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软件、算法与仿真

JPEG压缩下图像量化水印的鲁棒性估计

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摘要：

当嵌有水印的图像经受压缩时，水印检测可能出现错误。与通过各种仿真测试不同，提出以互信息为代价函数评测图像量化水印联合图像专家组（joint photographic experts group，JPEG）规范压缩下的鲁棒性，该方法以线性高斯模型近似JPEG压缩过程，推导了JPEG下的度量鲁棒性的互信息函数计算式，并仿真计算不同压缩因子对应的鲁棒性。实验中以分块离散余弦变换（discrete cosine transform，DCT)中频系数为量化载体进行水印嵌入和检测，结果表明当压缩因子变化时，互信息函数与实验误码率之间是匹配的，应用该方法可以评估和预测图像量化水印算法在JPEG压缩下的鲁棒性。

关键词： 量化水印 JPEG 鲁棒性 互信息

Evaluation of robustness for image quantization watermarking under JPEG compression

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Abstract:

A detectable error may happen when the watermarked image suffered from joint photographic experts group (JPEG) compression. Different from various simulation tests, a mutual information function is defined as a criterion measuring the robustness of image quantization watermarking against JPEG. Based on a linear Gaussian analog model of JPEG compression, a calculation formula of the mutual information function is derived to evaluate the robustness of watermarking under quantization index modulation (QIM) scheme. In the simulation experiment, the mutual information function is calculated in terms of quality factors, and the middle frequency AC coefficients are selected as the host and are quantified according to watermark bit series in the block based DCT domain. The statistic bit error rate (BER) is derived under the QIM watermarking scheme and JPEG compression. Experiment results show the evaluation conclusion of the mutual information method is matched with that of the empiric BER against the quality factor. With the analog model, the mutual information method can evaluate and predict the robustness of QIM image watermarking under JPEG compression.

Keywords: quantization watermarking joint photographic experts group (JPEG) robustness mutual information

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