

Turbo DeCodulation: Iterative Joint Source-Channel Decoding and Demodulation



Thorsten Clevorn

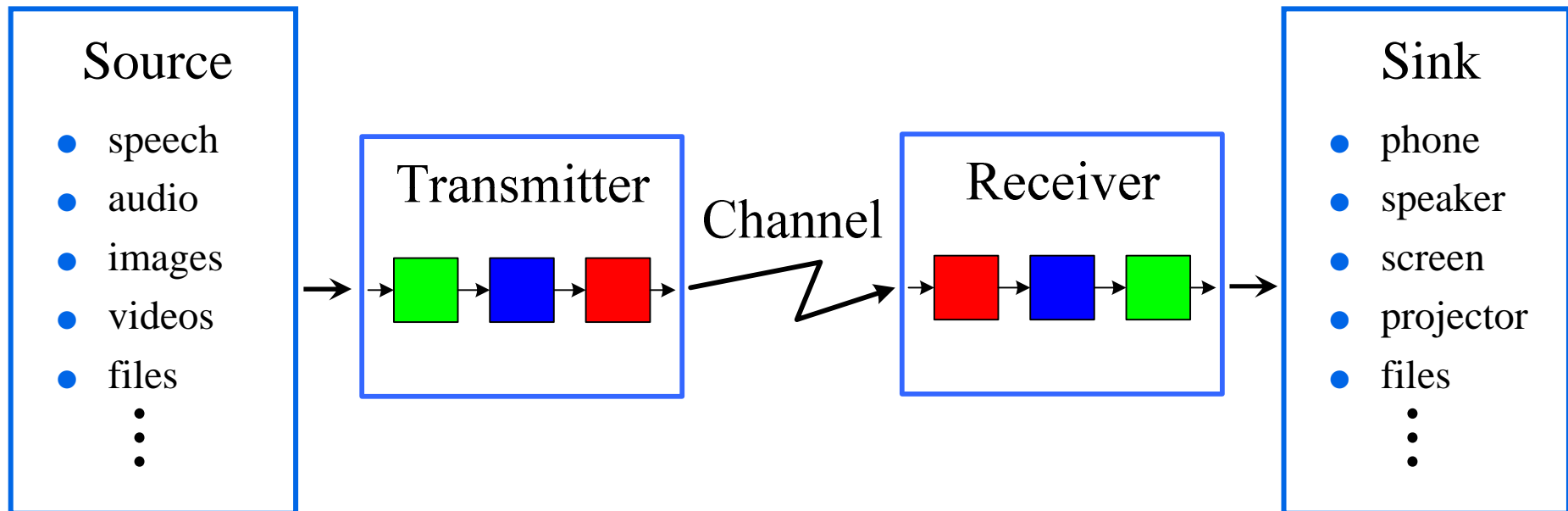
Overview

Transmission System



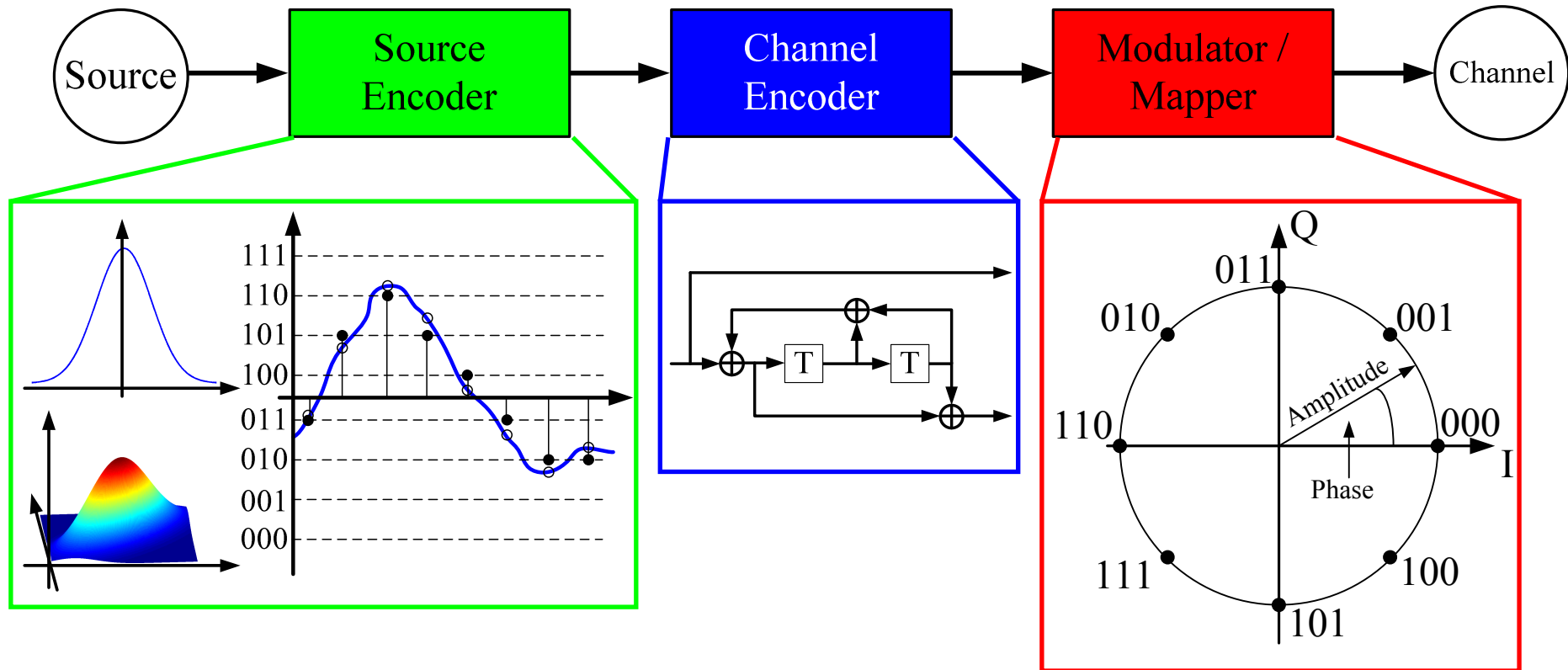
