History of Wireless* (IEEE Press and John Wiley & Sons, 2005), and *Physics of Multiantenna Systems and Broadband Adaptive Processing* (John Wiley & Sons, 2007), *Parallel Solution of Integral Equation-Based EM Problems in the Frequency Domain* (IEEE Press and John Wiley & Sons, 2009), *Time and Frequency Domain Solutions of EM Problems Using Integral Equations and a Hybrid Methodology* (IEEE Press and John Wiley & Sons, 2010), and *Higher Order Basis Based Integral equation Solver (HOBBIES)* (John Wiley & Sons 2012) .

Dr. Sarkar is a Registered Professional Engineer in the State of New York. He received the College of Engineering Research Award in 1996 and the Chancellor's Citation for Excellence in Research in 1998 at Syracuse University. He was an Associate Editor for feature articles of the IEEE Antennas and Propagation Society Newsletter (1986-1988), Associate Editor for the IEEE Transactions on Electromagnetic Compatibility (1986-1989), Chairman of the Inter-commission Working Group of International URSI on Time Domain Metrology (1990–1996), distinguished lecturer for the Antennas and Propagation Society from (2000-2003,2011-2013), Member of Antennas and Propagation Society ADCOM (2004-2007), on the board of directors of ACES (2000-2006), vice president of the Applied Computational Electromagnetics Society (ACES), a member of the IEEE Electromagnetics Award board (2004-2007), an associate editor for the IEEE Transactions on Antennas and Propagation (2004-2010) and on the editorial board of Digital Signal Processing – A Review Journal (2003-2012). He is on the editorial board of Journal of Electromagnetic Waves and Applications and Microwave and Optical Technology Letters. He is the chair of the International Conference Technical Committee of IEEE Microwave Theory and Techniques Society # 1 on Field Theory and Guided Waves. He is a member of Sigma Xi and International Union of Radio Science Commissions A and B. He is the 2014 President of the IEEE Antennas and Propagation Society. According to Google Scholar, he has a H-index of 55 with 13,485 citations to his work. He is also the president of OHRN Enterprises, Inc., a small business incorporated in New York state (1985) performing various research work for various organizations in system analysis. He received Docteur Honoris Causa from Universite Blaise Pascal, Clermont Ferrand, France in 1998, from Politechnic University of Madrid, Madrid, Spain in 2004, and from Aalto University, Helsinki, Finland in 2012. He received the medal of the friend of the city of Clermont Ferrand, France, in 2000.

Date : 18 March, 2015 (Wednesday)
Time : 11:00 am – 12:30 pm
Venue : Room 15-202, 15/F, meeting room of State Key Laboratory of Millimeter Waves, 15/F, Academic 3, City University of Hong Kong

*** ALL ARE WELCOME ***

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