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Iowa Flood Center, IIHR - Hydrosience and Engineering

Compression, Cognition and Coexistence in Radars

Wednesday, January 23, 2019, 2:00 pm

Location: SEH B1220

Abstract

In the past few years, novel approaches to radar signal processing have been introduced which allow the radar signal detection and parameter estimation using much smaller number of measurements than required by Nyquist sampling. These systems exploit the fact that the target scene is sparse facilitating the use of recent advances in compressed sensing methods. This talk will introduce recent developments in reduced-rate sampling that break the link between common radar design trade-offs such as range resolution and transmit bandwidth; dwell time and Doppler resolution; spatial resolution and number of antenna elements; continuous-wave radar sweep time and range resolution. For each of these ideas, we present state-of-the-art hardware prototypes that we have designed and developed to demonstrate the real-time feasibility. We examine extensions to diverse applications such as cognition, spectral coexistence, matrix completion, autonomous driving, ground penetration radar, multiple-input-multiple-output and synthetic aperture radars. Finally, we connect the cognition in radars to some interesting applications of deep learning.

Biography

Dr. Kumar Vijay Mishra obtained his Ph.D. in electrical engineering and his M.S. in mathematics from The University of Iowa in 2015, and his 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 in 2003. During 2003-2007, he worked on military surveillance radars as a research scientist at the Electronics and Radar Development Establishment (LRDE) Defence Research and Development Organisation (DRDO) in Bengaluru. He was a research intern at Mitsubishi Electric Research Labs (Cambridge) and at Qualcomm (San Jose) in 2015. During 2015-2017, he was Andrew and Erna Finci Viterbi and Lady Davis postdoctoral fellow at the Viterbi Faculty of Electrical Engineering, Technion - Israel Institute of Technology. He has been a Visiting Scholar at IIHR - Hydrosience & Engineering since 2015 and an honorary Research Fellow at SnT - Interdisciplinary Centre for Security, Reliability and Trust, University of Luxembourg since 2018. He is on the board of Singapore-based automotive radar startup Hertzwell as its Technical Adviser since 2018. He is the recipient of U.S. Army Research laboratory Harry Diamond Distinguished Postdoctoral Fellowship (2018), Royal Meteorological Society Quarterly Journal Editor's Prize (2017), Lady Davis Fellowship (2016-2017), Andrew and Erna Finci Viterbi Fellowship (twice awarded, 2015 and 2016), Technion EE Excellent Undergraduate Adviser Award (2017), Cornell Base-of-Pyramid Narrative Competition Prize (2009), Altera Forum Guru Challenge Winner (2008), DRDO LRDE Scientist of the Year Award (2006), NITH Director's Gold Medals for 1st rank in the Department of Electronics and Communication Engineering and entire university during the undergraduate commencement (2003), and NITH Best Student Award (2003). His research interests include radar systems (theory and hardware), signal processing, remote sensing, medical imaging, electromagnetics, antenna theory, information theory, communications, and deep learning.

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