Abstract

Multi-user detection is adopted to mitigate the performance degradation by multiple access interference and near-far effect in a DS-CDMA system. As a sub-optimum multi-user detector, a parallel interference cancellation (PIC) receiver has advantages such as moderate complexity and low processing delay.

In this thesis, a multi-stage partial PIC receiver is proposed for the asynchronous multi-rate DS-CDMA system which adopts the multiple processing gain (MPG) scheme. In each stage of the proposed receiver, partial cancellation is performed with an adaptive decision threshold which is computed from the absolute value of the matched filter outputs of the previous stage. The bit error rate (BER) performance of the proposed receiver is obtained by simulation in an AWGN channel and in a Rayleigh fading channel and compared with those of the conventional multi-stage PIC receiver and the extended group-wise successive interference cancellation (GSIC) receiver. In the simulation, the Rayleigh fading channel of each user is assumed to be frequency-flat and independent of those of the others. It is also assumed that each user modulates its information with BPSK and uses a Gold sequence as a signature sequence.

It is shown from the simulation results that the proposed receiver achieves smaller BER than the conventional multi-stage PIC receiver and extended GSIC receivers for the multi-rate DS-CDMA in an AWGN channel and in a
Rayleigh fading channel.

**Key Words:** multi-rate DS-CDMA, multi-user detection, partial parallel interference cancellation, AWGN, frequency flat Rayleigh fading, BER