

JNCD-Based Visually Lossless Compression of RGB Data

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Abstract — In contemporary image and video coding applications, a coveted aim is to decrease bitrates, as much as possible, without inducing perceptually conspicuous distortions in compressed RGB data, thus attaining visually lossless coding. In this paper, we propose a novel Just Noticeable Colour Difference (JNCD)-based perceptual quantisation technique, named RGB-PAQ, which is implemented into the High Efficiency Video Coding (HEVC) standard. The proposed method is designed for utilisation with RGB (4:4:4) data of various bit depths and spatial resolutions. In accordance with the well-established spectral sensitivity of the HVS, RGB-PAQ exploits the perceptually uniform colour space, CIELAB, in order to ascertain an appropriate JNCD threshold. The proposed technique capitalises on the inability of the Human Visual System (HVS) to detect imperceptible gradations in the shade of a colour. RGB-PAQ also exploits the Modulation Transfer Function (MTF) characteristics of the HVS; i.e., quantisation levels are significantly increased in medium and high frequency coefficient sub-bands. We compare RGB-PAQ with the following techniques (anchors), where the anchors are configured to operate in lossy mode to create a GBR PSNR = 40 dB in the compressed image data: HEVC HM, VP9, JPEG and JPEG 2000. In comparison with HEVC HM, the RGB-PAQ achieves up to 77.8% bitrate reductions; RGB-PAQ also achieves up to 79.9% bitrate reductions when compared with JPEG 2000. The subjective evaluations confirm that the compression artifacts induced by RGB-PAQ proved to be indiscernible to the participants.