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Spatially-Coupled Codes and Threshold Saturation on Intersymbol-Interference Channels

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Recently, it has been observed that terminated low-density-parity-check (LDPC) convolutional codes (or spatially-coupled codes) appear to approach capacity universally across the class of binary memoryless channels. This is facilitated by the "threshold saturation" effect whereby the belief-propagation (BP) threshold of the spatially-coupled ensemble is boosted to the maximum a-posteriori (MAP) threshold of the underlying constituent ensemble.
In this paper, we consider the universality of spatially-coupled codes over intersymbol-interference (ISI) channels under joint iterative decoding. More specifically, we empirically show that threshold saturation also occurs for the considered problem. This can be observed by first identifying the EXIT curve for erasure noise and the GEXIT curve for general noise that naturally obey the general area theorem. From these curves, the corresponding MAP and the BP thresholds are then numerically obtained. With the fact that regular LDPC codes can achieve the symmetric information rate (SIR) under MAP decoding, spatially-coupled codes with joint iterative decoding can universally approach the SIR of ISI channels. For the dicode erasure channel, Kudekar and Kasai recently reported very similar results based on EXIT-like curves.

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