

On Random Coding Error Exponents of Watermarking Codes

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Abstract

Watermarking codes are analyzed from an information-theoretic viewpoint as a game between an information hider and an active attacker. While the information hider embeds a secret message (watermark) in a covertext message (typically, text, image, sound, or video stream) within a certain distortion level, the attacker processes the resulting watermarked message, within limited additional distortion, in attempt to invalidate the watermark. For a memoryless covertext source, we provide a single-letter characterization of the minimax-maximin game of the random coding error exponent associated with the average probability of erroneously decoding the watermark. This single-letter characterization is in effect because there is a “memoryless saddle point” in this game: The information hider utilizes a memoryless channel to generate random codewords for every covertext message, whereas the attacker implements a memoryless channel to disrupt the watermark information hidden in the covertext.