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Recent Advances in Microwave and Millimeter-Wave Remote Sensing for Security Applications

Dr. Jeffrey Nanzer

Johns Hopkins Applied Physics Laboratory, Laurel , MD

Date: Wednesday, April 24, 2013

Time: 5:30 Reception, Dinner (Optional) 6:00 pm, Lecture 7:00

Place: American Center for Physics(ACP), College Park, MD

Directions: http://www.acp.org/map.html

Free parking.

All IEEE members and guests are welcome to attend.

Cost: Lecture free, Dinner $10

Please RSVP to Roger Kaul, 301-394-4775 or r.kaul@ieee.org.

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Abstract:

Microwave and millimeter-wave remote sensing techniques are fast becoming a necessity in many aspects of security as it becomes more difficult to counter new threats. The requirement for faster detection of objects and humans, improved spatial resolution in imaging, and more precise classification demands the use of novel sensor applications. This talk focuses on recent developments in remote sensing for security, and highlights two recently developed techniques: human micro-Doppler radar detection and millimeter-wave interferometric imaging.

Micro-Doppler refers to the frequency sidebands imparted by the motion of non-rigid objects, such as a moving human body, on the scattered radar signal. By analyzing certain aspects of the micro-Doppler signature, researchers have been able to discriminate humans from vehicles and animals. Much work has also been done in determining human activity from micro-Doppler signatures, which may be used to assess intent and thereby classify potential threats. The basic theory of human micro-Doppler detection will be discussed in this talk, and simulations and measurements will be presented.

Millimeter-wave remote imaging systems, both passive and active, have been shown to successfully detect weapons and other contraband hidden beneath clothing. While most systems rely on mechanical scanning apertures, the use of interferometric imaging has recently been investigated. Initially developed in the radio astronomy and satellite remote sensing communities, interferometric processing can provide images of equivalent quality to filled apertures while using sparse arrays. In addition to reduced aperture area, interferometric imagers require no scanning and are easier to integrate than fully populated phased arrays. This talk will explain the theory behind interferometric imaging, and will describe the effect of implementing various antenna geometries. Recent work from researchers in the field will be reviewed.

Speaker Biography:

Jeffrey Nanzer is a Senior Professional Staff Member at the Johns Hopkins University Applied Physics Laboratory. He received the Ph.D. degree in electrical engineering from the University of Texas at Austin in 2008.

From 2003 to 2009, he was with the University of Texas at Austin Applied Research Laboratories where he researched techniques of human presence detection using millimeter-wave radiometers and radars. In 2009 he joined The Johns Hopkins University Applied Physics Laboratory where his research involves advanced radar and communications technology. He is the author of *Microwave and Millimeter-Wave Remote Sensing for Security Applications* (Artech House, 2012) and has published more than 30 refereed journal and conference papers. His research interests are in the areas of microwave and millimeter-wave remote sensing, millimeter-wave photonics, radiometry, antennas, and electromagnetics.

Dr. Nanzer is a member of USNC/URSI Commission B, the IEEE Antenna Standards Committee, and the IEEE Microwave Theory and Techniques Society (IEEE MTT-S) Microwave Systems Technical Committee (MTT-16). He was a founding member and the first treasurer of the IEEE AP-S/MTT Central Texas Chapter.

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Please contact 2012-13 Chapter Chair Tony Ivanov