Abstract

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Fractal Barker Codes for Efficient Channel Estimation for Wavelet OFDM Systems

In this paper a new wideband channel estimation technique is presented. This new technique is based on using fractal Barker codes and the multi-scale decomposition of the wavelet filter bank. In this technique new Barker codes named fractal Barker codes are generated and used as inputs to the different stages of wavelet based orthogonal frequency division multiplexing (WOFDM) transmitter. This results in a wideband fractal output training sequence at the transmitter. This fractal training signal is used to accurately estimate the characteristics of a multipath frequency Selective fading channel. In doing so, the complex path gains can be obtained with accuracy through the use of only a few samples of the transmitted and received training sequences. The delays for each path can be calculated using the transmitted and received fractal Barker codes. This channel estimation technique allows for accurate calculations without the need for pilot interpolations as with other conventional techniques. The performance of this new synthesized pilot signal is tested with different wavelet filters for its generation in the transmitter. The simulations and results show how the fractal training signal is generated and how the wideband and fractal nature of the introduced training sequence results in a channel estimation technique with a reasonable percentage of error in addition to the simplicity of the technique as no pilot interpolation is needed.