

Multi-Layer Broadcasting Hybrid-ARQ Strategies for Block Fading Channels

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August 31, 2007

Abstract

Conventional hybrid automatic retransmission request (HARQ) is usually used to maximize throughput. However, high throughput is achieved at the expense of high latency. We study a novel broadcasting HARQ strategy. The multi-layer broadcast approach is suitable for the case where transmitter has no channel state information (CSI), which is the case with HARQ schemes as well. The broadcast approach enables the receiver to decode rates, which are matched to every fading gain realization. That is, the higher the fading gain realization, the more layers are reliably decoded. The broadcast approach combined with HARQ enables achieving high throughput with low latency. In a broadcast HARQ scheme every code layer supports HARQ independently. Thus HARQ is applied in every transmission block to undecoded layers only, which highly increases the broadcast approach efficiency. In this paper, both broadcast chase combining (BCC) HARQ and broadcast incremental redundancy (BIR) HARQ are studied in the limit of infinitely many layers, and for finite level coding. Interestingly, with continuous broadcasting the BCC-HARQ is found to closely approximate the BIR-HARQ, while using a sub-optimal broadcasting power distribution.

Index Terms

Multi-layer broadcasting, hybrid-ARQ, incremental redundancy, chase combining.