Overview

Transmission System



Overview - Conventional Transmission System

Transmitter

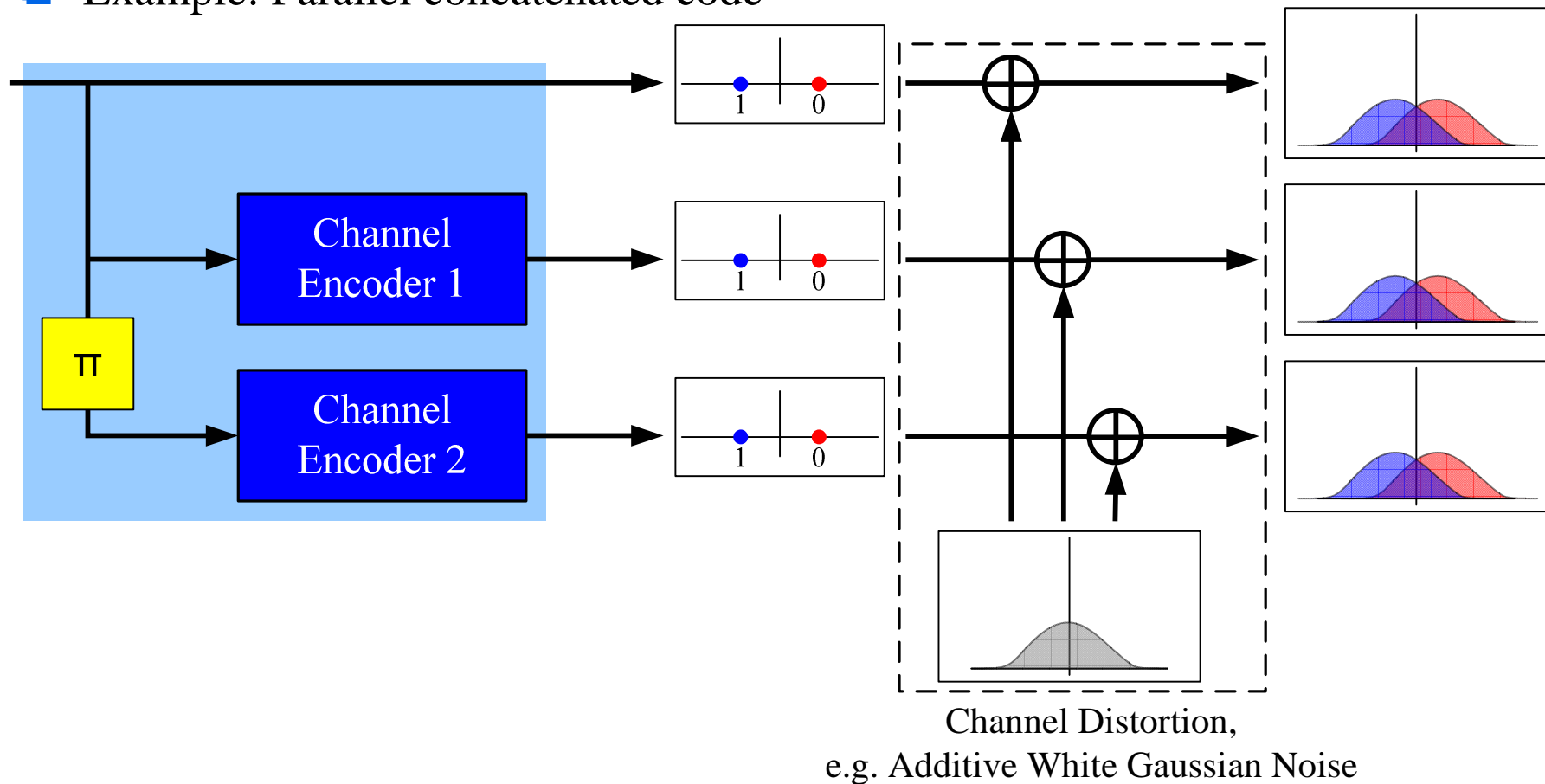


Receiver



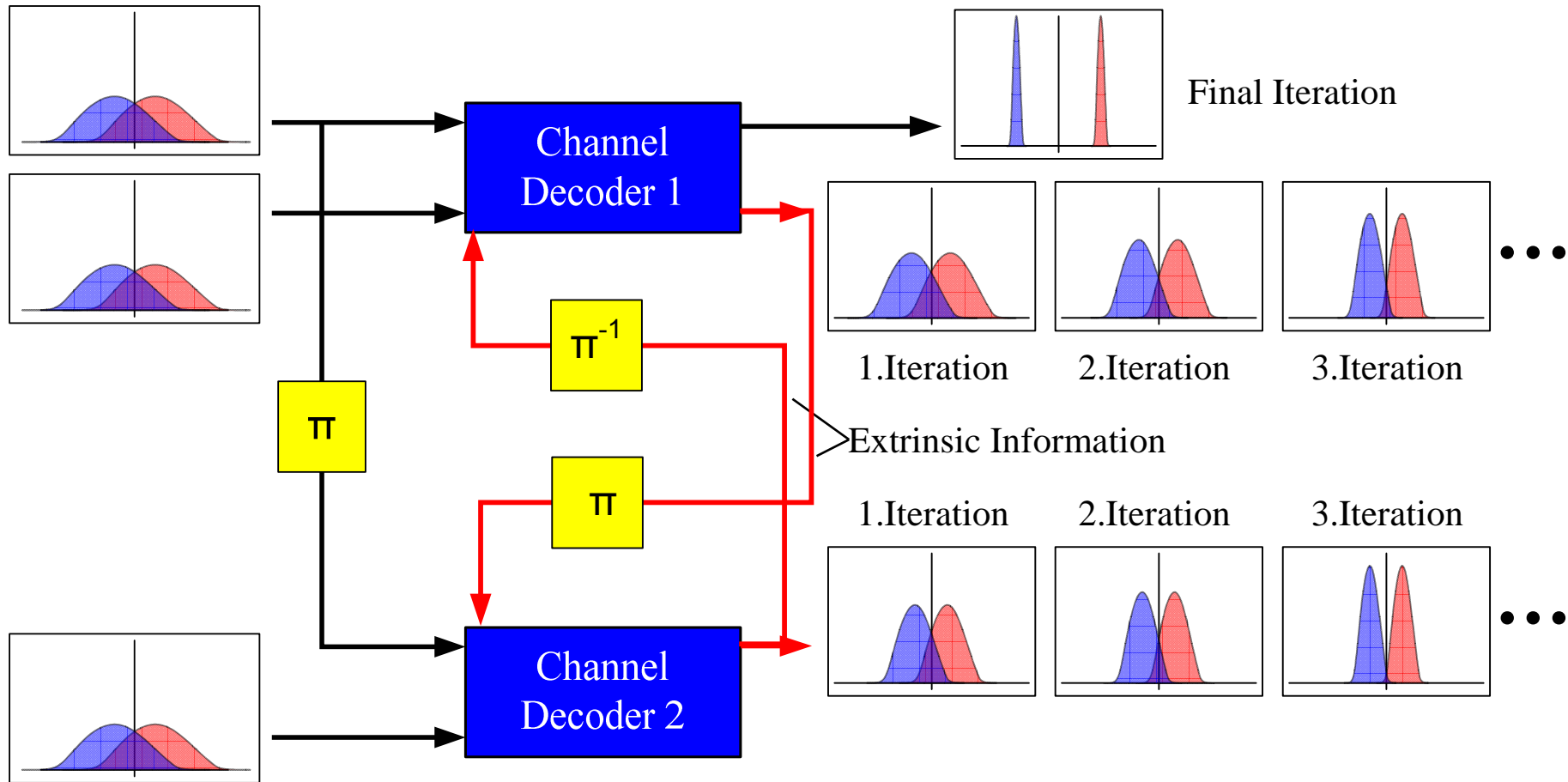
Turbo Principle – Concatenated Codes

- ❑ Concatenate several simple codes
- ❑ Place interleavers between the codes to distribute the information
- ❑ Example: Parallel concatenated code



