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Vehicular Technology Society

Join the NY Section of the Vehicular Technology Society for

Technology Forum

Featuring: **IEEE VTS Distinguished Lecturer, Dr. Kumar Vijay Mishra**, a Senior Fellow at the United States Army Research Laboratory (ARL).

Title: Signal processing for vehicular joint radar-communications

Abstract: In this talk, we focus on the recent signal processing strategies and challenges associated with the development of sensing and communication systems that coexist with the vehicles and road infrastructure deployed in a given area. We consider a broad definition of coexistence, which covers joint communication and sensing, collaborative communication and sensing, and also interference. We consider an aspect of the coexistence paradigm where the two systems support each other beyond interference mitigation such as sensor-aided communications and communications-aided sensing. This opens up the avenue for the development of multivehicle sensor fusion strategies. We describe recent works that define topologies for combining radar and communication functionalities into the same equipment, drawing on the spectrum scarcity and possible gains from the reuse of resources. In particular, we focus on the joint design of a waveform to mitigate interference, including communications-centric waveforms (OFDMA and 802.11ad), radar-centric waveforms (PMCW), or unified waveforms achieving optimal trade-offs between the two systems.

Title: Applications of MIMO in automotive radars

Abstract: Novel multiple-input, multiple-output (MIMO) signal processing techniques are increasingly used in automotive radar applications. These systems operate at millimeter-wave (mm-Wave) which provides transmission bandwidth that is several gigahertz wide to gain high range resolution. At mm-Wave, large MIMO antenna arrays are employed to compensate for severe path and propagation losses. The MIMO array configuration is also useful in achieving a high angular resolution with a limited number of antenna elements. However, a large array not only leads to complexity in signal processing but also presents challenges in spectrum usage and a concurrent operation with spectrally coexisting multiple radars and communications systems. In this talk, we address these specific challenges and recent developments in THz automotive radars, displaced MIMO sensor imaging, interference mitigation, and space-time adaptive processing for transmit sequence design.

When:

Wednesday, July 19, 2023

5:00 pm – 7:00 pm

Where:

WSP Office

One Penn Plaza

New York City, NY 10119

Refreshments will be offered at 4:45 pm, presentation starts at 5:00 pm.

- ✓ **The forum is free and open to all IEEE members as well as non-members.**
- ✓ **2 hours of PDH credits available. Fee for the PDH credit award is \$5. Payments by cash only.**

Please Register at <https://events.vtools.ieee.org/event/register/362632>

Please note advance registration is required for admission. Registration closes COB, July 18, 2023.

Additional information regarding program specifics can be obtained by contacting NY VTS officers.



Speaker Biography

Kumar Vijay Mishra (S'08-M'15-SM'18) obtained a Ph.D. in electrical engineering and M.S. in mathematics from The University of Iowa in 2015, and M.S. in electrical engineering from Colorado State University in 2012, while working on NASA's Global Precipitation Mission Ground Validation (GPM-GV) weather radars. He received his B. Tech. *summa cum laude* (Gold Medal, Honors) in electronics and communication engineering from the National Institute of Technology, Hamirpur (NITH), India in 2003. He is currently Senior Fellow at the United States Army Research Laboratory (ARL), Adelphi; Technical Adviser to Singapore-based automotive radar start-up Hertzwell and Boston-based imaging radar startup Aura Intelligent Systems; and honorary Research Fellow at SnT - Interdisciplinary Centre for Security, Reliability and Trust, University of Luxembourg. Previously, he had research appointments at Electronics and Radar Development Establishment (LRDE), Defence Research and Development Organisation (DRDO) Bengaluru; IIHR - Hydrosience & Engineering, Iowa City, IA; Mitsubishi Electric Research Labs, Cambridge, MA; Qualcomm, San Jose; and Technion - Israel Institute of Technology.

Dr. Mishra is the Distinguished Lecturer of the IEEE Communications Society (2023-2024), IEEE Aerospace and Electronic Systems Society (AESS) (2023-2024), IEEE Vehicular Technology Society (2023-2024), and IEEE Future Networks Initiative (2022). He is the recipient of the IET Premium Best Paper Prize (2021), U. S. National Academies Harry Diamond Distinguished Fellowship (2018-2021), American Geophysical Union Editors' Citation for Excellence (2019), Royal Meteorological Society Quarterly Journal Editor's Prize (2017), Viterbi Postdoctoral Fellowship (2015, 2016), Lady Davis Postdoctoral Fellowship (2017), DRDO LRDE Scientist of the Year Award (2006), NITH Director's Gold Medal (2003), and NITH Best Student Award (2003). He has received Best Paper Awards at IEEE MLSP 2019 and IEEE ACES Symposium 2019.

Dr. Mishra is Chair (2023-present) of the Synthetic Apertures Technical Working Group of the IEEE Signal Processing Society (SPS) and Vice-Chair (2021-present) of the IEEE Synthetic Aperture Standards Committee, which is the first SPS standards committee. He is the Vice Chair (2021-2023) and Chair-designate (2023-2026) of the International Union of Radio Science (URSI) Commission C. He has been an elected member of three technical committees of IEEE SPS: SPCOM, SAM, and ASPS; and IEEE AEES Radar Systems Panel. Since 2020, he has been Associate Editor of IEEE Transactions on Aerospace and Electronic Systems, where he was awarded Outstanding Editor recognition in 2021. He has been a lead/guest editor of several special issues in journals such as IEEE Signal Processing Magazine, IEEE Journal of Selected Topics in Signal Processing, and IEEE Journal on Selected Areas in Communications. He is the lead co-editor of three upcoming books on radar: *Signal Processing for Joint Radar-Communications* (Wiley-IEEE Press), *Next-Generation Cognitive Radar Systems* (IET Press Radar, Electromagnetics & Signal Processing Technologies Series), and *Advances in Weather Radar Volumes 1, 2 & 3* (IET Press Radar, Electromagnetics & Signal Processing Technologies Series). His research interests include radar systems, signal processing, remote sensing, and electromagnetics.