Karlsruher Institut für Technologie

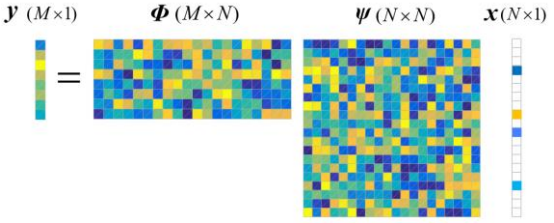
Seminar Radar & Communication WS 20/21

Compressed Sensing in Radar Systems

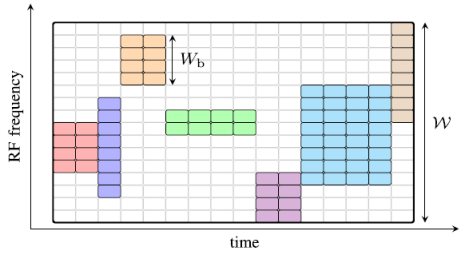
Due to the steadily increasing number of applications that make use of radars as well as their simultaneous demand for wide bandwidths and highly integrable hardware, there has been a growing interest in the application of compressed sensing (CS) in radar systems. In this context, CS consists of reconstructing information of interest from sparse signals or sparse sets of signals, and it can be used, e.g., for efficient waveform design or alleviation of hardware requirements.

A possible CS application in the waveform design context is the reconstruction of range and velocity information of targets from sparse signals in time and frequency domains, which enables more flexible interference-free multiuser operation in highly populated scenarios. Additionally, high-resolution radar measurements at relatively lower ADC sampling rates constitute a further CS application related to waveform design that also contributes towards having a simplified hardware platform. Focusing on hardware aspects only, a possible application of CS is in the reduction of the required number of antenna elements in an array. Such techniques allow achieving increased aperture and consequently enhanced angular resolution in spite of the reduced antenna count, therefore alleviating size and power consumption requirements.

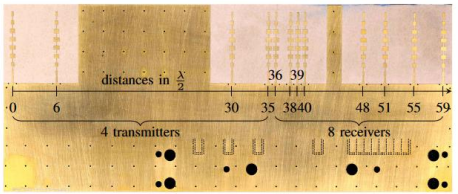
In this seminar, an overview of relevant CS techniques focusing on efficient waveform design and/or alleviation of hardware requirements shall be provided and the working principle of the CS-based algorithms used in these techniques shall be explained.



Y. Zhang et al., "Conjugate Gradient Hard Thresholding Pursuit Algorithm for Sparse Signal Recovery," *Algorithms*, vol. 12, no. 2, p. 36, Feb. 2019.



C. Knill et al., "High Range and Doppler Resolution by Application of Compressed Sensing Using Low Baseband Bandwidth OFDM Radar," in *IEEE Trans. Microw. Theory Tech.*, vol. 66, no. 7, pp. 3535-3546, July 2018



F. Roos et al., "Compressed Sensing based Single Snapshot DoA Estimation for Sparse MIMO Radar Arrays," 2019 12th German Microw. Conf., 2019, pp. 75-78, doi: 10.23919/GEMIC.2019.8698136.

Contact Person

M.Sc. Lucas Giroto de Oliveira
Building 30.34, Room 126
E-Mail: lucas.oliveira@kit.edu
Phone: 0721-608 45214