

Forschungspraxis

Investigation of Practical Dirty Paper Coding Approaches

Many practical communication scenarios involve interference from other users. Generally, this interference will cause a degradation of the link quality and hence, lower transmission rates can be achieved.

In 1983, Max Costa developed a scheme known as dirty paper coding (DPC), which shows that one can achieve the same performance (with the same power budget!) on the additive white Gaussian noise (AWGN) channel as in the interference-free case if the interference is noncausally known to the transmitter [1]. However, a practical implementation has a high complexity and is not considered feasible at this point.

In this research project, we want to review an approximation of DPC by using sum codes [2] and compare it to schemes that have been developed at our institute.

The work will contain both theoretical investigations using achievable rates as well as a practical implementation using finite length FEC codes. A good proficiency in Matlab/Python/Julia/C will be of good help. The project can be extended to a Master's thesis if desired by the student.

[1] M. Costa, "Writing on dirty paper," IEEE Trans. Inf. Theory, vol. 29, no. 3, pp. 439–441, May 1983.

[2] K. M. Rege, K. Balachandran, J. H. Kang, and M. K. Karakayali, "Practical Dirty Paper Coding With Sum Codes," IEEE Trans. Commun. Theory, vol. 64, no. 2, pp. 441–455, Feb. 2016.

Prerequisites

- **MUST:** Information Theory
- **MUST:** Channel Coding
- **GOOD TO HAVE:** Channel Codes for Iterative Decoding
- **GOOD TO HAVE:** Multi-User Information Theory

Advisors

Fabian Steiner, Juan Diego Lentner Ibanez