

MSc Thesis Project

Coupled Product Codes for Optical Communication

Introduction: DTU Fotonik has suggested product codes as error-correcting codes for very high speed optical communication. Product codes are constructed as two-dimensional arrays where each row and column belongs to some component code. Iterative decoding is employed as decoding method with great decoding performance. Recently, a paper has been published on a structure involving coupling of several product codes. The performance of such a system is promised to be better than single product codes.

Contents: The first task of this project is to implement the proposed system in MATLAB or C. The performance is then studied as function of the number of iterations and various other parameters. The performance may also be compared to usual product codes of the same rate and similar complexity. Dependent on the interest of the student, implementation of such a decoder in VHDL could also be investigated.

Prerequisites:

- 01405 Error-Correcting codes (or 34220 with a little extra effort)
- 34251 Convolutional codes and iterative decoding methods
- Knowledge of VHDL coding techniques, e.g. from 34349 FPGA design for Communication systems if the implementation path is followed

Additional information:

- Y.-Y. Jian, H.D. Pfister & K.R. Narayanan, "Approaching Capacity at High Rates with Iterative Hard-Decision Decoding", IEEE Transactions on Information Theory, September 2017.
- Contact teacher.

Practical details: The project is intended for one student with 30 ECTS-points.

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