Abstract

For orthogonal frequency-division multiplexing (OFDM) communication systems, the frequency offsets in mobile radio channels distort the orthogonality between subcarriers resulting in intercarrier interference (ICI). This paper studies an efficient ICI cancellation method termed ICI self-cancellation scheme. The scheme works in two very simple steps. At the transmitter side, one data symbol is modulated onto a group of adjacent subcarriers with a group of weighting coefficients. The weighting coefficients are designed so that the ICI caused by the channel frequency errors can be minimized. At the receiver side, by linearly combining the received signals on these subcarriers with proposed coefficients, the residual ICI contained in the
received signals can then be further reduced. The carrier-to-interference power ratio (CIR) can be increased by 15 and 20 db when the group size is two or three, respectively, for a channel with a constant frequency offset. Although the redundant modulation causes a reduction in bandwidth efficiency, it can be compensated, for example, by using larger signal alphabet sizes. Simulations show that OFDM systems using the proposed ICI self-cancellation scheme perform much better than standard systems while having the same bandwidth efficiency in multipath mobile radio channels with large Doppler frequencies.

References

- R. W. Chang and R. A. Gibby, "A theoretical study of performance of an orthogonal multiplexing data transmission scheme,
- L. J. Cimini, Jr., "Analysis and simulation of a digital mobile channel using orthogonal frequency division multiplexing,"
- J. Ahn and H. S. Lee, "Frequency domain equalization of OFDM signal over frequency nonselective Rayleigh fading channels.
- N. A. Dhahi et al., "Optimum finit-length equalization for multicarrier transceivers.
- Y. Zhao and S.-G. Häggman, "Sensitivity to Doppler shift and carrier frequency errors in OFDM systems.

Index Terms

Computer Science    Emerging Trends in Technology

Keywords

Ici Self-cancellation  Intercarrier Interference  Multicarrier Modulation  Ofdm