

Multiuser Detection Based on Adaptive LMS and Modified Genetic Algorithm in DS-CDMA Communication Systems

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Abstract In this paper, we present an efficient evolutionary algorithm for the multi-user detection (MUD) problem in direct sequence-code division multiple access (DS-CDMA) communication systems. The optimum detector for MUD is the maximum likelihood (ML) detector, but its complexity is very high and involves an exhaustive search to reach the best fitness of transmitted and received data. Thus, there has been considerable interest in suboptimal multiuser detectors with less complexity and reasonable performance. The proposed algorithm is a combination of adaptive LMS Algorithm and modified genetic algorithm (GA). Indeed the LMS algorithm provides a good initial response for GA, and GA will be applied for this response to reach the best answer. The proposed GA reduces the dimension of the search space and provides a suitable framework for future extension to other optimization algorithms. Our algorithm is compared to ML detector, Matched Filter (MF) detector, conventional detector with GA, and Adaptive LMS detector which have been used for MUD in DS-CDMA. Simulation results show that the performance of this algorithm is close to the optimal detector with very low complexity, and it works better in comparison to other algorithms.

Keywords Direct sequence-code division multiple access (DS-CDMA) · Multiuser detection · Adaptive LMS algorithm · Genetic algorithm

1 Introduction

In a direct sequence-code division multiple access (DS-CDMA) system, the receiver is a matched filter bank (MFB), which comprises the conventional detector (sign detector). This

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