Masked Wavelets:
Applications to Image Compression

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Abstract

In a least mean square setting, amenable to analytical methods, one seeks to minimize a quadratic error function on the reconstruction of the image to decide on how to quantize the wavelet coefficients. However, these schemes do not guaranty that all important features in the image are preserved, since the quantization optimization process may allocate bits to noise at the detriment of important features, such as edges or other details that may not correspond to large wavelet moduli.

We present in this paper two algorithms to decimate the wavelet coefficients according to an arbitrary pixel mask. The first algorithm is the MMT, the maximum mask transform that allows from a binary mask to decimate wavelet coefficients in an non-overlapping wavelet transform. We also show how the successive projection algorithm can be used to decimate coefficients in an arbitrary wavelet transform. We also present the results of the decimation method on typical images. The method of arbitrary mask allows the user to decide more finely on bit allocation schemes. Pushed to the extreme this idea suggests that the user only keeps wavelet coefficients that support the pixels under the mask, leading to high compression ratio and acceptable image quality. Tests show that for some pictures, as low as 10% of the pixels exactly coded are enough to deliver good image quality.

Figure 1: On the left, a baseline JPEG at 0.25 bits per pixel (7937 bytes), on the right, 0.25 bits per pixel masked Haar (7818 bytes).

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