

Title	ワイヤレス通信における情報源相関を用いたフィードバック付き誤り制御
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Citation	
Issue Date	2017-03
Type	Thesis or Dissertation
Text version	ETD
URL	http://hdl.handle.net/10119/14245
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The primary objectives of this dissertation are to improve the end-to-end throughput of parallel multihop relaying network and to fully mathematically analyze the performance of one-time retransmission in a single-hop system, with the utilization of the source correlation and the feedback. Hence, we arrange the analyses into two parts: multihop and single-hop transmissions.

In the first part, we consider a parallel multihop transmission where there is no direct link between the source and the destination. We introduce Lossy-Forwarding (LF) concept to Hybrid Automatic Repeat reQuest (HARQ) schemes, referred to as LF HARQ, and propose two techniques of LF HARQ: Fully-LF and Partially-LF HARQs. With Fully-LF HARQ, the relay nodes always forward the packet, regardless of whether or not the information part of the packet contains errors, to the next hop instead of discarding those containing errors as in the conventional lossless decode-and-forward schemes. With Partially-LF HARQ, the relay nodes select either forwarding the erroneous packets or requesting retransmission. The mode selection bases on the confidence indicator (CI) expressing the reliability of the received packets which is. Since the channels are assumed to suffer from block Rayleigh fading, the CI is calculated via online measurement of mutual information, block-by-block. The numerical results show that the average end-to-end throughput performances of the proposed techniques significantly outperforms the conventional techniques. Furthermore, Partially-LF HARQ outperforms Fully-LF HARQ for the packet loss ratio less than 60 percent.

As the number of retransmission in a link increase, the system throughput will be decreased. Therefore, in the second part, we focus on the single-hop transmission with only one retransmission in the form of a helper packet, referred to as M -in-1 helper transmission. The helper is constructed simply by taking binary exclusive-OR (XOR) of the M unrecovered information packets. We propose a way to analyze the achievable diversity order of M -in-1 helper transmissions taking into account the source correlation. To identify the trade-off between source correlation and performance gain due to coding and diversity relationship, we start in-depth analyses on rate regions and outage probabilities with $M = \{2, 3\}$. We also review the influence of unequal power or redundancy allocation between the helper and information packets. Finally, we provide the analysis of achievable diversity order with arbitrary M . It is shown that the achievable diversity order depends on the correlation among the sources, the bit error probability of the helper packet, and the integer M being whether even or odd.

Keywords: hybrid ARQ, multihop, relay system, correlated sources, source coding with a helper