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Interference Cancellation in Wideband Receivers using Compressed Sensing

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Abstract
Previous approach for narrowband interference cancellation based on compressed sensing (CS) in wideband receivers uses orthogonal projections to project away from the interference. This is not effective in the presence of nonlinear LNA (low noise amplifier) and finite bit ADCs (analog-to-digital converters) due to the fact that the nonidealities present will result in irresolvable intermodulation components and corrupt the signal reconstruction. Cancelling out the interferer before reaching the

LNA thus becomes very important. A CS measurement matrix with randomly placed zeros in the frequency domain helps in this regard by removing the effect of interference when the signal measurements are performed before the LNA. Using this idea, under much idealized hardware assumptions impressive performance is obtained.

The use of binary sequences which makes the hardware implementation simplistic is investigated in this thesis. Searching sequences with many spectral nulls turns out to be nontrivial. A theoretical approach for estimating probability of nulls is provided to reduce significant computational effort in the search and is shown to be close to actual search iterations. The use of real binary sequences (generated using ideal switches) obtained through the search does not do better compared to the orthogonal projection method in the presence of nonlinear LNA.

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