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一种基于变换系数拉普拉斯分布的HEVC码率控制算法

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Laplace Distribution Based Rate Control Algorithm for HEVC

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摘要 基于变换后残差信号的拉普拉斯分布特性, 提出了一种面向高效视频编码(high efficiency video coding, HEVC) 的编码树单元(coding tree unit, CTU) 级码率控制算法. 首先, 研究了量化参数、拉普拉斯分布参数以及拉格朗日乘数之间的关系, 并建立了模型. 然后, 根据每个CTU 的变换残差的拉普拉斯分布特性动态调整其量化参数, 以获取高效的编码性能. 此外, 通过与帧级码率控制算法相结合, 获得了更加精确的码率控制效果以及良好的编码性能. 实验结果表明, 所提出的码率控制算法可以获得比HEVC标准提案JCTVC-H0213和JCTVC-K0103中所述码率控制算法更优的编码性能.

关键词: 高效视频编码   码率控制   拉普拉斯分布

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Abstract： This paper proposes a rate control scheme on the level of coding tree unit (CTU) based on the Laplace distribution modeling of the transformed residuals for high efficiency video coding (HEVC). At first the relationship between the optimal quantization parameter, the Laplace parameter and the Lagrange multiplier is established. Based on this relationship, the quantization parameter for each CTU is dynamically adjusted according to its distribution properties of the transformed residual to achieve high coding performance. Moreover,this paper incorporates this scheme within a rate control algorithm on the frame level to produce accurate rate control as well as high coding performance. Experimental results show that the proposed rate control scheme achieves accurate control as well as better coding performance than both the rate control schemes in the HEVC proposals JCTVC-H0213 and JCTVC-K0103.

Keywords： high efficiency video coding (HEVC),   rate control,   Laplace distribution

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