# Low-complexity Distributed Equalizers for Data Transmission Using Spatial Division Multiplexing

Master's Thesis

Project

Future fiber-optic communication systems will likely rely on spatial division multiplexing techniques, where multiple fiber cores or multiple transmission modes are used to transmit data over parallel channels, akin to MIMO wireless communications. The unavoidable crosstalk between the different channels must be compensated for. This is typically done using digital equalization techniques in a digital signal processor. Due to the large amount of data needed to be processed, this task typically cannot be implemented on a single processor, but needs to be distributed to multiple processors. Unfortunately, the communication between different processors within the receiver is typically a bottleneck, and the speeds required to exchange finely quantized samples would exceed multiple TBit/s, which is not feasible.

Hence, in this thesis, we investige novel concepts of realizing distributed signal processors with constrained data exchange between the individual processors. Starting from an existing equalizer, you first evaluate which parts can be distributed in the best possible way by carrying out an analysis of the intercommunication data rate. In a second step, you use machine learning to evaluate novel equalization concepts that directly take into account the intercommunication bottleneck during design time.
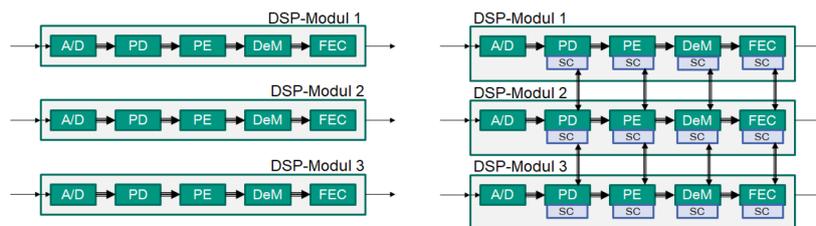
Tasks

1. Evaluate distributed MIMO equalizers with communication constraints
2. Investigate traditional and ML-based distributed MIMO equalizers
3. Assess the potential of this approach for other receiver components

Requirements

- ✔ Knowledge of communications engineering
- ✔ Knowledge of machine learning for communications
- ✔ Programming experience in Python and/or MATLAB

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