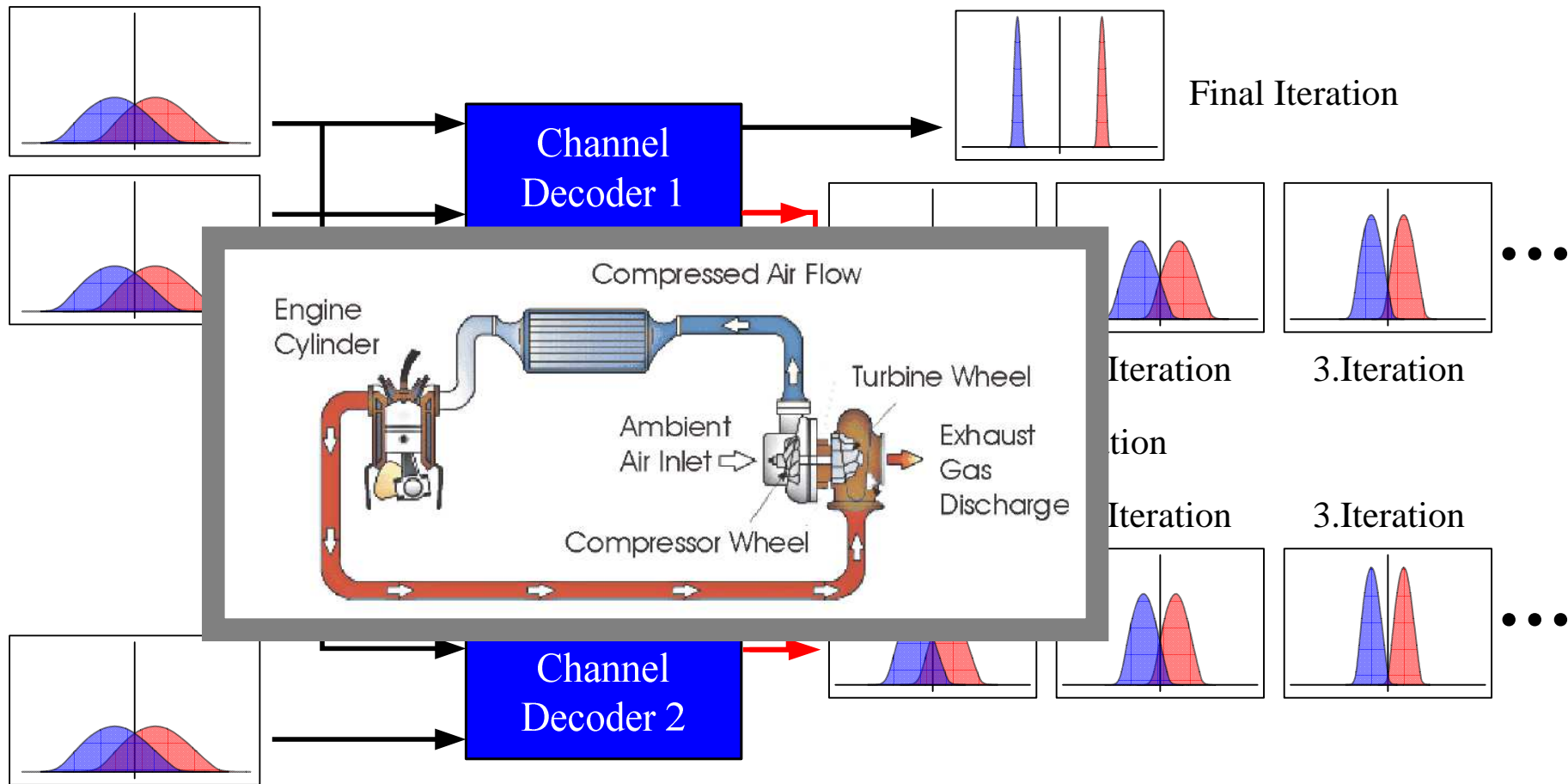
Turbo Principle – Turbo Decoding

- Iterative alternating processing of decoders
- Exemplary development of probability densities



