Chair of Communications Engineering
TUM Department of Electrical and Computer Engineering
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Forschungspraxis

Code construction for quasi-cyclic LDPC codes based on PEG and ACE

Finite length low-density parity-check codes can be constructed based on different approaches. The most obvious approach is a random, unconstrained construction, where the edges in the parity-check matrix are placed based on the desired edge distribution pairs.

In general, this approach leads to suboptimal performance, as the codes have a lot of small cycles, which deteriorate the belief propagation decoding. To mitigate this, greedy approaches like progressive edge (PEG) have been proposed. PEG can further be complemented by taking the extrinsic cycle degree into accout [2], which also provides an additional measure for the "harmfullness" of a cycle in the Tanner graph.

In this research internship, the student is asked to implement a tool for building finite length QC LDPC codes which uses both PEG and ACE for girth optimization and conditioning.

[1] X.-Y. Hu, E. Eleftheriou, and D. M. Arnold, “Regular and irregular progressive edge-growth Tanner graphs,” IEEE Trans. Inf. Theory, vol. 51, no. 1, pp. 386–398, Jan. 2005.

[2] T. Tian, C. R. Jones, J. D. Villasenor, and R. D. Wesel, “Selective avoidance of cycles in irregular LDPC code construction,” IEEE Trans. Commun., vol. 52, no. 8, pp. 1242–1247, 2004.

Prerequisites

- Channel Codes for Iterative Decoding
- Solid Matlab/Julia and C knowledge

Advisors

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