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Erasure/List Exponents for Slepian–Wolf Decoding*

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Abstract

We analyze random coding error exponents associated with erasure/list Slepian–Wolf decoding using two different methods and then compare the resulting bounds. The first method follows the well known techniques of Gallager and Forney and the second method is based on a technique of distance enumeration, or more generally, type class enumeration, which is rooted in the statistical mechanics of a disordered system that is related to the random energy model (REM). The second method is guaranteed to yield exponent functions which are at least as tight as those of the first method, and it is demonstrated that for certain combinations of coding rates and thresholds, the bounds of the second method are strictly tighter than those of the first method, by an arbitrarily large factor. In fact, the second method may even yield an infinite exponent at regions where the first method gives finite values. We also discuss the option of variable–rate Slepian–Wolf encoding and demonstrate how it can improve on the resulting exponents.

Index Terms: Slepian–Wolf coding, error exponents, erasure/list decoding, phase transitions.

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