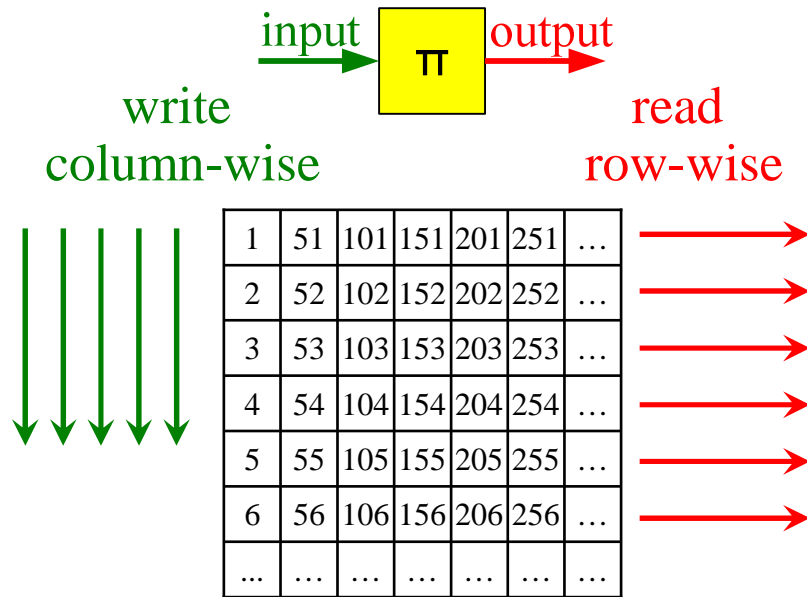
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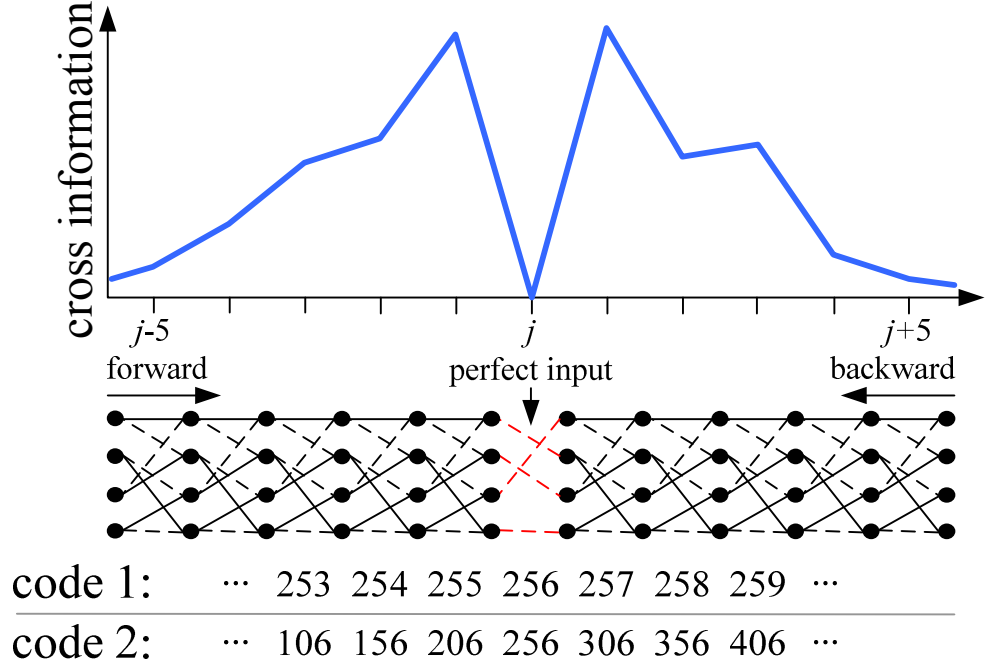


