

HDR Shop is a computer application (currently under development) designed to view and edit high-dynamic-range (HDR) images: pictures that can capture a much greater range of light intensities than standard photographs or computer images. This approach is very useful for image-based lighting and post-render processing.

Photographs from traditional cameras do not record the amount of light over a certain level. All the bright points in a photo are white, which makes it impossible to detect any difference in intensity. The standard technique to acquire HDR images that capture this missing information is to take several photographs at different exposures (making each photo progressively darker, without moving the camera), until the bright lights no longer saturate. The sequence of photographs can then be analyzed to derive the light intensity of each point in the scene.

Whereas traditional image editors work with 8- or 16-bit images, HDR Shop is built from the ground up to work correctly with HDR images. All operations are done with linear floating-point numbers. In many cases, this simplifies the code, as well as providing more correct output.

For the purpose of real-time display, however, it is important to quickly convert linear floatingpoint images to 8-bit RGB with the appropriate gamma curve. The standard gamma formula involves an exponentiation, which is slow. In the interest of speed, we have found it useful to approximate this calculation by constructing a lookup table indexed by the most significant bits of the floating-point values. For common gamma values of 1.4 ~ 2.2, it suffices to use 16 bits (eight exponent bits and eight mantissa bits) to reduce the error below rounding error.

In addition to resampling, cropping, and mathematical operations, HDR Shop also supports transformations among most common panoramic formats, facilitating the use of HDR panoramas in image-based lighting. HDR Shop can also automatically export a low-dynamic-range (LDR) copy of any image to an external image editor. Changes to the LDR image are then incorporated into the HDR image, so existing tools can be used to modify HDR images.

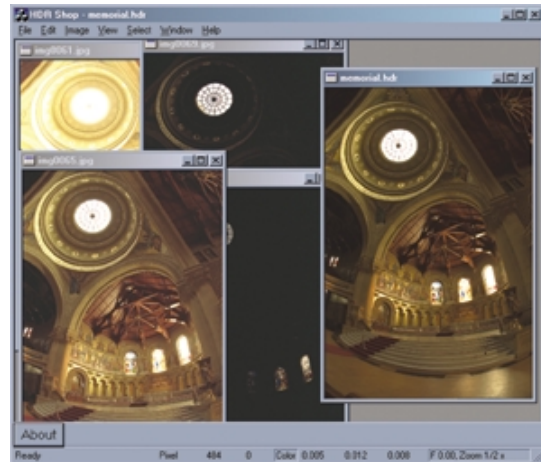


Figure 1. In HDR Shop, a sequence of low-dynamic-range images (left) can be compiled into a single high-dynamic-range image (right).

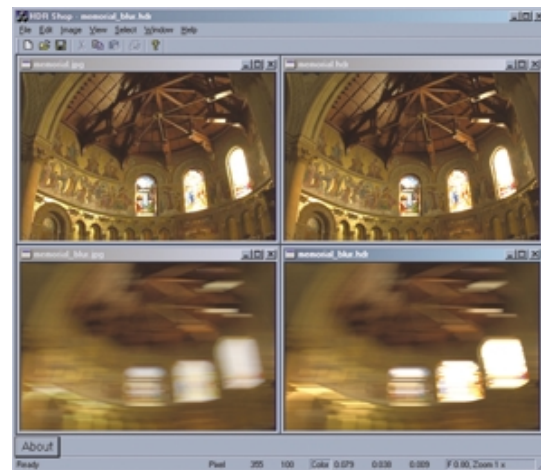


Figure 2. Comparison of HDR Shop's horizontal motion blur on a low-dynamic-range image (left) vs. a high-dynamic-range image (right).



Figure 3. St. Paul's Cathedral panorama, originally in cube-map format (left), converted in HDR Shop to latitude-longitude (upper right), mirrored ball, and light probe formats (lower right).