Abteilung Telekommunikationstechnik und Angewandte Informationstheorie
Universität Ulm

DIPLOMARBEIT

Statistical Prefiltering for Wireless Multiple Antenna Systems with Feedback Link

Erläuterungen:

Recent theoretical results on multiple antenna wireless systems promise a great performance improvement in terms of capacity compared to single-input single-output systems. However, it turns out that without adaptive transmit processing, this capacity improvement is very much dependent on a rich scattering environment, which provides uncorrelated fading between the antenna elements. In the presence of strong fading correlation, the performance of non-adaptive systems significantly degrades, thus making it impossible to transmit multiple data streams in parallel.

If it is possible to acquire channel state information at the transmitter, it is well known that adaptive transmit signal processing comprising subchannel power allocation in combination with adaptive modulation can at least partly overcome the problems in the presence of fading correlation. To this end, the transmitter needs adequate information on the prevailing channel state. Unfortunately, especially in frequency duplex systems, it is difficult if not impossible to obtain instantaneous (short-term) channel state information at the transmitter. In this case, one can base the adaptive algorithms on long-term channel state information, namely the fading correlation, which depends only on the large-scale scattering scenario and changes only on a long-term time scale. Long-term information on the wireless link at the transmitter can e.g. be acquired via a (low-rate) feedback link from the receiver.

In this Diploma thesis, adaptive feedback-based statistical transmit processing algorithms shall be found, that are capable of dealing with strongly correlated multiple-input multiple-output wireless channels. The algorithms shall be implemented in Matlab, whereas an existing simulation environment can be taken as a basis.

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