Turbo Principle – Information Spreading

Interleaver example

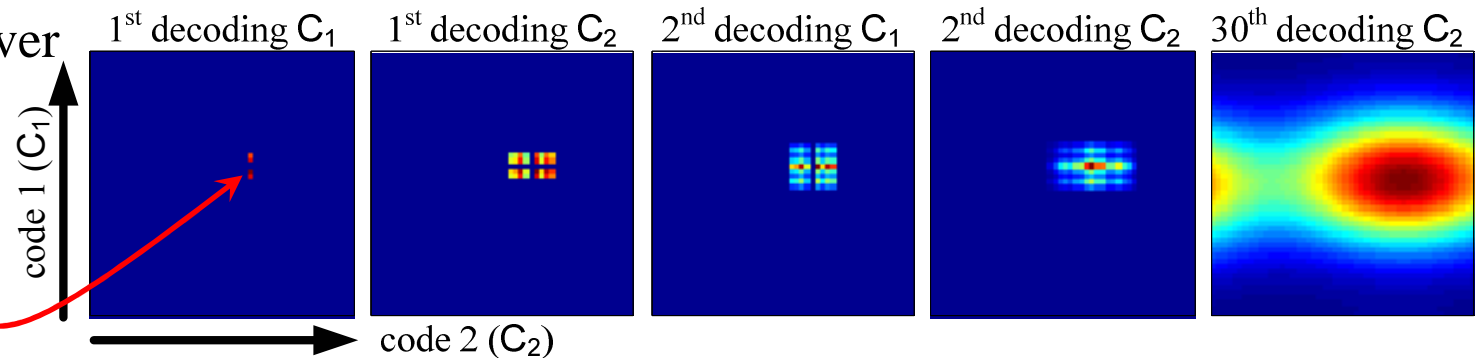


Propagation of extrinsic information



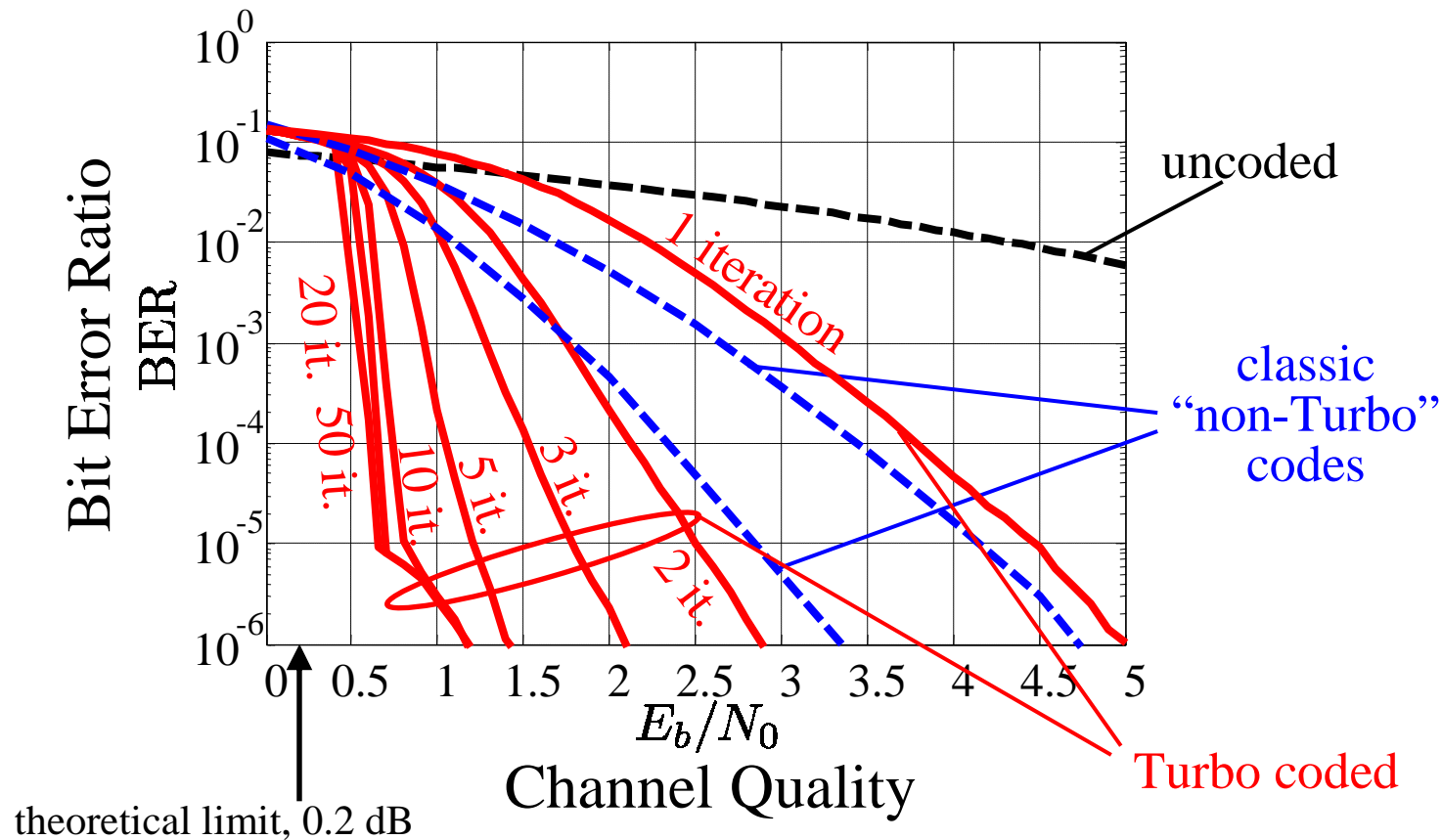
Block interleaver (50 x 50 bits)

example single information



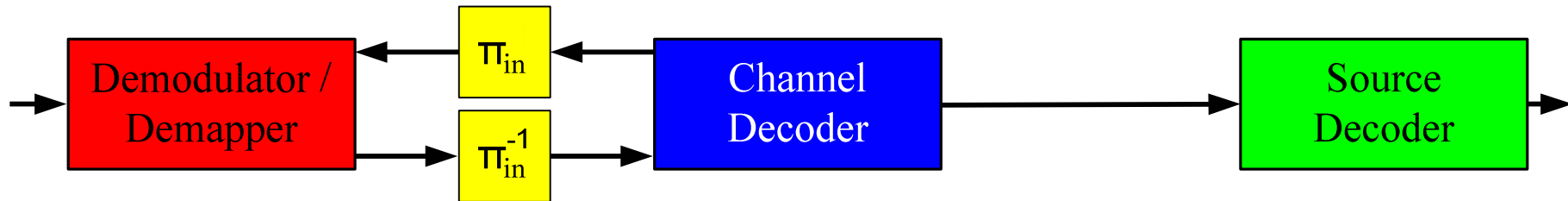
Turbo Principle – Performance Example

- ❑ Coding with manageable complexity close to theoretical limits possible
- ❑ Improvements by the iterations
- ❑ Convergence for high number of iterations

