Georgia Tech
Georgia Electronic Design Center

Distinguished Lecture Series

Conformal Metasurfaces For Exotic Designer Wavefronts

Featuring Jordan Budhu
Assistant Professor
Steven O. Lane Junior Faculty Fellow
Bradley Department of Electrical and Computer Engineering, Virginia Tech

Tuesday, October 17, 2023
11:00 a.m. - Noon
Location: TSRB 118 Auditorium

Abstract: When light interacts with the atoms in natural matter, different processes such as scattering and absorption cause the object to appear as it does to the observer. Imagine being able to 'play the almighty' and design matter atom by atom as if by tweezer in order to engineer a specific response to incident light. In metamaterials and metasurfaces, matter is assembled meta-atom by meta-atom to engineer a specific response to incident electromagnetic radiation. Since the wavelength of the incident radiation is long compared to the dimensions of the meta-atoms, the individual atoms cannot be resolved, and therefore the response of the metamaterial or metasurface is an aggregate or averaged one just as how light interacts with ordinary natural matter (remember that atoms have a breadth on the order of an angstrom whereas visible light has a wavelength of approximately 600nm or 6000 times longer than the atom). Hence, the meta-atoms can be designed individually and when placed into an array with subwavelength spacing, produce the macroscopic effect of complete field and wavefront control. Being able to completely control light-matter interaction allows for the creation of electromagnetic or optical illusions where a solid object, with its surface patterned in a particular way, will appear to an observer as a completely different object. Hence, you could go to pick up the object and would fumble, as it looks like a sphere but in reality, is a small cube for example. Or, in another example, a beam can be seen to completely disappear from one location in space and reappear in another spatially dislocated place as if it had teleported. In this talk, progress toward technologies that make these kinds of phenomena possible at microwave frequencies will be presented.

Bio: Jordan Budhu received his M.S. in electrical engineering from California State University, Northridge, in 2010, and his Ph.D. in electrical engineering from the University of California, Los Angeles, in 2018.

He was hired as an assistant professor at Virginia Tech in 2022, where he is currently the Steven O. Lane Junior Faculty Fellow of Electrical and Computer Engineering with the Bradley Department of Electrical and Computer Engineering. He was a postdoctoral research fellow in the Radiation Laboratory and a lecturer in the Department of Electrical Engineering and Computer Science, Ann Arbor, Michigan, USA from 2019 to 2022. In 2011 and 2012, he was a graduate student intern at the NASA Jet Propulsion Laboratory. In 2017, he was named a teaching fellow at the University of California, Los Angeles. His research interests are in metamaterials and metasurfaces, computational electromagnetics algorithms for metamaterial and metasurface design, conformal beamforming antennas, nanophotonics and metamaterials for the infrared, 3D printed inhomogeneous lens design, CubeSat antennas, reflectarray antennas, and antenna theory.

Budhu's awards and honors include the 2010 Eugene Cota Robles Fellowship from UCLA, the 2012 Best Poster award at the IEEE Coastal Los Angeles Class-Tech Annual Meeting, the 2018 UCLA Henry Samueli School of Engineering and Applied Science Excellence in Teaching Award, the first-place award for the 2019 USNC-URSI Ernst K. Smith Student Paper Competition at the 2019 Boulder National Radio Science Meeting, and the Steven O. Lane Junior Faculty Fellowship of Electrical and Computer Engineering in the Bradley Department of Electrical and Computer Engineering at Virginia Tech.

Host: Joshua Kovitz
Co-host: Nima Ghalichechian

Pizza and soda will be available post seminar