

ABSTRACT

In this dissertation a modification to the belief-propagation algorithm is presented. The algorithm modifies the belief-propagation algorithm to allow for the parallel decoding of product codes. The algorithm leverages the fact that each component code in the product code can be independently decoded because the codewords are encoded by independent and identically distributed (i.i.d.) processes. The algorithm maximises the parallelisation by decoding all the component codes in each dimension in parallel. In order to facilitate this process we developed new additional stages which are added to the belief-propagation algorithm: the codeword reliability estimation, the belief-aggregation and the exit test stages. The parallel product code decoder offers a 0.2 dB worsening of the decoding BER performance when compared to the best serial decoder. However, the parallel belief-propagation decoder offers a 7.26 time *speedup* on an eight-core processor, which is 0.91 of the theoretical maximum of eight for an eight-core processor.