Channel Estimation and Multiuser Detection for DS-CDMA System Using Hidden Training Sequence in Multipath Channels

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Abstract

We propose a new receiver for the CDMA system using a hidden training sequence in the multipath channel. Based on this concept of a hidden training sequence, the proposed receiver achieves more bandwidth efficiency than the training based MMSE receiver (no re-training period) and more improvement in the convergence performance than the blind Minimum Variance (MV) receiver. In addition, we also estimate the channel information of the desired user using the hidden training sequence to estimate the effective spreading code of the desired user. The simulation results show that the performance of the proposed receiver is better than that of the blind MV receiver and close to that of the training based MMSE receiver.

I. Introduction

DS-CDMA systems have great advantages to wireless environments. They are prime candidates for the third generation wide band wireless systems, due to their improved bandwidth efficiency and flexibility. Recently, significant efforts have focused on designing multiuser receiver in order to suppress multiuser interference (MUI) and deliver the promised capacity gains of the CDMA technology.

Multiuser receiver design can be divided into two categories based on whether training sequences are used or not. In the first category, training based minimum mean square error (MMSE) receivers can be adaptively implemented if the desired signal is known at the receiver and Tdmshow the best performance among sub optimal linear receivers [4]. However, it has to use a portion of bandwidth just for transmitting a training sequence. Therefore, bandwidth efficiency is decreased. To overcome this drawback, a blind approach is employed. A scheme was presented in [4] for the case when multipath interference is absent. Recently, constrained optimization solutions called as minimum variance (MV) receivers were developed, which combine all multipath components of the signal of interest and jointly minimize MUI while maximizing the signal component at the receiver’s output [2]. And the adaptive implementation of the MV receivers are presented in [3]. Although this type of the blind receivers are good for applying the adaptive algorithm, it is verified in [2][4] that it is difficult to converge to the