On Joint Information Embedding and Lossy Compression

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Abstract

We consider the problem of optimum joint information embedding and lossy compression with respect to a fidelity criterion. The goal is to find the minimum achievable compression (composite) rate R_c as a function of the embedding rate R_e and the average distortion level Δ allowed, such that the average probability of error in decoding of the embedded message can be made arbitrarily small for sufficiently large block length. We characterize the minimum achievable composite rate and demonstrate how this minimum can be approached in principle.

1   Introduction

In the last few years, along with increasing awareness regarding the data protection, there is observed an increased interest in watermarking codes in their various applications. Watermarking is a form of hiding information in a host data set (covertext), usually an image, audio signal or video, creating a distorted version of the host data (stegotext, composite data). Successful retrieving of the watermark from the examined data indicates ownership, while on the other hand, damaging of the watermark beyond retrieving or its fabrication allows stealing the data or its forgery. There exists a variety of applications for data hiding ranging from classical steganography [1], [2], data authentication, copyright protection and copy control information [3], [4].

The requirements in watermarking scheme design are quite conflicting: In most applications, the watermark should be *perceptually transparent*, that is, invisible to the naked eye,

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