Tone Mapping Parameter Settings

The goal of this document is to provide parameter settings for each tone mapping operator and all images used in our experiment. To fully understand the meaning of those parameters please refer to the respective original papers.

A few restrictions were imposed to prepare images. We asked the respective tone mapping authors to apply such parameter values which lead to the best possible image accordingly to their judgement. For some tone mapping operators default values were chosen by their authors which also lead in such cases to very high quality images. Of course apart from the gamma correction (we fixed the gamma to 2.2) no post processing such as sharpening for example were allowed.

For Tumblin and Rushmeier [1993] we tried to follow the implementation of the foveal method [Tumblin et al. 1999] in which a user point to a region of interest with the mouse, the difference with the base operator is not only that the world adaptation is sampled in a constrained area, but also high and low luminance are remapped in a S-shaped curve to avoid cropping values to black and white. However, we had to sample world adaptation using the whole image which somehow did not produce an ideal situation for this global operator.

We relied on "pcond" (part of the Radiance rendering system) for the histogram adjustment [Larson et al. 1997], we consistently used the default settings and the human contrast sensitivity function. The images produced consistently exhibit high contrast, it is interesting to note that for very high contrast content such as in this experiment, the results are visually close to the real scene if one does a direct comparison.

The application of the Gradient Domain High Dynamic Range Compression [Fattal et al. 2002] is described in detail by the author of the method: "Each input HDRI is first normalized such that the max luminance in the image becomes 100. Next the parameter α specifies the gradient threshold (only gradients with magnitude larger than α are attenuated). β is the exponent controlling the amount of attenuation. Finally, S is the exponent that controls color saturation in the resulting image. Solving the system of equations results in a floating point image with a reduced dynamic range. Then the values low and high that contain everything but the darkest 0.1% and the brightest 0.25% of the pixels are selected and the resulting (low..high) range is linearly remapped to (0..255). No gamma correction is applied, because none seems to be necessary: the algorithm already brings out the details in the dark regions and additional gamma correction only reduces the contrast and creates a washed-out look."

For adaptive logmapping [Drago et al. 2003] we consistently used a unique bias parameter of 0.75 along with the gamma correction function proposed in the paper. The primary exposure was evaluated from the whole scene. Each image might have benefited from a few parameter tuning in exposure and contrast but we rely on default consistent values for every scene.

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Automatic parameters for the Photographic tone mapping operator [Reinhard et al. 2002] were published in [Reinhard 2002]. We relied one the automatic method to select the key value necessary to compute world luminance adaptation, but we consistently applied the local operator to every image, the number of scales and other parameters were left to their default values.

The bilateral filtering [Durand and Dorsey 2002] method has the particularity to correct gamma before the tone mapping operation. Else default parameters of 0.4 for the sigma_range, sigma_spatial=40 pixels, and base contrast=5 were used for all images. Since this method is not physically nor perceptually based but an image processing technique, we fell that visually better images could have been produced with some ad-hoc tuning for each image.

Ashikhmin's TMO [Ashikhmin 2002] has only one parameter, the maximum allowed local contrast. The author's idea was to make the process as automatic as possible. Resulting images are somehow brighter than others, to the benefit of more details in dark areas.

Twenty Retinex iterations [Drago et al. 2003] in both clockwise and counter-clockwise directions were applied, no initial exposure was set since the number of iteration determine the level of contrast compression and detail enhancement, a bias parameter of 0.9 in the contrast clipping function prevented the propagation of black halos (gradient reversal phenomenon) and the maximum value of the reset operation was set to 100 cd/m^2 the maximum luminance of the display [Drago et al. 2003].

Tumblin and Rushmeier, Ashikhmin, and the Histogram Adjustment algorithms model some aspects of the human visual system and require a physically accurate representation of luminance. Such values are usually readily available for rendered simulations of real world scenes. However, the physical accuracy of HDR photographs depends on the quality of the camera and its calibration, the knowledge of the original luminance values in the scene, and the precaution taken during the construction of the radiance map. Personal experience shows that in most scenes found on the Internet, the luminance maxima are often very different from plausible values. Moreover scene exposure is easily manipulated and the dynamic range of HDR images is also affected by resizing.

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