Exact Random Coding Exponents and Universal Decoders for the Asymmetric Broadcast Channel

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Abstract

This work contains two main contributions concerning the asymmetric broadcast channel. The first is an analysis of the exact random coding error exponents for both users, and the second is the derivation of universal decoders for both users. These universal decoders are certain variants of the maximum mutual information (MMI) universal decoder, which achieve the corresponding random coding exponents of optimal decoding. In addition, we introduce some lower bounds, which involve optimization over very few parameters, unlike the original, exact exponents, which involve minimizations over auxiliary probability distributions. Numerical results for the binary symmetric broadcast channel show improvements over previously derived error exponents for the same model.

Index Terms: Error exponent, asymmetric broadcast channel, universal decoding, MMI.