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Research Article

Enhancement of Noise Performance in Digital Receivers by Over Sampling the Received Signal

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Abstract

In wireless channel the noise has a zero mean. This channel property can be used in the enhancement of the noise performance in the digital receivers by oversampling the received signal and calculating the decision variable based on the time average of more than one sample of the received signal. The averaging process will reduce the effect of the noise in the decision variable that will approach to the desired signal value. The averaging process works like a filter that reduces the noise power at its output according to its averaging interval. Although the power spectrum of the noise does not change according to the averaging process, the noise variance at the decision variable will be smaller than the channel noise variance. This paper studies this idea and show how the performance of digital receivers can be enhanced by oversampling the received signal. This paper shows another treatment method to the noise problem in digital modulation systems.

Keywords : Wireless channel; Noise performance; Signal; Averaging interval.

1 Introduction

Noise is the main corrupting element in any communication system. It is unavoidable interference source in all communication channels and the main source of errors and performance degradations. A lot of researches have been done to minimize the effect of the noise or to try to cancel it. Some of these researches depend on minimizing the mean square error value between the channel noise and another noise like signal which generated from a noisy source and an adaptive filter [1, 2, 6].Other approaches use the recursive least square (RLS) algorithm to minimize the error square between the estimated signal with reduced noise and the noisy measured signal [3]. The noise reduction receivers based on RLS algorithm are faster than those based on LMS algorithm however the LMS algorithm can reduce the noise power more than the RLS algorithm. Another research shows that the noise and signal feature detection problem can be converted to statistical hypotheses tests based on the sample correlation in different orientations [4].This algorithm provide ways of measuring the degree of noise with respect to the degree of signal feature, and its adaptive noise reduction filtering framework provides good performance with respect to the adaptive algorithms when the underlying noises are from Gaussian or non-Gaussian distributions. In addition to adaptive algorithms, channel coding may be used to enhance the noise reduction process as shown in [5]. The previous trials are depending on a complex signal processing unit that complicates the receiver structure however the performance enhancement is not great especially with the white noise case. On the other

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