Early Termination of BP Decoder for CV-QKD

Bachelor's Thesis

Project

This proposal aims to investigate the early termination of the belief propagation (BP) decoder for continuous-variable quantum key distribution (CV-QKD). CV-QKD is a promising technique for secure communication based on quantum physics. However, one of the main challenges is to design efficient and reliable decoders for the error correction codes used in CV-QKD. BP decoder is a popular choice for decoding low-density parity-check (LDPC) codes, which are widely used in CV-QKD. However, the BP decoder may require many iterations to converge, which increases the decoding latency and complexity. Therefore, it is desirable to find a way to terminate the BP decoder early without compromising the decoding performance.

The main idea for the early termination is to use the dynamics of the messages exchanged during the decoding process to foresee whether the decoding will converge to a codeword in the next iterations. By doing so, further unnecessary decoding iterations will be prevented. The thesis will be based on an extension of the previous thesis. The research methods will include theoretical analysis, simulation, and performance evaluation.

Tasks

1. Implementing an early termination scheme for the BP decoder
2. Simulating and evaluating the decoding performance

Requirements

- ✔ (optimally) Good skills in MATLAB/C++
- ✔ Interest in channel coding

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