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Performance enhancement of LACO-OFDM BER and PAPR using a K-means algorithm for a VLC system

Abstract

Layered asymmetrical clipped optical-orthogonal frequency division multiplexing (LACO-OFDM) enhances spectral efficiency by mandating the use of a K-means algorithm in LACO-OFDM (KLACO-OFDM), which enables efficiency gains to nearly double by modulating odd and even subcarriers. The traditional receiver is not sufficiently sophisticated enough to exploit the full potential of LACO-OFDM, thereby restricting its performance. In this paper, a K-means algorithm was used to increase the spectral efficiency of LACO-OFDM by integrating machine learning to cluster the inward signal such that the original locations of the received constellations can be retrieved. A K-means algorithm is used for assigning the received constellation points into their clusters of the ordinary quadrature amplitude modulator constellation points. The new mathematical framework in the proposed scheme is structured to analyze the PAPR and BER performance of LACO-OFDM systems that have been derived. The K-means algorithm development in LACO-OFDM (KLACO-OFDM) has also reduced the intersymbol interference, hence improving the spectral efficiency of LACO-OFDM compared with the conventional system in visible light communication (VLC) systems. BER gains were about 1.2–1.6 dB at 10−3 BER value, which rises from 1.4 to 2 dB for a 10−4 BER value because a lower BER facilitates precise estimation.

Keywords

Machine learning; Orthogonal frequency division multiplexing; Peak to average power ratio; Spectrum efficiency; Visible light communication