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A Low Bit Rate Color Image Encoder Using An Adaptive Morphological Pyramid Decomposition

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Abstract: Interest in multiresolution techniques for image processing and coding is increasing steadily. An attractive instance is pyramid decomposition schemes due to their low computational complexity, simple parallel implementation, and ability to produce acceptable color images at moderate data rates. We present an approach combining a modified pyramidal algorithm and mathematical morphology for color image coding applications denoted as the adaptive morphological pyramid coding (AMPC) algorithm. The proposed AMPC pyramidal strategy involves (1) building a multilevel pyramid based on a developed adaptive morphological filter that preserves the significant details (without shape bias) and does not require very high computational cost, and then (2) the resulting pyramid levels (images) are applied to suitable coding techniques including an adaptive 3-D vector quantization (AVQ). The proposed technique gives an average peak SNR (PSNR) in the range 46.78 to 50.7 dB when no additional coding is applied. When AVQ and differential pulse code modulation (DPCM) are applied to the pyramid levels an average PSNR varies in the range 22.2 to 37.8 dB) at bit rates in the range 0.07 to 1.51 bpp is obtained. When compared with JPEG/JPEG2000, embedded zero-tree wavelet (EZW) coding and set partition in hierarchical trees (SPIHT), the proposed algorithm provides comparable reconstruction quality