

Low-rate Polar Code Design

Master's Thesis

Project

Polar Codes are an information-theoretic approach to channel coding and they are proven to achieve the capacity of binary input discrete memoryless channel under successive cancellation decoder. They transform N identical channels into N synthesized channels using channel polarization. Some of these synthesized channels are purely noiseless and the rest are completely noisy, thus the information can be encoded into noiseless channels, while the completely noisy channels remain unused.

Polar Code design can be seen as determining the bits that experience the best K channels of N synthesized channels, where K depends on the rate of the code. To this end, the quality of the synthesized channels must be estimated, which can be challenging for BI-AWGN channel. Accordingly, some approximations are need to be used to determine the channel quality and using these approximations, different design approaches have been proposed.

In this thesis, low-rate Polar Codes will be designed using different approaches and their performance will be evaluated and compared with each other using different decoding schemes.

Tasks

1. Literature search on the design of Polar Codes
2. Design of low rate polar codes using different channel quality estimation techniques
3. Performance evaluation of the designed codes with different decoding schemes

Requirements

- ✓ Good knowledge of channel coding (CC-GBC)
- ✓ Good skills in MATLAB/C++

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