Comments Regarding "On the Performance/Complexity Tradeoff in Block Turbo Decoder Design"

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***Abstract*—In this comment we position the work of [1], [2] in terms of the prior literature and note that many of its results are subsumed by previous papers.**

***Index Terms*—Product code, list decoding, iterative decoding, Chase decoding.**

IN [1], [2] modifications to the decoding of binary block Turbo codes/ Turbo product codes, as described in [3], [4], are considered. Unfortunately, the work ignores much of the existing relevant literature, which subsumes much of their work.

The row and column component codes of the *product code (PC)* are iteratively decoded as described in [3], [4]. Each *soft-input soft-output (SISO)* component decoder uses a Chase decoder [5] to generate a list of possible codewords, which is used to calculate the soft output. The modified Chase search described in [1], [2] appears to be the same as the test pattern elimination algorithm presented earlier in [6]. In addition, there are many existing papers which modify the Chase algorithm, including [6], [7], [8], [9], [10].

Various algorithms have been used in place of the Chase algorithm in the SISO decoders of [3], [4]. For example, the the order-i reprocessing algorithm of [11] has been used in [12], [13]. Also Fang *et al*. developed a different variation in [14]. In addition, the approach of [1], [2], was modified by the authors in [15], [16], both of which should have been referenced in [1]. All these approaches were found to provide significant performance improvements over the Chase-based approach of [3], [4] when the minimum Hamming distance of the component codes was greater than four. The cost is an increase in decoding complexity.

In [3], [4] the extrinsic information passed between decoding stages is scaled by precomputed values to improve performance. In [1], [2] the extrinsic information is scaled by 0.5 and then the hyperbolic tangent of it is taken. In [1], their performance for the $(63, 51, 5)^2$ PC is compared with that of [3] for the $(64, 51, 6)^2$ PC. Note that these codes have different lengths, rates and minimum Hamming distances and so cannot easily be compared. Performance results for the approach of [3], [4] can be found for the $(63, 51, 5)^2$ PC in [4].

The approach to scaling the extrinsic information of [1], [2] should also be compared with those in [17], [18]. In [17], [18] adaptive scaling approaches are presented, derived from log-likelihood ratios. Note that modifications to the approach of [3], including amplitude clipping, are considered in [19].

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