Antenna Evolution: From Hertz's Experiments to Modern Nonlinear Techniques

Featuring Majid Manteghi
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Tuesday, October 24, 2023
11:00 a.m. - Noon
Location: TSRB 118 Auditorium

Abstract: Antennas, with a history spanning more than 130 years, continue to be a fascinating area of study that is profoundly ingrained in our daily lives. This presentation will examine their enduring relevance and the challenges that they present. Our journey commences with the radiation process and Hertz experiments continued by the fundamentals of electrically small antennas (ESAs), which are limited in bandwidth and efficacy due to their small size. We will investigate the unique characteristics of ESAs, such as their stored energy and impedance characteristics. In the context of ESA, we will investigate the relatively uncharted territory of nonlinear techniques in electromagnetic theory. While nonlinearity is a well-known concept in other disciplines, such as control theory, its applicability in electromagnetics has enormous potential. We will discuss how nonlinear techniques challenge the limitations of linear time-invariant systems, thereby offering novel antenna design insights. In addition, we will investigate cutting-edge innovations such as parametric amplification and Fano matching circuits in the context of ESAs, demonstrating their transformative potential for augmenting wireless communication.

Join us as we navigate the world of antennas, from their historical significance to the modern challenges and innovations that continue to shape our connected lives.

Bio: Majid Manteghi, an electrical engineer, holds a Bachelor of Science and a Master of Science in electrical engineering from the University of Tehran in 1994 and 1997, respectively. In 2005, he completed his Doctor of Philosophy in electrical engineering at the University of California, Los Angeles (UCLA).

Since 2007, Manteghi has been an assistant professor and then an associate professor in the Department of Electrical and Computer Engineering at Virginia Tech. His career began in the telecommunications industry in Tehran, where he led an RF team on a GSM base transceiver station project from 1997 to 2000. He then joined UCLA's ARAM Laboratory, focusing on his doctoral dissertation in ultra-wideband (UWB) impulse radiating antennas. During this period, his research spanned areas like phased-array design, electrically small antennas, and multi-port antennas. He also collaborated with Mojix Inc. on RFID circuits and systems for two years.

Since 2015, Manteghi has led the Virginia Tech Antenna Group (VTAG), conducting cutting-edge research in electrical engineering. His expertise includes Electrically Small Antennas (ESAs), innovative non-LTI antenna techniques, and the development of Ultra Low-Frequency Transmitters and Antennas for underwater communication and navigation. Manteghi's contributions extend to RFID Technology, including chipless, passive, and active RFID systems, advancing tracking and identification technologies. His research also explores Space-Time-Frequency Target Identification, time domain and Transient Electromagnetics, Implanted Devices, Wireless Power Transfer, and wave propagation in the human body for medical and healthcare applications. Manteghi's expertise in Phased Array Theory and Designs contributes to innovations in Autonomous Driving and automotive radar systems.

Host: Nima Ghalichechian

Pizza and soda will be available post seminar