BCJR algorithm

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The **BCJR algorithm** is an algorithm for maximum a posteriori decoding of error correcting codes defined on trellises (principally convolutional codes). The algorithm is named after its inventors: Bahl, Cocke, Jelinek and Raviv.[1] This algorithm is critical to modern iteratively-decoded error-correcting codes including turbo codes and low-density parity-check codes.

Steps involved [edit]

Based on the trellis:

- Compute Forward probabilities α
- Compute Backward probabilities β
- Compute smoothed probabilities based on other information (i.e. noise variance for AWGN, bit crossover probability for Binary symmetric channel)

Variations [edit]

SBGT BCJR [edit]

Berrou, Glavieux and Thitimajshima Simplification.[2]

Log-Map BCJR [edit]

[3]

Max-Log-Map BCJR [edit]

Implementations [edit]

- Susa framework implements BCJR algorithm for Forward error correction codes and channel equalization in C++.

See also [edit]

- Forward-backward algorithm
- Maximum a posteriori (MAP) estimation
- Hidden Markov model

References [edit]

1. ^ L.Bahl, J.Cocke, F.Jelinek, and J.Raviv, "Optimal Decoding of Linear Codes for minimizing symbol error rate", IEEE Transactions on Information Theory, vol. IT-20(2), pp.284-287, March 1974.
2. ^ Sichun Wang and François Patenaude, "A Systematic Approach to Modified BCJR MAP Algorithms for Convolutional Codes," *EURASIP Journal on Applied Signal Processing*, vol. 2006, Article ID 95360, 15 pages, 2006. doi:10.1155/ASP/2006/95360
3. ^ P. Robertson, P. Hoeher and E. Villebrun, "Optimal and Sub-Optimal Maximum A Posteriori Algorithms Suitable

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for Turbo Decoding", European Transactions on Telecommunications, Vol. 8, 1997.

External links [edit]

- The on-line textbook: Information Theory, Inference, and Learning Algorithms, by David J.C. MacKay, discusses the BCJR algorithm in chapter 25.
- The implementation of BCJR algorithm in Susa signal processing framework

Categories: Error detection and correction