ELEDIA Research Center
ELEDIA@UniTN - University of Trento
Via Sommarive 5, 38123 Trento, ITALY
E-mail: andrea.massa@eledia.org
Web: www.eledia.org/eledia-unitn

Benchmarking computational electromagnetics with exact analytical solutions of canonical electromagnetic scattering problems

Speaker: **Prof. Danilo ERRICOLO**
(University of Illinois at Chicago, Chicago, U.S.A.)

Date: 11 September 2017 @ 16:00

Location: Room OFEK – Polo Scientifico F. Ferrari – Povo

Note: The seminar will be held in English

Contact: Prof. Giacomo Oliveri (giacomo.oliveri@unitn.it)

Abstract:

Solutions of canonical electromagnetic scattering problems may be used to benchmark computational electromagnetics methods. While the list of known exact analytical solutions is limited, this list extends significantly beyond classical solutions for the scattering from metallic bodies such as the sphere, the 2D metallic wedge, and the infinite circular cylinder. In fact, recently developed exact solutions exist for geometries involving cavities, sharp edges, apertures, and propagation across different media. Unfortunately, many articles discussing computational electromagnetics solutions frequently propose validations or benchmarks with geometries as simple as a sphere and then jump into comparisons with very complex objects such as a numerical model of an airplane. In such cases, validations with simpler, but yet challenging benchmarks should provide additional evidence of their accuracy. In many cases, comparisons with exact solutions for benchmarking purposes are quite straightforward to implement.

About the Speaker:

Danilo Erricolo received the Laurea degree of Doctor (summa cum laude) in electronics engineering from the Politecnico di Milano, Milan, Italy, in 1993, and the Ph.D. degree in electrical engineering and computer science from the University of Illinois at Chicago (UIC), Chicago, IL, USA, in 1998. In 2009, he was an Air Force Faculty Fellow with the Air Force Research Laboratory, Wright Patterson Air Force Base, Dayton, OH, USA. He is currently a Professor with the Department of Electrical and Computer Engineering, UIC, where he is also the Director of the Andrew Electromagnetics Laboratory and an Adjunct Professor of bioengineering. He developed a 2-D simulator for the propagation of the electromagnetic field in urban environments that could consider base-stations located below or above the average rooftop height, thanks to introduction of uniform theory of diffraction double wedge diffraction coefficients. He contributed to the development of many exact solutions of canonical scattering problems, which advance the understanding of scattering from analytically treatable geometries and provide benchmarks for computational electromagnetics software. As part of these studies, he wrote software for the computation of Mathieu functions that has applications beyond the field of electrical engineering. He also developed an acceleration method for series expansions containing Mathieu, prolate, and oblate spheroidal functions, which impacts all applications of these functions, such as in porous media flow. He contributed to the validation of the incremental theory of diffraction by developing comparisons with exact canonical solutions and experiments. He also applied his research to medical applications, specifically in the field of magnetic resonance imaging. He co-authored the first papers on RF tomography for applications to subsurface sensing and is currently engaged with its extension to other environments. He has authored or co-authored more than 240 publications in refereed journals and international conferences. His current research interests include electromagnetic propagation and scattering, high-frequency techniques, wireless communications, electromagnetic compatibility, the computation of special functions, and magnetic resonance imaging. Dr. Erricolo is a member of Eta Kappa Nu and was an elected full member of the U.S. National Committee (USNC) of the International Union of Radio Science (URSI) Commissions B, C, and E. He served as the Chair from 2009 to 2011, the Vice Chair from 2006 to 2008, and the Secretary of the USNC-URSI Commission E on Electromagnetic Environment and Interference from 2004 to 2005. From 2009 to 2014, he served as the Chair of the USNC-URSI E. K. Smith Student Paper Competition. He also served as the Vice-Chair of the Local Organizing Committee of the XXIX URSI General Assembly, held in Chicago, in 2008. He serves as a member at Large of USNC-URSI from 2012 to 2017, a committee of the U.S. National Academies. He was the General Chairman of the 2012 IEEE International Symposium on Antennas and Propagation and USNC-URSI National Radio Science Meeting, held in Chicago, in 2012. From 2011 to 2016, he was the Chair of the Chicago Joint Chapter of the IEEE Antennas and Propagation Society (AP-S) and the IEEE Microwave Theory and Techniques Society. Since 2005, he has been serving the IEEE AP-S Future Symposia Committee, and since 2006, he has been serving as a USNC-URSI Representative on the AP-S/USNC-URSI Joint Meetings Committee. He was an elected member of the Administrative Committee of the IEEE AP-S from 2012 to 2014 and served as the Chair of the Distinguished Lecturer Program of the IEEE AP-S from 2015 to 2016. He has served on more than 40 conference Technical Program Committees, chaired over 60 conference sessions, and organized more than 20 special sessions at international scientific conferences. He was an Associate Editor of the IEEE Antennas and Wireless Propagation Letters from 2002 to 2014, the IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION from 2013 to 2016, and Radio Science from 2014 to 2016. In 2006, he was the Guest Editor of the "Special Issue on RF Effects on Digital Systems" of the Electromagnetics Journal, and in 2012, he was a Lead Guest Editor of the "Special Issue on Propagation Models and Inversion Approaches for Subsurface and Through Wall Imaging" of the International Journal of Antennas and Propagation. Since Aug. 2016 he is the Editor-in-Chief of the IEEE Transactions on Antennas and Propagation.

Additional Notes:
Additional information can be found at www.eledia.org