

Dual Function Systems: Radar as Signal of Opportunity for Wireless Communications

Abstract:

There is a growing need for bold and new concepts with the potential to contribute towards significant improvements in the efficiency of radio spectrum utilization and protection from interfering services. One of the most pressing problems in the area of spectral congestion and dynamic frequency allocations is to provide uncontested shared bandwidth between radar and communications. This has recently spurred extensive efforts towards devising solutions for simultaneous operations of radar target illuminations and wireless services sharing the same frequency bandwidth. Unlike the general approach of coexistence, which predicated on cognitive radio and cognitive radar for spectrum sensing and utilization, recent research is moving to enable the embedding of communication signals into radar waveforms. In so doing, the communication systems capitalizes on the resources of existing radar infrastructure, including high power, large bandwidth, and high quality hardware.

The talk establishes and promotes the area of dual system functionality, allowing radar to house voice and data transmission, leading to technological advances in radar and communications systems. The research develops novel signaling schemes for embedding information into the radar pulsed emissions, which, in most cases, is blind to the primary radar operation. It considers different antenna configurations, including multiple-input multiple-output (MIMO) radars and achieves high data rate communications by combining amplitude and phase-shift keying modulations with waveform-diversity and spatial degrees of freedom, while satisfying an overall power constraint.