Modeling and Simulation of Turbo Encoder and Decoder for Wireless Communication Systems

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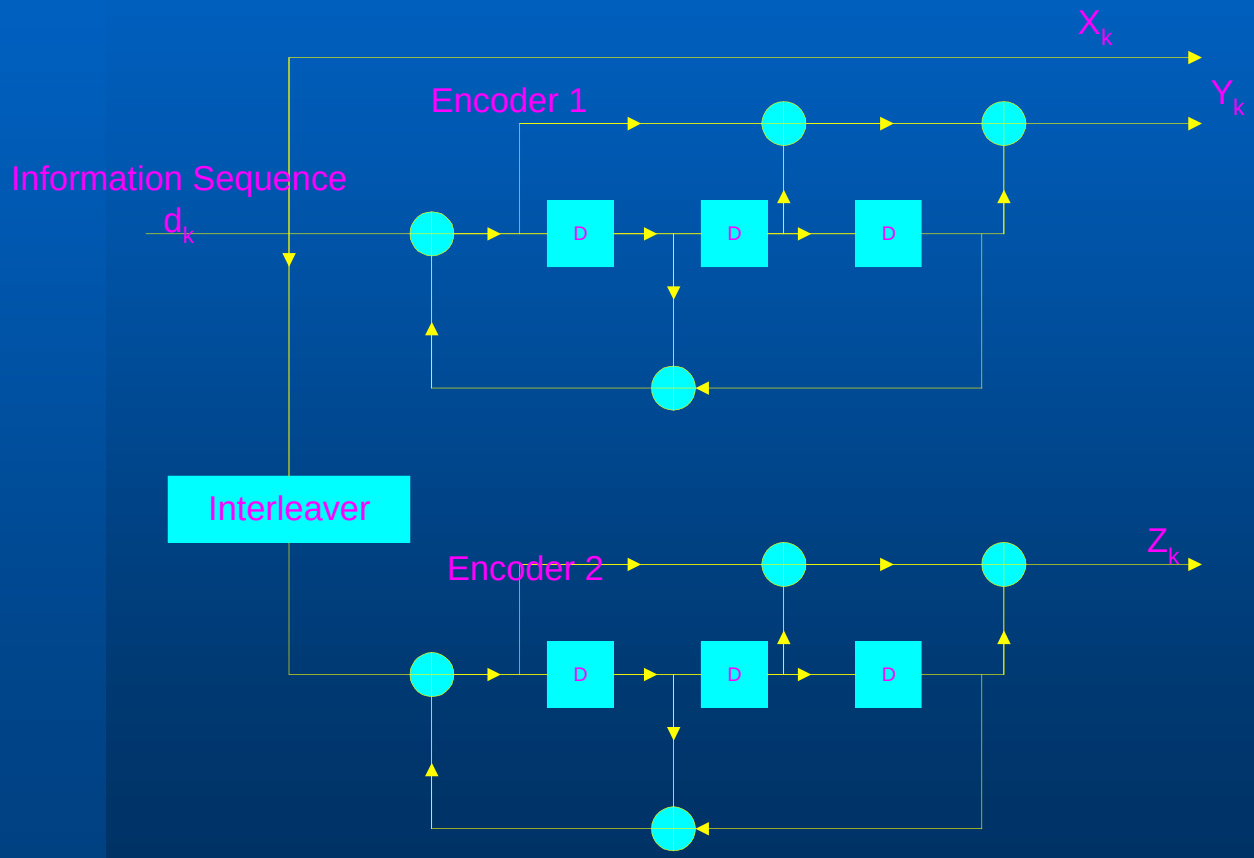
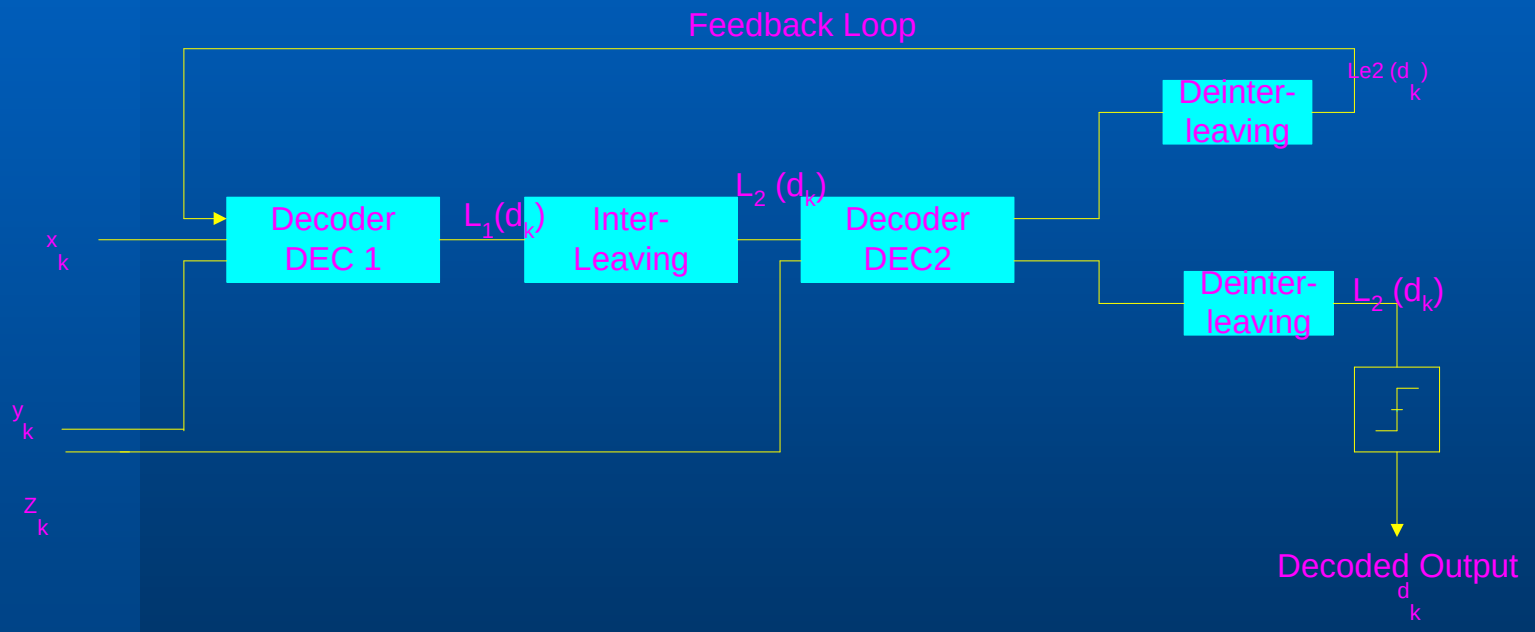
Problem Statement

