

Improved hard-decision decoding for generalized product codes

Value Proposition

When baseband signals are transmitted over communication channels, errors often arise due to noise in the channels. Forward error correction (FEC) is a method of obtaining error control in data transmission, for enhanced data reliability. FEC attempts to correct these errors by using an encoder to map code symbols to the underlying data. The corrupted signal is received by a decoder which attempts to reconstruct the code symbols in order to recover the underlying data. Occasionally, however, the decoder mistakenly interprets a correct code symbol as an error. Some attempts to improve iterative bounded-distance decoding (BDD) have been made, such as extrinsic message-passing. Though the method showed improvements over iterative BDD, but it suffers from heightened data flow and storage requirements. Therefore, there is a need for an idealized process of BDD which prevents miscorrections.

Technology

The invention is a novel decoding algorithm for the component-based codes that include Generalized Product Codes (GPCs). In particular, it describes a method to avoid most miscorrections and to backtrack miscorrections that are not avoided and improves the decoding of GPCs. Simulation shows that the performance is significantly improved compared to the conventional decoding. In particular in terms of the error floor, the performance is virtually identical to the idealized decoding where miscorrections are prevented. Overall, the improvements translate into an additional coding gain of around 0.4 dB at a post-FEC bit error rate of over the conventional decoding.

Other Applications

Regional/metro optical transport networks (OTNs) and other cost-sensitive applications such as optical data center interconnects.

Advantages

- Reduces the effect of undetected component code miscorrections.
- Significantly improves performance, while retaining a low-complexity implementation suitable for high-speed optical transport networks

Duke File (IDF)

T-005247

Inventor(s)

- Pfister, Henry
- Haegar, Christian

Links

- [From the lab of Dr. Henry Pfister](#)

College

Pratt School of Engineering

For more information please contact

Chang Villacreses, David
9196683401
david.chang@duke.edu

Publications

- [Miscorrection-free decoding of staircase codes \(Poster\)](#)
- [Miscorrection-free decoding of staircase codes \(European Conference on Optical Communication, 2017\)](#)

Patents

Patent Number: 10,693,500

Title: SYSTEMS AND METHODS FOR DECODING
FORWARD ERROR CONNECTIONS BASED ON
COMPONENT CODES

Country: United States of America