Soft-feedback MMSE equalization for non-orthogonal frequency division multiplexing (n-OFDM) signal detection

Abstract:

A frequency division multiplexing technique, nonorthogonal frequency division multiplexing (n-OFDM), is proposed in [1]- [2] to enhance the efficiency of bandwidth utilization. This paper reveals that the smaller the frequency separation, the larger sum capacity can be achieved compared with the conventional OFDM technique. However, n-OFDM system introduces inter-carrier interference (ICI) at the transmitter because the orthogonality between the subcarriers no longer holds. Moreover, since the channel covariance matrix of n-OFDM has high condition number when the overlapping factor, 1 - α, is large, conventional linear detectors suffers from severe noise enhancement. To solve this problem, this paper proposes the use of soft cancellation- minimum mean-squared error (SCMMSE) turbo equalization. Binary constellation constrained mutual information (CCMI) is calculated by utilizing the area property for the EXtrinsic Information Transfer (EXIT) chart of the SC-MMSE equalizer. Results of the EXIT chart analysis and bit-error-rate (BER) simulations in additive white Gaussian noise (AWGN) channel are presented.