Master Thesis

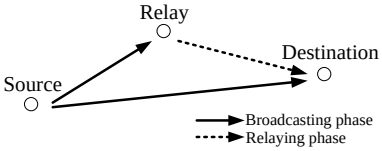
Chair for Theoretical Information Technology | RWTH AACHEN UNIVERSITY

Maximizing the QoS-Constrained Performance of Relaying with Finite Blocklengths:
More Retransmissions vs. Longer Blocklengths

Research Area
Wireless communication

Keywords
Relaying, finite blocklengths, optimization

Description
Motivated by the increasing demand for higher throughput, broader coverage and higher-level quality of service (QoS), major effort is being made to study the relaying technology in wireless networks. In particular, our previous work shows that (with an assumption of infinite blocklength) relay-assisted retransmission protocols significantly improve the QoS of the system. However, most existing research on investigating the relaying performance over wireless fading channels typically rely on a simplifying assumption of infinite blocklength, which may be inaccurate in realistic wireless systems.



Two-hop relaying.

Recent studies show that in a finite blocklength scenario the shorter the blocklength is the lower the performance is. In other words, the system performance is increasing in the blocklengths. Therefore, having a long blocklength for a single transmission leads to a high performance. For QoS-support systems, i.e., with certain delay constraint, the total time/symbols for the initial transmission and retransmissions are fixed. Then questions are raised: Are the relay-assisted retransmission protocols still promising in the finite blocklength regime? How to determine the blocklength (in symbols) for the initial transmission and retransmissions? Should we choose a short blocklength to let the system offer more retransmissions? Or is it better to make each single transmission (the initial transmission or a retransmission) have a relatively longer blocklength which leads to less retransmissions?

Goal
Our goal is to maximize the QoS-constraint performance of relaying with finite blocklengths by determining the optimal blocklength.

Requirements
- Strong interest in theoretical research.
- Background/knowledge in the filed of wireless communications and convex optimization.
- Expertise in mathematics.
- A solid foundation in MATLAB programming.

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Reference
[1] **Y. Hu**, J. Gross and A. Schmeink, 'QoS-constrained energy efficiency of cooperative ARQ in multiple DF relay systems', *IEEE Trans. Veh. Technol.*, accepted.
[2] **Y. Hu**, J. Gross and A. Schmeink, 'On the capacity of relaying with finite blocklength', *IEEE Trans. Veh. Technol.*, accepted.
[3] **Y. Hu**, J. Gross and A. Schmeink, 'On the performance advantage of relaying under the finite blocklength regime', *IEEE Commun. Lett.*, vol. 19, no. 5, pp. 779-782, May 2015.