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Compressed Sensing Inspired User Acquisition for Downlink Integrated Sensing and Communication

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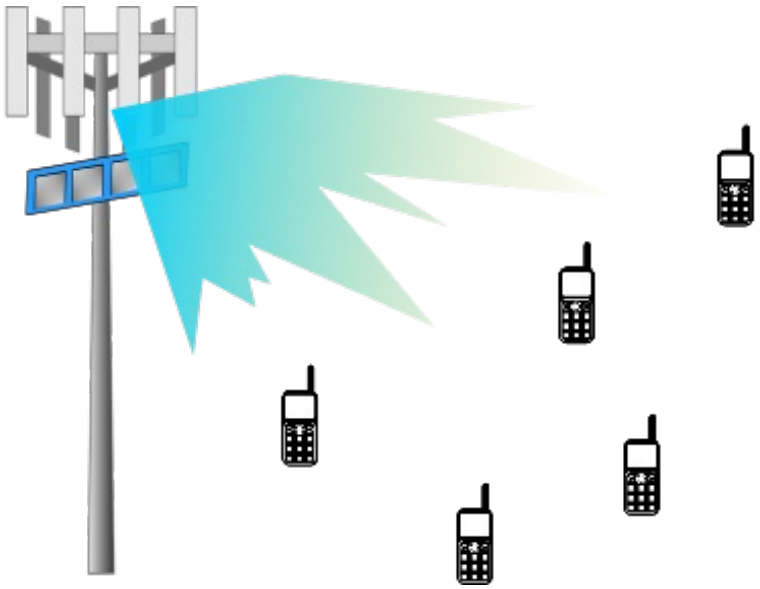
How can we accelerate acquisition of multiple users and estimate their locations when augmenting a MIMO base station with a radar receiver? How can we theoretically assess the performance of such an application?



E.g. A multi-antenna base station broadcasts an OFDM signal containing a control message to a set of connected devices through a random beam. A radar receiver, co-located with the base station, listens to the echo of the transmitted signal and processes it to detect the presence of new users, and their position in space.

KEY FINDINGS

Integrated sensing and communication has recently attracted considerable attention, mainly due to the proliferation of location-based services and the great opportunities for overhead reduction. Among the many different supporting infrastructures studied, a common option consists of augmenting a conventional base station with a radar receiver where the echoes of the information bearing signals are processed for localization and tracking purposes. Taking advantage of the spatial domain sparsity in high frequency channels, techniques from compressed sensing in combination with subspace methods can be applied to detect new users and locate them in delay and space domains. Furthermore, we apply tools from space-time coding theory to provide a theoretical analysis leading to the design of beamforming strategies.

Y. Song, F. Pedraza, S. Li, S. Li, H. Yu and G. Caire, "Compressed Sensing Inspired User Acquisition for Downlink Integrated Sensing and Communication Transmissions," ICC 2024 - IEEE International Conference on Communications, Denver, CO, USA, 2024, pp. 5293-5298, doi: 10.1109/ICC51166.2024.10622469.