A New Class of Turbo-Like Codes with Desirable Practical Properties

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“Desirements”

- **Flexibility**
  - \( k = 128 \rightarrow 16K \text{ bits w/ fine granularity} \)
  - Rates: \( 1/2 \rightarrow 19/20 \text{ w/ fine granularity} \)
  - BPSK, QPSK, 8PSK, 16Q, \((12,4)\) PSK

- **Universally good performance**
  - ~ “theory + 1 dB” or comparable to best known
  - Target BERs: \( 1e^{-6}, 1e^{-8}, 1e^{-10} \)

- **High-speed decoding**
  - ~ 1 bps/logic-Hz throughput
Candidate TLCs: SCCCs

\[ r = r^o r^i \leq r^o \]

- Difficult to hit high rates & low floors
  - Complicated puncture patterns & parallel transitions for rate variability
Candidate TLC: Generalized Repeat Accumulate (GRA) Code

- **Floor @ BER ~ 1e-7, for r=7/8, k=1024**
- **Q=4, J=28**
- **Memory access contention**
RSPC Interpretations

Recursive SPC code (aka zig-zag)

- Method for rate control
New Class of TLCs

- **Benefits**
  - Simple, low-rate outer code (rate J inner)
  - Less memory contention (smaller J & Q)
  - Very low floor/flare (large d_min)
  - Uniform interleaver analysis ==> same design rules as SCCC
Performance: k=1024

- TrellisWare FlexiCode Hardware Prototype
Performance: k=16384

- TrellisWare FlexiCode Hardware Prototype
Throughput Trades (k=16K)

- **TrellisWare FlexiCode Hardware Prototype**
Universally Good Performance (e.g., k=4096)

- TrellisWare FlexiCode Hardware Prototype