

Seminar On

Continuous-Aperture Array (CAPA)-Based Wireless Communications: When Hertz Meets Leibniz–Newton

Prof. Yuanwei Liu

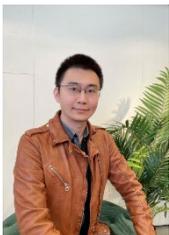
The University of Hong Kong, Hong Kong

Date : 21 November 2024 (Thursday)
Time : 11:00 am – 12:00 noon
Venue : Room 15-202, 15/F, State Key Laboratory of Terahertz and Millimeter Waves,
Lau Ming Wai Academic Building, City University of Hong Kong

Abstract

Multiple-antenna technologies are evolving toward larger aperture sizes, denser antenna deployments, higher frequencies, and more flexible aperture shapes. This evolution has led to the concept of continuous-aperture arrays (CAPA), which form a spatially continuous electromagnetic aperture. Unlike conventional spatially discrete arrays (SPDAs), CAPA can achieve extreme spatial resolution and approach the upper limits of spatial degrees of freedom within a given spatial resource. In this talk, we provide a comprehensive overview of the state-of-the-art in CAPAs. We begin by introducing the fundamental principles of CAPA, including practical implementation and signal models. Next, we explore its information-theoretic limits in both uplink and downlink communications. Additionally, we perform a performance analysis for CAPA-based line-of-sight and fading channels, followed by a discussion on CAPA's beamforming design. Throughout, we highlight the key differences between CAPA and conventional SPDAs. Finally, we conclude with an exploration of potential opportunities and unresolved challenges in the field of CAPA.

Biography



Yuanwei Liu is a tenured full Professor in Department of Electrical and Electronic Engineering (EEE) at The University of Hong Kong (HKU). He is IEEE Fellow, AAIA Fellow, web of Science Highly Cited Researcher (2021 to present). His research interests include next generation multiple access, integrated sensing and communications, reconfigurable intelligent surface, near-field communications and mobile edge generation. He is listed as one of 35 Innovators Under 35 China in 2022 by MIT Technology Review. He serves as an IEEE Communication Society Distinguished Lecturer, an IEEE Vehicular Technology Society Distinguished Lecturer, the academic Chair for the Next Generation Multiple Access Emerging Technology Initiative. He received IEEE ComSoc Outstanding Young Researcher Award for EMEA in 2020. He received the 2020 IEEE Signal Processing and Computing for Communications (SPCC) Technical Committee Early Achievement Award, IEEE Communication Theory Technical Committee (CTTC) 2021 Early Achievement Award. He received IEEE ComSoc Outstanding Nominee for Best Young Professionals Award in 2021. He received four IEEE best paper awards. He serves Co-Editor-in-Chief of IEEE ComSoc Technical Newsletter, Area Editor of IEEE TCOM/CL, Editor of IEEE COMST/TWC/TCCN /TVT/TNSE, (leading) guest editor of Proceedings of IEEE/IEEE JSAC/JSTSP etc., the rapporteur of ETSI Industry Specification Group on RIS Industry Specification Group Work Item 6, and the UK representative for the URSI Commission C on “Radio communication Systems and Signal Processing”.

*** ALL ARE WELCOME ***

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