- **Implementation of a turbo encoder and decoder**
  - **Maximum A Posteriori (MAP) algorithm**
  - **Sliding window implementation**
- **Performance metrics：**
  - **Bit Error Rate (BER)**
  - **Signal to Noise Ratio (SNR)**
- **For a fixed BER, SNR requirement is reduced (Coding Gain)**

Turbo Encoder



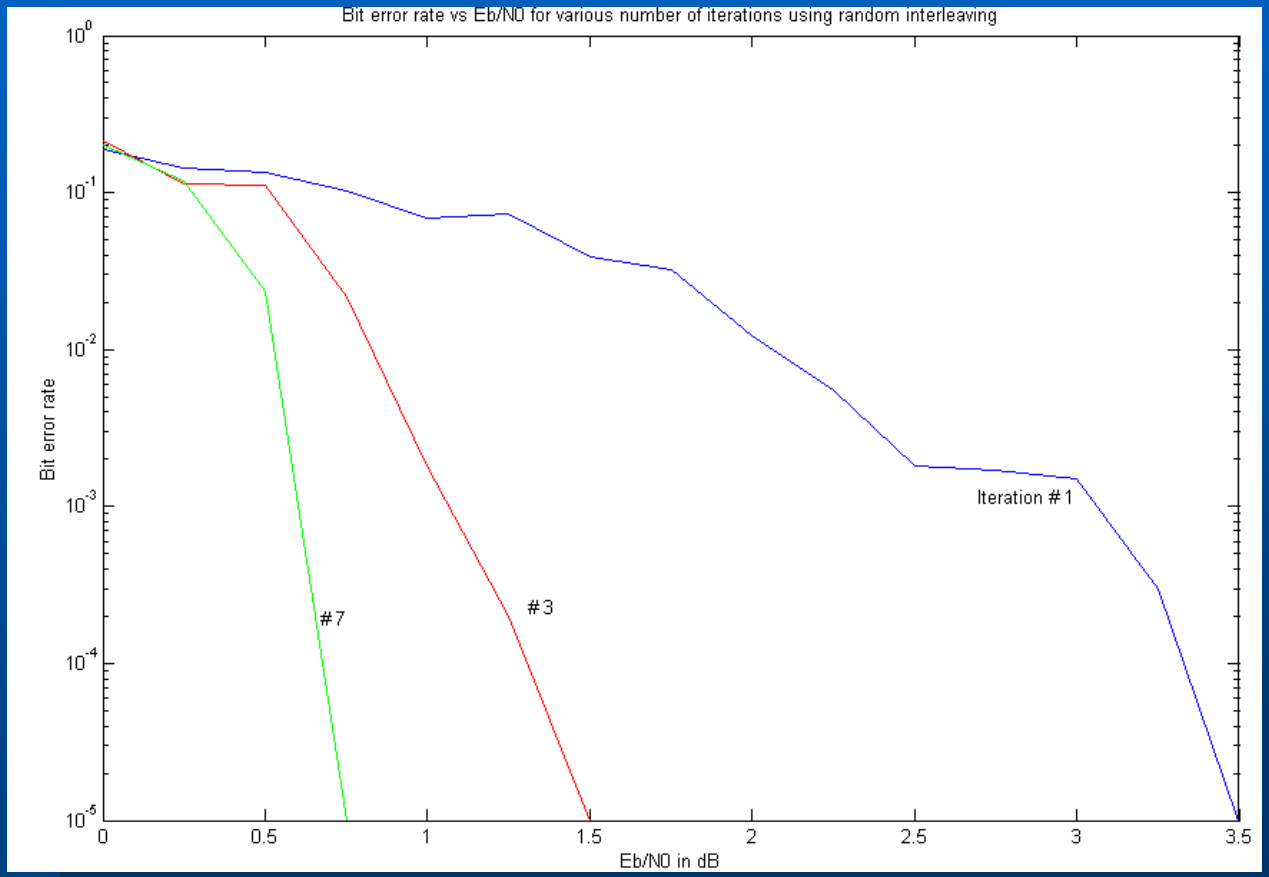
Turbo Decoder



Implementation

- **SDF model of computation**
- **Use MAP algorithm for decoding**
  - **Advantage : Higher coding gain at low SNR**
  - **Disadvantage : More computationally and memory intensive**
- **Enhancements**
  - **Sliding window**
  - **MAX* approximation**

Performance Evaluation



Performance Factors and Tradeoffs

- Selection of algorithm
- Constraint length and number of iterations
- Interleaver design
- Trellis termination
- Puncturing
- Frame size

Conclusions

- **Successful implementation of Turbo Encoder and Decoder**
- **Written mainly in C**
- **Works with TMS320C67 DSK**
- **Well designed code should be very easy to port to Advanced Design Systems (ADS)**