ICI Reduction in Multicarrier Systems

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Abstract

Inter-Carrier Interference (ICI) is a major contribution to performance degradation in multicarrier systems. The main reason of the ICI is the Carrier Frequency Offset (CFO). Some researchers reduced the effect of this ICI by estimating the CFO value then compensating for it. The CFO estimation accuracy affects in turn the multicarrier system performance. The Repeated Prefix (RP) is a new technique that is recently proposed to reduce the ICI effect by estimating the CFO value without producing mathematical derivations. The drawback of this technique is its low performance at low guard interval values. This paper enhances the performance of this method at low guard interval values, giving the Maximum Likelihood Estimation (MLE) derivation for this process in addition to a derivation of the relative Cramer-Rao Lower Bound (CRLB). The proposed technique (RP-combined) reduces the effect of the residual ICI and can be used once in the transmitted frame with less data rate losses. Simulations show comparable results between both theoretical and simulated cases. Simulations also show the system performance with/without using channel estimation stage to show that, the channel estimator increases the
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immunity of the system performance to ICI for small offset values.

References


Index Terms

Computer Science  Signal Processing
Keywords

Orthogonal frequency division multiplexing (OFDM), channel estimation, Repeated Prefix (RP),
inter-carrier interference (ICI), carrier frequency offset (CFO), Maximum Likelihood Estimation
(MLE), Cramer-Rao Lower Bound (CRLB).