Edge-Based Artifact Mitigation in a Wavelet Transform Coding Framework

Anand Kalyanaraman1 — Patrick J. Flynn
Department of Electrical Engineering
The Ohio State University
Columbus, OH 43210-1272 USA
anand@intervideo.com — flynn@ee.eng.ohio-state.edu

All image compression techniques exhibit artifacts at very low bit rates. The main artifact that occurs in wavelet based compression is ringing around high contrast edges. The problem of artifact mitigation is addressed in this work. A low-resolution edge map is computed from a low frequency subband in the wavelet decomposition. Edge strength is used to selectively emphasize or de-emphasize spatially corresponding coefficients throughout the subband tree; coefficients representing strong edge content are emphasized (allowing finer quantization and better reconstruction of image content near the edge), and coefficients in smooth regions are de-emphasized to trade off rate consumption with the coefficients near edges. This differential weighting process is inverted in the decoder. The edge map itself is transmitted as side information with little rate impact due to sparseness. The proposed technique was implemented as a variant of the SPIHT coder proposed by Said and Pearlman and uses the open source QccPack implementation of SPIHT licensed from PrimaComp. Experimental results demonstrate artifact mitigation in low-rate reconstructions, but also reveal the simple technique’s lack of control over the prominence of edge quality improvements. Future work will focus on improved control of reconstruction.

Figure 1: (a): Reconstruction of Goldhill image at 0.08bpp using unmodified SPIHT algorithm. (b): Reconstruction of Goldhill image at 0.08bpp using proposed technique.

1Now at InterVideo, Inc.