INTERACT Training Day

Organiser

Erik Ström, Chalmers University of Technology, Gothenburg, Sweden

Theme

Integrated sensing and communication

Location

Chalmers University of Technology, Gothenburg, Sweden | EDIT building, Hörsalsvägen 11 | 5th floor, Room ED

Date

June 16, 2025, 14:00 – 18:00

Speakers

Speaker 1: Klaus Witrisal (witrisal@tugraz.at)
Affiliation: TU Graz
Title: Robust Localization and Environment Sensing for Enhanced CSI Awareness
Abstract: Radio signals have been used for applications as diverse as communication, broadcasting, radar, positioning, navigation, and even wireless power transfer. Some 6G wireless networks envision providing all these different services with a single technology platform and leveraging synergies in-between them. Situational awareness is anticipated, where position information paired with a learned map of the radio propagation environment is used to make reliable large-scale predictions of channel state information. This talk reviews theoretical and practical performance limitations of position-parameter estimation and sensing in multipath radio channels. Algorithms will be described that leverage information from multipath propagation, creating a model of the propagation environment that can be used to predict channel state information for robust and efficient communication and sensing.

Speaker 2: Sofie Pollin (sofie.pollin@kuleuven.be)
Affiliation: KU Leuven
Title: Massive Integrated Communication and Sensing
Abstract: We introduce the topic of integrated communication and sensing. Then, we show how an in-band full duplex communication radio can easily be extended with radar signal processing, almost for free. When extending the concept to MIMO, massive MIMO

and cell-free networks, a range of opportunities arise for multi-static joint communication and sensing, even in scenarios with multipath and other non-idealities.

Speaker 3: Thomas Zemen (Thomas.Zemen@ait.ac.at)
Affiliation: AIT
Title: RIS propagation modelling and experimental validation for JCAS applications
Abstract: The mmWave frequency band starting at 30GHz provides new resources for reliable low-latency communication links for industrial indoor automation and control applications. Reconfigurable intelligent surfaces (RISs) enable a reliable low-latency millimetre wave (mmWave) communication links in case of a blocked line-of-sight (LOS). A RIS mounted on a wall or on a ceiling enables a bypass for the radio communication link by dynamically adjusting its reflection angle. In this tutorial we introduce a numerical geometry based wave propagation model and its validation by empirical measurement results. The detailed implementation of an active mmWave RIS will be presented and a RIS control algorithm that takes the practical limitations of a given RIS implementation is introduced in two version: (a) assuming the UE coordinate is known, and (b) using a single bit feedback from the UE to update the RIS configuration.

Speaker 4: Yang Miao (y.miao@utwente.nl)
Affiliation: University of Twente
Title: ISAC channel matching and multi-beam tiled array design
Abstract: The integration of sensing and communication capabilities within a single platform is of great interest to the 6G communication infrastructure. Multi-beam technology offers an efficient front-end solution for joint communication and sensing (JCAS) at the base station (BS), enabling simultaneous communication with multiple users and sensing multiple targets through analog beamforming. This talk introduces a scenario-based tiling array methodology for a JCAS BS, employing a tiled planar array (TPA) that emphasizes cost-effectiveness, modularity, and scalability. We adopt a low-complexity channel-matching method to optimize the tiles by leveraging self-and cross-correlations of communication and sensing channels. Numerical results indicate that the optimum design of TPAs for JCAS necessitates a proper knowledge of the scenario and environment in which the apertures will be employed. In conflicting scenarios, such as non-line-of-sight communication and line-of-sight sensing, scatterers serving as pathways for communication act as clutter for sensing. For fully-blocked targets, the JCAS system experiences a 10 dB decrease in sensing SINR; however, this blockage can benefit communication, when the scatterers are positioned in regions of higher aperture gain.

Speaker 5: Fredrik Tufvesson (fredrik.tufvesson@eit.lth.se)
Affiliation: Lund University
Title: ISAC and channel characteristics in the millimeter wave band
Abstract: Radio channel properties lay the foundation for ISAC and possible sensing and positioning performance. Based on recent channel measurements in the mmWave band we will discuss channel properties and how we can use multipath propagation for highly accurate positioning and sensing. We will also discuss system aspects, time and frequency synchronization, and show some measurement examples with commercial base stations.