Aufgabenstellung zur Studienarbeit

SNIR Investigation for Decentralized Interference Cancellation in Mobile Radio Networks

In future mobile radio systems, interference cancellation is a very challenging issue. The decentralized iterative joint detection (JD) / joint transmission (JT) signal processing considering only partial channel state information (CSI) for intercell interference cancellation is a promising candidate for future time division duplex (TDD) based orthogonal frequency division multiplexing (OFDM) mobile radio networks.

A multi-cell cellular system is used as the reference scenario to investigate the proposed technique. Based on partial CSI, a distributed implementation of the iterative algorithm which is well known as parallel interference cancellation is performed in the uplink and named as decentralized iterative partial JD. The same ideas are implemented in the downlink and the decentralized iterative partial JT is implemented. If the iterative partial JD/JT converges, based on the limiting value we can analytically assess the system performance in terms of bit error rate (BER) and capacity with the help of the signal-to-noise-plus-interference ratio (SNIR). The investigation of the SNIR is a key point during the system performance assessment.

In this work, the following tasks are expected to be completed.

- Derive the formula to calculate the SNIR of the conventional cellular system and the service area (SA) based joint transmission and detection integrated network (JOINT). The corresponding simulation and calculation of the system capacity based on the SNIR will be performed with the help of the software tool Matlab. This aim of this task is to get a general idea of the SNIR of different cellular systems, and the results will be used for the comparison with our proposal.

- To investigate the system performance of our proposal, i.e., future mobile radio networks applying JD/JT with partial CSI, the formula to calculate the SNIR of the reference scenario is to be derived in some special cases, i.e., the case that all the user specific significant interference channel matrices are compatible with each other, the case that the combined significant interference channel matrix can cover all the elements of the significant useful channel matrix and the special case of full cooperation. The corresponding simulation and calculation of the system capacity based on the SNIR will be performed with Matlab.

This work is expected to help the system performance assessment of the reference scenario with different system architectures and under various conditions of the channel coefficients for our current research.

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