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(4) Research Title: A Fast and Efficient Adaptive Channel Equalizer for OFDM-Based Wireless Relay System

Detail:

In order to eliminate the interference signals for a novel wireless communication repeater based on OFDM. The wireless repeater in communication system is important especially for mobile system. Now these days, in order to amplify the signal via repeater, receiver and transmitter of repeater using only one frequency without frequency shift. However, in this case repeater has problem that, amplified signal will feedback to receiver sides and this may cause the internal instability and distortion of repeater system. Therefore, by estimating the feedback signal by adaptive filter, we can eliminate the effects of feedback signal. In this paper we consider LMS, NLMS and RLS algorithms in order to estimate the feedback signal. Furthermore, by these adaptive filters we identify the unknown channel and evaluate the performance of each algorithm by MSE. Here, the LMS does not work and RLS has the best performance comparing to NLMS for identification of the unknown multi path channel.
Results:

The interference effects of feedback signal may cause the distortion in repeater system due to existence of multi path channel. Therefore, in this paper interference cancellation system is implemented by adaptive filter. There are many schemes and algorithms for adaptive filter. But in this paper, we consider the channel identifier algorithm in order to realize the unknown channel inside repeater and by identifying the unknown channel we can produce the feedback signal. Consequently, by producing the feedback signal we can eliminate the interference effects in receiver sides of repeater.

Interference Cancellation in Repeater System

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MSE = 10\log_{10} \frac{\sum_{i=1}^{n} (y_{feedback}(i) - y_{estimate}(i))^2}{\sum_{i=1}^{n} y_{feedback}(i)^2}
\]

In this paper, we consider a novel wireless repeater communication system based on OFDM. By implementing LMS, NLMS and RLS algorithms, the interference of feedback signal is cancelled. As a consequence for RLS with forgetting factor 0.1 for channel No. 1 and 0.01 for Channel No.2, it had fast convergence comparing to LMS and NLMS. However, For channel No.2 LMS became unstable. As a future works we are going to implement a new and fast algorithm in order to identify more complicated feedback multi path channel.