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FAKULTÄT FÜR INFORMATIK UND ELEKTROTECHNIK

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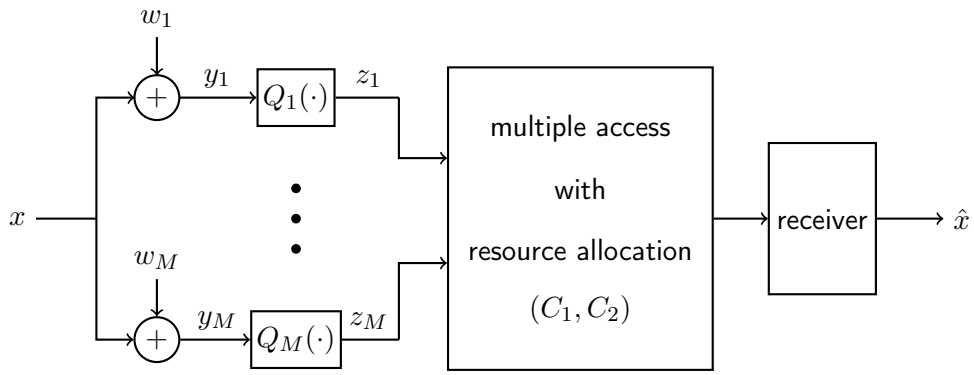
Master Thesis

Optimization of Distributed Compression and Resource Allocation

Description:

Distributed technical systems for monitoring and control rely heavily on communication capabilities. Sensing, communication, and signal processing have to be jointly optimized to optimally infer the desired information. In this thesis, distributed sensors communicate over a shared medium to a common receiver. The measurements are noisy which is widely known as remote sensing problem. In order to ensure reliable transmission from each sensor to the common receiver the measurements have to be compressed and FEC encoded. These compressed measurements shall contain as much information as possible about the measured physical quantity. This problem is known as the Chief Execution Officer (CEO) problem. Usually, the link capacities to the common receiver are given. For a shared medium, however, resource allocation allows to assign different rate tuples to the sensors. For orthogonal multiple access (OMA) schemes like FDMA, the overall bandwidth can be differently shared between the sensors. For non-orthogonal access (NOMA), the detection order at the common receiver determines the rate with which each sensor is allowed to transmit.



In this thesis, a scenario with two sensors shall be considered. Their quantizers are jointly optimized using the successive information bottleneck (SIB) approach. The rate constraints required for this optimization are obtained from a resource allocation algorithm to be developed. The resource allocation algorithm shall consider the relevant information the sensors can provide under different rate constraints.

The required tasks for this thesis are:

- Literature review on the CEO problem and the Information Bottleneck method as well as resource allocation principles approach.
- Familiarization with the current implementation of the SIB algorithm in Python
- Derivation and implementation of resource allocation algorithm
- Analysis of its performance

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