Iterative Symbol Recovery for Power Efficient DC-Biased Optical OFDM Systems

MATLAB Package

Notations

We consider the model

$$y[n] = s_{a,B}[n] + v[n], \ 0 \le n \le N-1,$$

where:

- $y[n]$ is the received noisy signal;

- $s_{a,B}[n]$ is the OFDM signal, after 1) DC-bias addition and 2) absolute value; and

- $v[n]$ is an additive noise.

In this model, we assume that $s(t)$ is a time-domain OFDM signal, generate from a known constellation of symbols (e.g., 8-PSK or 4-QAM). Due to the non-negativity constraint of the Intensity-Modulation Direct-Detection (IM-DD) transmission, A DC-bias is added to form $s_B(t) \triangleq s(t) + B_{DC}$, where $B_{DC} \in \mathbb{R}^+$. Then further ensure non-negativity, we apply the absolute value operator to have $s_{a,B}(t) \triangleq |s_B(t)| = |s(t) + B_{DC}|$. Finally, $s_{a,B}[n] \triangleq s_{a,B}(nT_s)$.

Content

This package contains two files (not including this instruction file):

1. `ISEA.m`
2. `Script_DC_OFDM_Direct_Detection_via_ISEA.m`

Description

1. `ISEA.m` — This function is an implementation of the Iterative Sign Estimation Algorithm (ISEA), as it appears in [1], Subsection II-C.

   Note: The file contains additional (necessary) local functions, so it is self-contained. For more details see the in-code documentation in the file.

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2. `Script_DC_OFDM_Direct_Detection_via_ISEA.m` — A GUI-equipped script which demonstrates the operation of the ISEA algorithm.

References:

[1] Weiss, A., Yeredor, A., and Shtaif, M, "Iterative Symbol Recovery for Power Efficient DC Biased Optical OFDM Systems", *Journal of Lightwave Technology*, vol. 34, no. 9, pp. 2331-2338, May 2016.

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