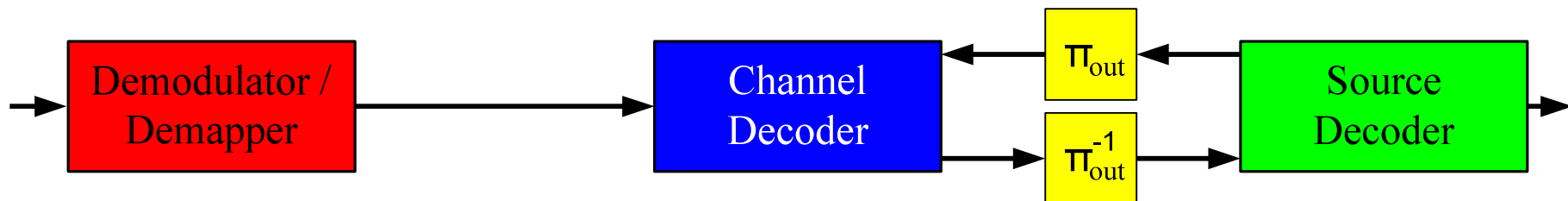


Turbo DeCodulation – Receiver Structure

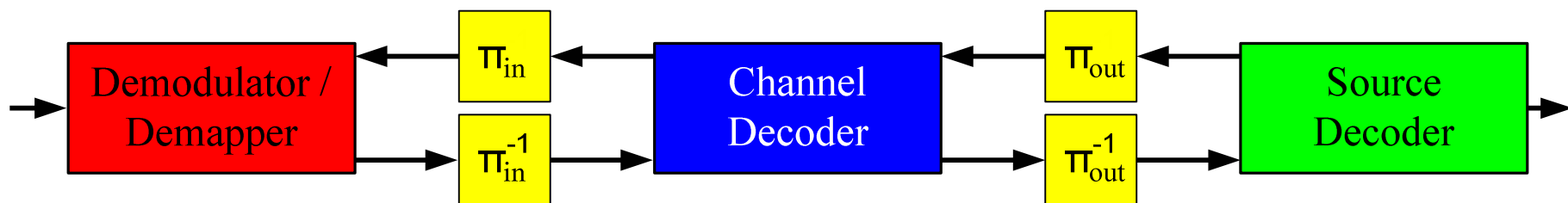
- Bit-Interleaved Coded Modulation with Iterative Decoding



