Designing a Sensible Block Semi-Random Interleaver for Turbo Codes

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Abstract

It is highly known that an interleaver (a device that scrambles the order of a sequence of numbers) is a key component of a turbo encoder to guarantee excellent bit error rate and frame error rate performances. Turbo codes were initially proposed using a randomly constructed interleaver. Turbo codes are a rank of high-performance forward error correction (FEC) codes, which were the initial practical codes to closely approach the channel capability. We introduce here a method for generating a sequence of semi-random interleavers, projected to be optimally stored and employed in a turbo coding system that requires litheness of the input block (i.e., interleaver) size. By the arrangement of construction and random search based on a careful analysis of the low weight words and the distance properties of the component codes, it is possible to find interleavers for turbo coding with a high minimum distance. We have designed a block semi-random interleaver with permutations of each row, and found a combination of permutations where a tight upper bound to the minimum distance of the complete turbo scheme is 108. By using our designed technique it is easier to include restrictions which make the
interleaver correctly-terminating or odd-even. While the block semi-random interleavers serves well for specifying interleaver spread, we think our method will achieve better performance in a more sophisticated designed criteria.

References

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Index Terms

Computer Science
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Keywords

Interleavers, Encoder, Iterative decoding, Bit error rate, Turbo Code.