Decoding of Block Turbo Codes

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Block turbo codes (BTCs) are constructed by serially concatenating linear block codes and iteratively decoded by letting each component code be decoded in two stages. The Chase algorithm is employed in the first stage to make a list of candidate codewords by generating a fixed number of test sequences (TSs) and algebraically decoding them, regardless of the signal-to-noise ratio or the iteration number. In the second stage, the extrinsic information is generated for iterative decoding. In the first part, we present a low-complexity decoding algorithm for BTCs. It first checks whether an algebraic hard-decision decoder outputs a codeword for a given decoder input vector, and then adaptively applies one of two estimation rules depending on the Hamming distance between them. Based on these two estimation rules, the number of TSs in the proposed algorithm can be made monotonically decreasing with iterations. As a result, it has much lower computational complexity with a negligible performance loss, compared with the conventional decoding scheme based on the Chase algorithm. In the second part, we propose another low-complexity decoding algorithm for BTCs. The proposed algorithm can avoid a number of unnecessary hard-decision decoding operations in the first stage by imposing some conditions on the Chase algorithm. Also, it simply computes the extrinsic information for the decision codeword in the second stage. Numerical results demonstrate that the proposed algorithm has not only much lower computational complexity, but also a little better performance than the conventional decoding scheme based on the Chase algorithm.