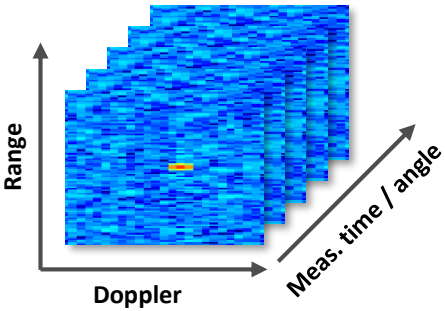
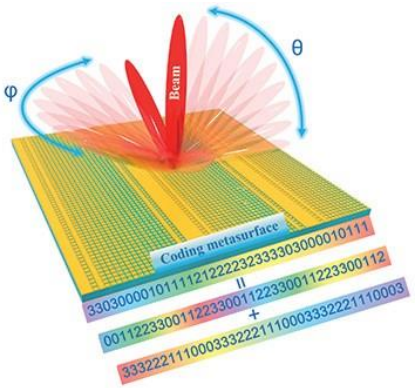
Karlsruher Institut für Technologie

Bachelor/Master Thesis

Direction of Arrival Estimation in OFDM Radar with Reconfigurable Metasurfaces

Currently, multiple-input multiple-output (MIMO) is the standard approach for enabling direction-of-arrival (DoA) estimation in radar systems. Its main drawback in terms of both hardware and signal processing requirements is the simultaneous usage of multiple transmit and receive channels/antennas. A possible alternative is the use of the so-called metasurfaces, which can be regarded as implementations of modern smart antenna arrays with codeable high-flexible beamforming that allow steering of a scattering beam to arbitrarily predefined directions.
By using this feature of reconfigurable metasurfaces, the main scattering beam of an OFDM radar transmitter can be pointed into predefined directions after transmitting an OFDM frame, whose received reflections from targets are processed and converted into range-Doppler images. The aim of this thesis is then to develop a strategy and signal processing algorithms to efficiently form 3D (range-Doppler-Azimuth) images from the ultimately obtained series of range-Doppler radar images, measured at as few as possible beam positions to optimize the measurement time. Additionally, the developed algorithms shall compensate eventual range migration errors caused by the movement of targets during the measurement.





Prerequisites:

- Basics of radio-frequency and communications engineering as well as signal processing
- Basic knowledge of OFDM
- Proficient knowledge of MATLAB
- Motivation and capability of independent work

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