

Department of Electrical and Computer Engineering



TEXAS TECH UNIVERSITY

Edward E. Whitacre Jr.

College of Engineering

Fall 2024 Seminar Series

Seminar Title: *Implementation Challenges in Airborne Distributed Radar: Navigation, Synchronization, and Signal Processing*

Time: 3:00-3:50 PM, Monday, Oct 7, 2024

Location: Holden Hall 104

Speaker:

Russell Kenney

The University of Oklahoma



Abstract:

Recent developments in all-digital phased array radar systems have probed the upper bound of performance for single monostatic radar systems. However, no matter how sophisticated, monostatic systems will always inherently be limited by the constraints of monostatic geometry. To continue pushing the state-of-the-art in radar capabilities, it is imperative that distributed radar systems with multiple-input multiple-output (MIMO) capabilities be developed, as these systems have been shown to not only increase performance but also enable enhanced capabilities in contrast with traditional monostatic systems. To properly implement such a distributed network of radars, particularly in airborne or other mobile modes, both accurate navigation and synchronization of the systems must be performed. These processes must be performed with accuracy on the order of the carrier wavelength, which poses strict requirements on the performance of the algorithms used for navigation and synchronization. In this seminar, a review will be presented on recent work done in the overlapping areas of navigation and time, phase, and frequency synchronization for mobile networks of distributed radar systems, beginning with a high-level description of relevant basic radar principles. This review will first cover recent work in implementing distributed radar navigation algorithms for leveraging time-of-flight (TOF) measurements in conjunction with inertial sensors to achieve higher-accuracy navigation. Second, the talk will review a recently proposed reference-free and fully digital technique for achieving time, phase, and frequency synchronization among distributed radar systems. This discussion will also include a description of preliminary research into integrating navigation with synchronization from an algorithmic standpoint. The talk will conclude with comments on the potential for future research efforts in the distributed radar space.

Speaker Bio:

Dr. Russell Kenney received the Ph.D. degree in electrical and computer engineering from the University of Oklahoma, Norman, OK, USA, in 2024. He is currently an assistant professor with the School of Electrical and Computer Engineering at the University of Oklahoma and is a member of the Advanced Radar Research Center (ARRC). He is a member of IEEE, Eta Kappa Nu, and Tau Beta Pi. His current research interests include system design and testing for synthetic aperture radar (SAR) and developing techniques for navigation, synchronization, and signal processing in mobile distributed radar networks. Dr. Kenney was the recipient of the University of Oklahoma's Outstanding Senior in Computer Engineering Award and the University of Oklahoma Dolese Teaching Fellowship. He was also the winner of the 2019 IEEE R5 Student Paper Competition at the local and area levels and was the runner-up at the regional level. In 2021, he was awarded the DoD National Defense Science and Engineering Graduate (NDSEG) Fellowship.



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