

A Chip-Level BSOR-based linear GSIC multiuser Detector for Long-Code CDMA Systems

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Abstract

In this work, we introduce a chip-level linear group-wise successive interference cancellation (GSIC) multi-user structure that is asymptotically equivalent to block successive over-relaxation (BSOR) iteration, which is known to outperform the conventional block Gauss-Seidel iteration by an order of magnitude in terms of convergence speed. The main advantage of the proposed scheme is that it uses directly the spreading codes instead of the cross-correlation matrix and thus doesn't require the calculation of the cross-correlation matrix (requires $2NK^2$ floating point operations (flops), where N is the processing gain and K is the number of users) which reduces significantly the overall computational complexity. Thus it is suitable for long-code CDMA systems such as IS-95 and UMTS where the cross-correlation matrix is changing every symbol. We study the convergence behavior of the proposed scheme using two approaches and prove that it converges to the decorrelator detector if the over-relaxation factor is in the interval $]0, 2[$. Simulation results are in excellent agreement with theory.