

Towards Perceptually Optimal Coding of Color Images using Subband Transforms

Evgeny Gershikov* and Moshe Porat

*Department of Electrical Engineering, Technion - Israel Institute of Technology,
Haifa 32000, Israel*

Abstract

The Mean Square Error (MSE) or the Peak Signal to Noise Ratio (PSNR) are common distortion measures used to assess image quality. Nevertheless, they are usually chosen due to their simplicity and not their performance as they are not always suitable compared to the human observer. In this work we present a Rate-Distortion approach to color image compression based on subband transforms using perceptual optimization of the compression quality. This approach is based on minimization of the Weighted Mean Square Error (WMSE) of the encoded image, which better corresponds to the quality assessment of the human eye. The WMSE can be measured in the YCbCr color space, for which visual weights are relatively easily derived. Based on the new approach, new optimized compression algorithms are introduced using the Discrete Cosine Transform and the Discrete Wavelet Transform. We compare the new algorithms to presently available algorithms such as JPEG and JPEG2000. Our conclusion is that the new WMSE optimization approach outperforms presently available compression systems when a human observer is considered.

Key words: Color image compression, Weighted Mean Square Error, Discrete Cosine Transform, Discrete Wavelet Transform, Perceptual Rate-Distortion model, Optimal color components transform, Optimal rates allocation

1 Introduction

Many color image coding algorithms are based on subband transforms for the compression process. The complexity of such algorithms varies from systems

* Corresponding author. Tel.: +972-4-8294725; Fax: 972-4-8294799.

Email addresses: `eugeny@tx.technion.ac.il` (Evgeny Gershikov),
`mp@ee.technion.ac.il` (Moshe Porat).