symbol blocks are as equal as possible.

The mutual information is maximized by making the known symbol clusters as small as possible and placing them such that the unknown symbol clusters are the largest possible. Known symbol clusters placed with cluster lengths at least possible. Known symbol clusters placed with cluster lengths at least the set of all the

\[ f'(\theta|\phi) = \frac{f'(|\theta|,|\phi|)}{f(|\phi|)} \]

Optimizing the Position of Known Symbol Clusters

What is the optimal equalizer?

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Detecting symbol clusters for maximizing the mutual information:

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Lemma 1 For a given linear time invariant filter f and known symbol placement, the feedback optimal performance criterion is given by the following equation:

\[ G(f, d) = \sum_{i=1}^{N} |H(f, d) i|^2 \]

where

\[ H(f, d) = \sum_{i=1}^{N} f_i d_i \]

is the joint optimization of the performance criterion. Our objective is to perform the joint optimization of this performance criterion.

We consider the average mean square error (A-MSE) as the performance criterion. For a given linear time invariant filter f and known symbol placement, the feedback optimal performance criterion is given by the following equation:

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The channel is assumed to be of order L. The forward filter is assumed to be time invariant and of order L. Noise is assumed to be additive, white, and Gaussian with zero mean and variance \( \sigma^2 \). The unknown symbols are assumed to be independent and identically distributed with zero mean and variance \( \sigma^2 \). The unknown symbols are assumed to be independent and identically distributed with zero mean and variance \( \sigma^2 \). The input sequence is assumed to consist of known and unknown symbols.

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Theorem. Let \( \{ \alpha_k \} \) be the optimal symbol distribution independent of the propagation channel. This property is crucial in broadcast applications.

- Figure 8 shows one distribution that is optimal.
- Figure 9 suggests that symbol detection can be improved if known.

Conversely, known symbols are placed in clusters of length at least \( d \).

We assume that the known symbols are placed in clusters of length at least \( d \).

**Generalized Optimal Symbol Placement**

Flows are examples of graphical representations.

**Example**

(6)

\[
f \neq f \wedge f \in \mathcal{D} \quad \exists \; \alpha \quad \mathbb{P}(x_k = \alpha | f) \neq 0
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**Precursor Cancellation DFE**

Flows are examples of graphical representations.
The gain from optimization is significant for systems with high percentage of known symbols.

The algorithm of placement is quite simple.

Optimizing the equalizer and the position of known symbols.

We find that the performance of the receiver can be improved by jointly optimizing the performance of conventional DFE.

The known symbols present in the data stream can be used to improve

Conclusions

Simulation

Optimal Forward Filter and Minimum AMSE