

Seminar On**Some Studies on Characteristic Mode Theory and Its Applications
in AI/ML-Based Computational Electromagnetics****Professor Ming-Yao Xia
School of Electronics, Peking University**

- Date** : 24 January 2024 (Wednesday)
Time : 11:00 am – 12:00 nn
Venue : Room 15-202, 15/F, State Key Laboratory of Terahertz and Millimeter Waves,
Lau Ming Wai Academic Building, City University of Hong Kong
Remarks : The seminar will be conducted in Putonghua.

Abstract

Characteristic Mode Theory (CMT) was developed in the 1970's, and witnessed as a surging research topic in the past two decades. It has become a popular tool for antenna design and target scattering control. However, the CMT module in current commercial software can handle only perfect-electrically-conducting (PEC) structures or lossless materials. In this talk, I will disclose some spurious mode issues for the CMT based on Surface Integral Equations (SIEs) or including lossy materials. As a result, some proper manners to define the Characteristic Modes (CMs) are suggested.

As a new application paradigm, the CMs can play a valuable role in AI/ML-based Computational Electromagnetics (CEM). Take the scattering problem as an example. Because the CMs are independent of excitation/response, we can use them as a special kind of Inherent Features of a target, and train a Neural Network (NN) to extract them, which amounts to extract the impulse response of the target. When an excitation is given, the response can be computed rapidly using the obtained Inherent Features. Compared with the common AI/ML-based methods, this approach can avoid under- or over-fitting involving how many excitations are required to train the NN, and do not need to specify the scattering directions in the training stage. For on-line computations, tens to hundreds of times faster than the traditional Method of Moments (MoM) are achievable.

Biography

Professor Ming-Yao Xia received the master's and Ph.D. degrees in electrical engineering from the Institute of Electronics, Chinese Academy of Sciences (IECAS), Beijing, China, in 1988 and 1999, respectively.

From 1988 to 2002, he was an Engineer and then a Senior Engineer with IECAS. From October 1995 to October 1996, he was a Visiting Scholar with the University of Oxford, Oxford, U.K. From June 1999 to August 2000, he was a Senior Research Assistant with the City University of Hong Kong, Hong Kong, where he was a Research Fellow in 2002. He joined Peking University, Beijing, as an Associate Professor in 2002, and was promoted to a Full Professor in 2004. In 2010, he joined the University of Electronic Science and Technology of China, Chengdu, China, as a Changjiang Professor nominated by the Ministry of Education of China. In 2013, he returned to Peking University. His current research interests include electromagnetic theory, numerical methods and applications, such as wave propagation and scattering, electromagnetic imaging and probing, microwave antennas and components.

Professor Xia received the Young Scientist Award of the URSI in 1993, the First-Class Prize on Natural Science from the Chinese Academy of Sciences in 2001, and the Foundation for Outstanding Young Investigators presented from the National Natural Science Foundation of China in 2008. He served as an Associate Editor for the IEEE Transactions on Antennas and Propagation.

*** ALL ARE WELCOME ***

Enquiries:

Professor Chi Hou Chan, State Key Laboratory of Terahertz and Millimeter Waves
Tel.: (852) 3442 9360 Fax: (852) 3442 0353 Email: eechic@cityu.edu.hk