- Iterative Source-Channel Decoding

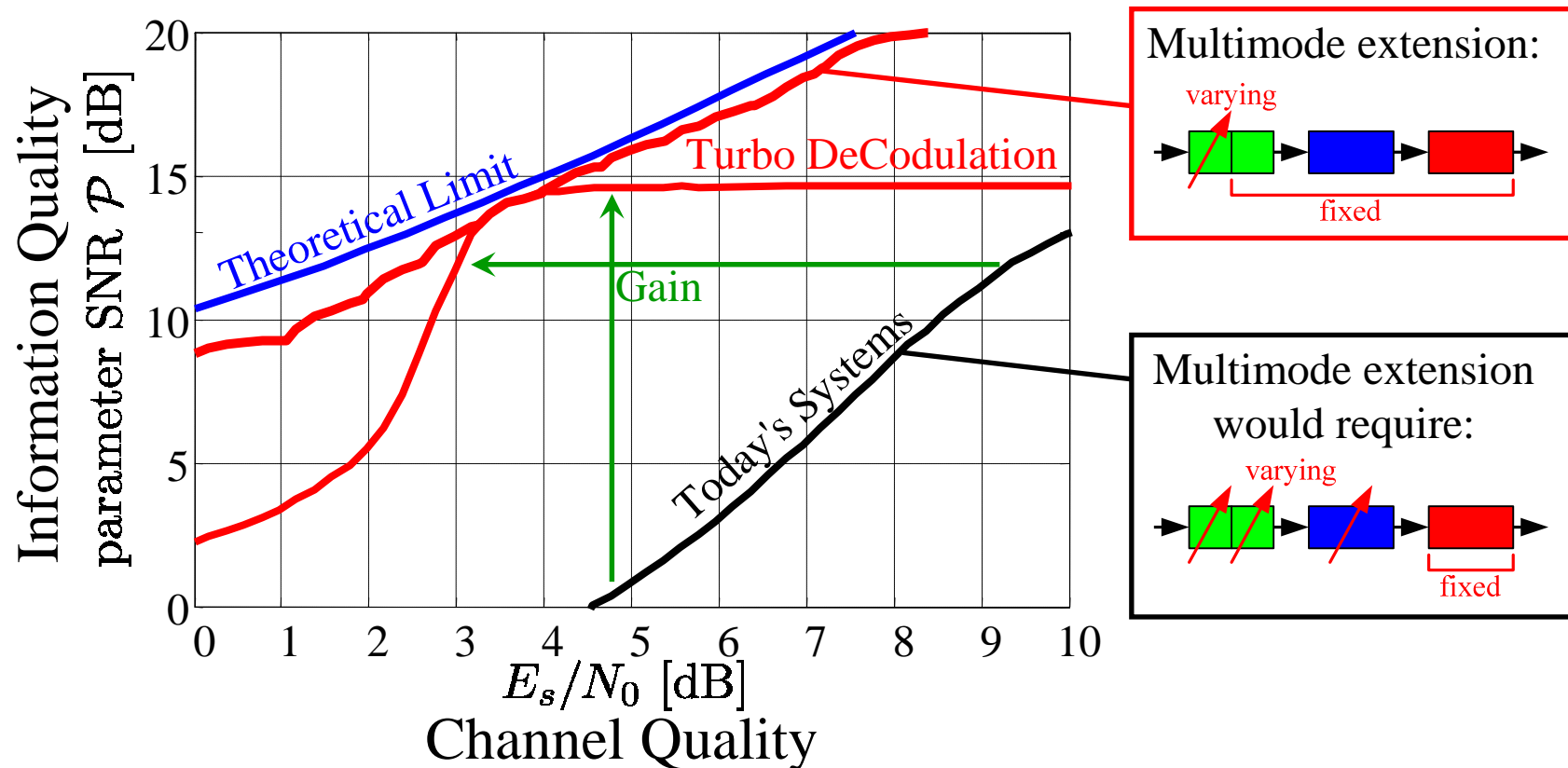


- Turbo DeCodulation



Turbo DeCodulation - Performance

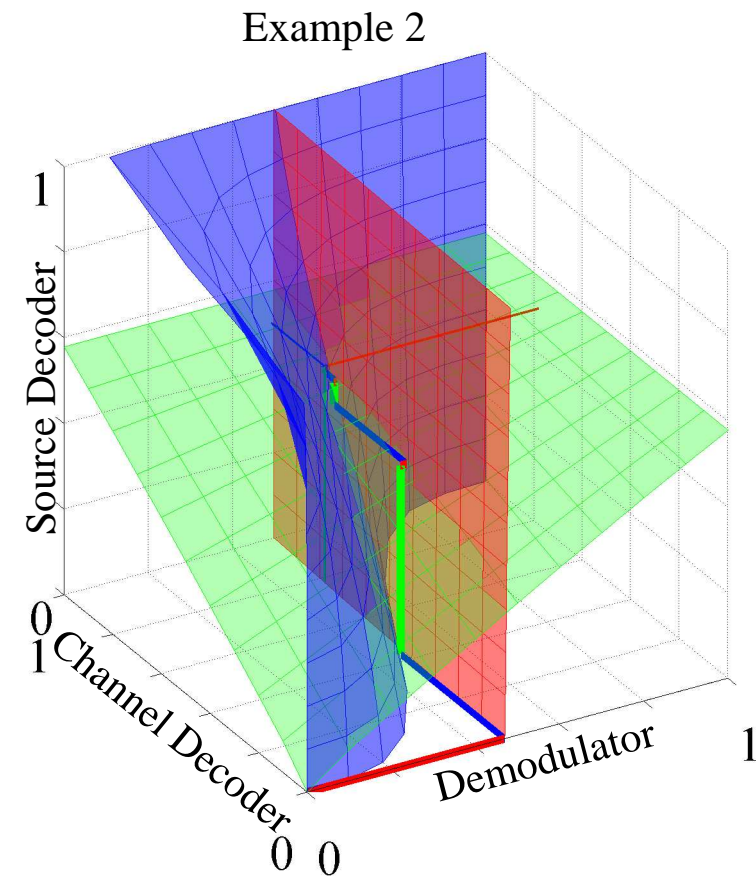
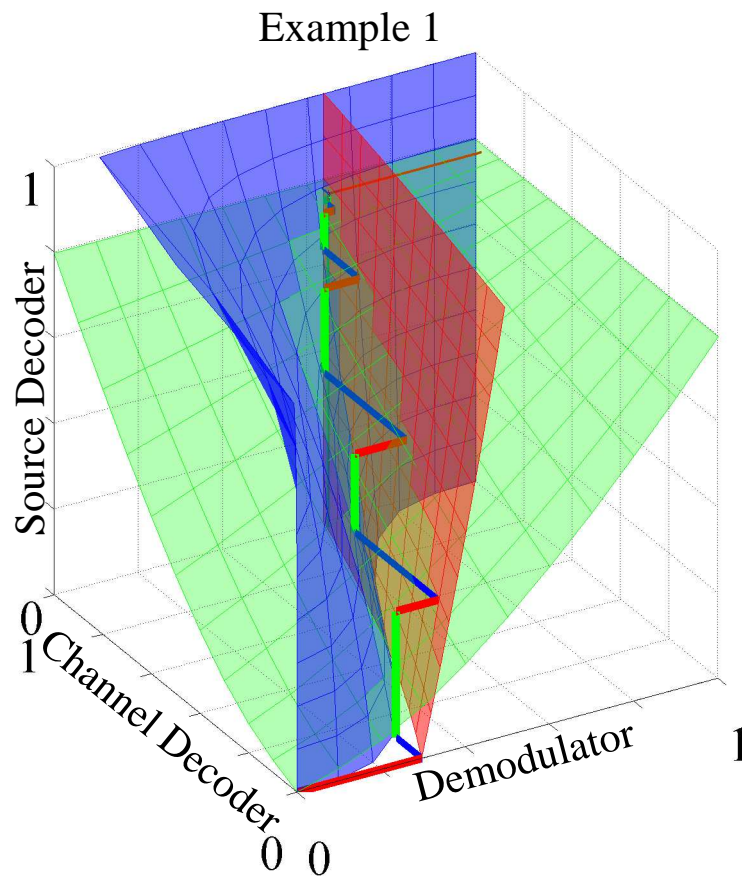
How good is Turbo DeCodulation?



- Turbo DeCodulation approaches theoretical limit

Turbo DeCodulation – Analysis and Optimization

- ❑ Three-dimensional Extrinsic Information Transfer (EXIT) Charts
- ❑ EXIT charts depict the extrinsic information exchanged between the components
- ❑ Unique characteristics for different components



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Thank You!