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Distributed Joint Radar-Communications

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Recently, there has been a spate of developments in developing sensing and communications systems that operate in a common spectrum and hence avoid spectrum crowding [1]. Conventional joint radar-communications (JRC) models have focused on colocated antenna systems. In this work, we provide an overview of recent advances in JRC for the case when transmit and receive units are distributed in a wide area.

In particular, statistical or widely distributed radar, the target cross-section does not appear identical to all transmit-receive pairs. We discuss statistical JRC system in which by exploiting the connection between the achievable rate and the weighted minimum mean square error (WMMSE), we simultaneously design the radar waveform code, precoders of the full-duplex multi-user MIMO communications and the linear receive filters. Unlike prior works, here we consider practical constraints related to power and quality of service [2].

Next, we consider optimal allocation of shared for a distributed system comprising heterogeneous radars and multi-tier communications [3]. We focus on resource allocation in the context of multi-target tracking while maintaining stable communication connections. By simultaneously allocating the available power, dwell time and shared bandwidth, we improve the tracking performance under a Bayesian framework and guarantee the communications throughput.

We then analyze passive distributed JRC for narrowband Internet-of-Things (NB-IoT) applications, where each node receiver employs one-bit analog-to-digital-converters and describe a novel low-complexity nodal delay estimation method using constrained-weighted least squares minimization [4]. Finally, we provide an overview of JRC in the emerging Terahertz band applications [5].

References

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