ProperSample Improves Video Quality for Highly-Compressed Video

Highly-compressed video streams have distracting banding and blockiness artifacts because current decompressors ignore the uncertainty in the encoded stream. UNC's *ProperSample* technique for image and video decompression looks much better because it turns banding and blockiness into uncertainties that our eyes expect and handle well. It works at full video rate and without any changes to the video encoding or transmission – it just makes standard images and videos look better.

The method is particularly well suited for improving the user experience on cell phones, televisions, and computers because users commonly stream highly-compressed images or videos to these high-resolution devices. This technology is covered by a pending patent and is available for licensing from UNC Chapel Hill. Contact Russ Taylor taylorr@cs.unc.edu or Peter Liao liaopb@unc.edu for information about licensing.

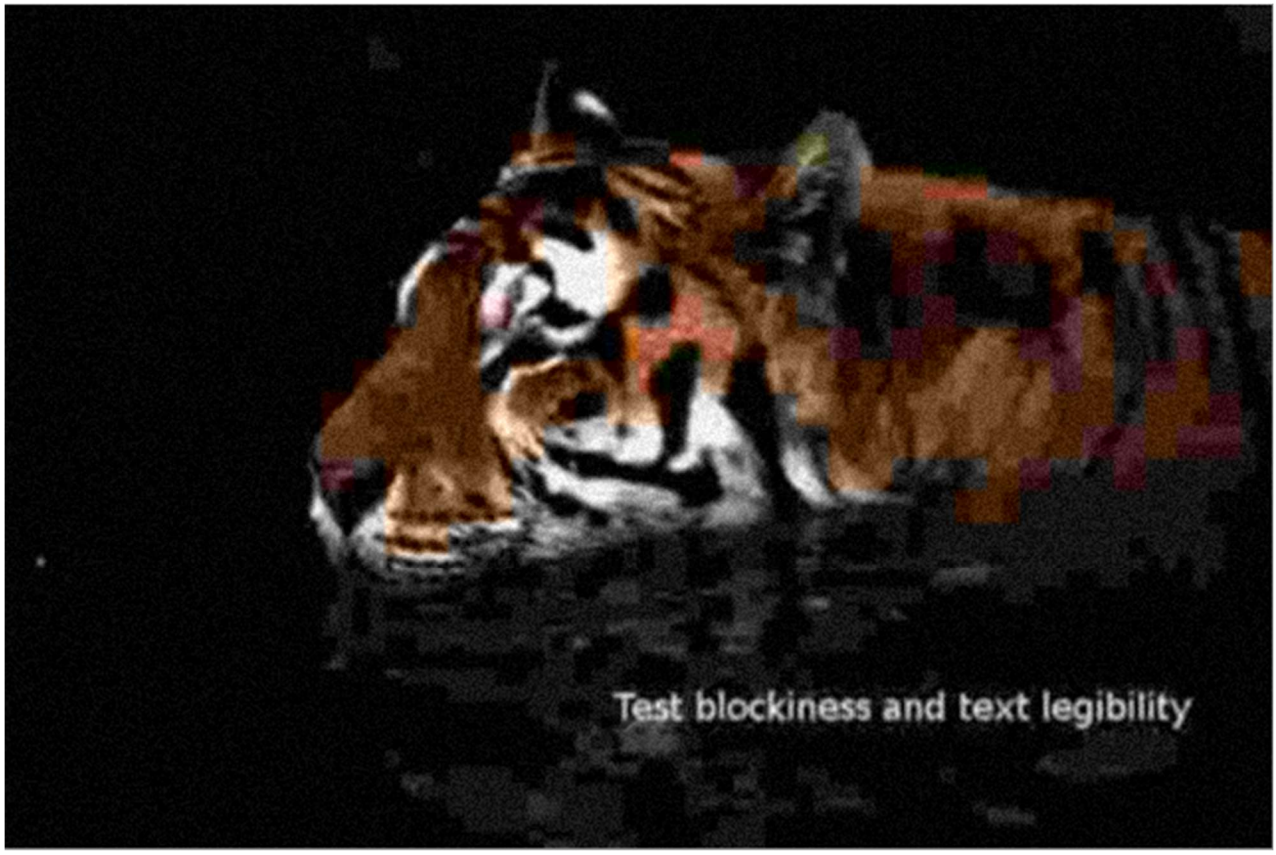
Examples

JPEG: An example of this technique applied to a highly-compressed image of a swimming tiger is shown on the two images on the next page.

The first image is the standard reconstruction from a JPEG image with quality-factor 5. It is equivalent to heavily-compressed streaming network video and shows both block reconstruction from undersampled macroblocks (sharp vertical and horizontal boundaries in the brown area between the nose and eyes) and some banding (around the neck near the water line).

ProperSample reduces both artifacts, as seen in the following image. The presence of noise can be noticed if you look for it in the image but looks much better than the artifacts it replaces because (1) it does not excite the edge-detection machinery present in the early visual system, and (2) it looks like the noise in real photographs. It also reduces the ringing artifacts seen near the text in the lower right portion of the image.


Test blockiness and text legibility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H.264: The following frame from a video that runs at 60fps when doing both standard and properly-sampled de-compression (using a modified color-conversion kernel in a standard nVidia hardware decoding pipeline). Block-iness caused by compression seen in the back of the ground plane and in the lighting highlights is removed by proper resampling. The improvement is much more pronounced on moving video (example program available).