

Channel Equalization in Fiber Optic Communication Systems



Overview

Equalization is the technique designed to reverse the channel's blurring effect by applying an inverse operation at the receiver. This is achieved through a specialized digital component known as an equalizer, which acts as a compensating filter. We start by clarifying the metrics used to evaluate the equalizers' performance, relating them to the loss functions employed. In this paper, photonic reservoir computing chip architectures for noise equalization in optical fiber communication channels are proposed. These architectures leverage optical computing instead of electrical computing to reduce computational pressure at the receiver and decrease processing. Channel equalization is a processing technique that restores the quality of a digital signal after it has traveled through a physical communication path.



Article Content

Channel and Equalization Algorithms in Optical Fiber Communication

In this paper we demonstrate the spatial and spectral dynamics of pulse propagation in a step-index few-mode optical fiber, through an experimental and numerical analysis.

Neural Networks-based Equalizers for Coherent Optical Transmission ...

works (NN) based nonlinear channel equalizers in coherent optical communication sys. ems. The goal of this study is to guide researchers and engineers working in this field. We start by clarifying the

Low Latency Fiber Communication System Equalizer Based on

Abstract: We demonstrate a low latency fiber channel distortion equalizer that implements mainly of the equalization calculations in the optical domain, based on an integrated photonic reservoir computing

Multi-core fiber channel equalization algorithm based on K nearest ...

Abstract. Aiming at the channel damage problems of multi-core fiber (Multi-core Fiber, MCF), the AKNN (Adapted K-Nearest Neighbor) algorithm is proposed. The MATLAB software was used to simulate

Coherent all-optical reservoir computing for nonlinear equalization in ...

For real long-haul transmission scenarios, we propose an all-optical RC operated in a coherent scheme to mitigate the nonlinear distortion of high-speed signals.

Phase Noise and Polarization Effects in Fiber-Optic Communication ...

This thesis unravels phase and polarization challenges in optical communication systems by characterizing polarization drift channels, introducing polarization tracking algorithms, utilizing polar

Equalization and FEC Techniques for Optical Transceivers

Abstract— In this tutorial paper, we present the application of well-known DSP techniques used in lower speed wireline and wire-less applications, to high-speed optical communications. After an

Electrical equalization for advanced optical communication systems ...

The optical transmission channel in today's high capacity high speed lightwave communication systems is well understood and various system level models exist for the various

A Volterra Equalizer for Compensation of Nonlinear Phase Noise and ...

In the realm of high-speed data transmission, the increasing demand for bandwidth and low-latency communication has intensified the utilization of busy fiber optic lines. These high

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Introduction Conventional linear feed forward equalizers (FFE) are widely used in fiber optic communication systems to mitigate inter-symbol interference resulting from a limited bandwidth of

Coherent detection in optical fiber systems

Abstract: The drive for higher performance in optical fiber systems has renewed interest in coherent detection. We review detection methods, including noncoherent, differentially coherent, and coherent

Blind Equalization and Channel Estimation in Coherent Optical ...

As the demand for higher data throughput in coherent optical communication systems increases, we need to find ways to increase capacity in existing and future optical communication links.

Neural Networks-based Equalizers for Coherent Optical Transmission ...

Abstract—This paper performs a detailed, multi-faceted analysis of key challenges and common design caveats related to the development of efficient neural networks (NN) based nonlinear channel

Dual-Tap Optical-Digital Feedforward Equalization Enabling High

When the fiber length is 15km, there are two frequency notches in the upper sideband of the channel response for the IM/DD system without an optical equalizer, while only one notch exists

Analysis for Joint Algorithm in Coherent Optical Fiber Communication ...

We propose a joint algorithm for nonlinear channel equalization in coherent optical communication system. We have experimentally demonstrated its performance and complexity, and analyzed the

Turbo Equalization in Fiber-Optics Communication Systems

Turbo Equalization in Fiber-Optics Communication Systems In order to adapt to the ever-increasing demands of telecommunication needs, network operators already consider 100 Gb/s per dense

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