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Capacity-Achieving Ensembles of Accumulate-Repeat-Accumulate Codes for the Erasure Channel with Bounded Complexity*

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Abstract

The paper introduces ensembles of accumulate-repeat-accumulate (ARA) codes which asymptotically achieve capacity on the binary erasure channel (BEC) with *bounded complexity*, per information bit, of encoding and decoding. It also introduces symmetry properties which play a central role in the construction of capacity-achieving ensembles for the BEC with bounded complexity. The results here improve on the tradeoff between performance and complexity provided by previous constructions of capacity-achieving ensembles of codes defined on graphs. The superiority of ARA codes with moderate to large block length is exemplified by computer simulations which compare their performance with those of previously reported capacity-achieving ensembles of LDPC and IRA codes. The ARA codes also have the advantage of being systematic.

Index terms – binary erasure channel (BEC), capacity, complexity, degree distribution (d.d.), density evolution (DE), iterative decoding, irregular repeat-accumulate (IRA) codes, systematic codes.

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