

EXPLORING HIGH DYNAMIC RANGE IMAGING: §3.2 SIMPLE OPERATOR*

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Abstract

The simplest operator used to map an HDR image to an LDR image. For example, the simplest method for how to map a 32-bit range down to an 8-bit range is a basic quantizer.

Now that one has an HDR image, to be able to display it on conventional displays, one must map it back down to the range of an LDR image. This results from current display technologies, be CRT, LCD, or printer, can only display at most about 8-bits per color channel, around the LDR range. So, to be able to see the results of adding all this information together, one must map the high-dynamic range of 32-bits back to 8-bits.

The simplest way to perform this calculation is using a quantizer, to directly map ranges in the 2^{32} space back to single values in 2^8 space. That is, the range $\{0 \dots \frac{2^{32}}{2^8}\} = \{0 \dots 16777216\}$ would all be mapped to 0 in the 2^8 space. This can be realized by:

$$\frac{\lceil \frac{A}{2^{H-1}} \rceil - 1}{2^{L-1}} \quad (1)$$

where A is the HDR color matrix, H is the HDR (source) bitrate, and L is the LDR (destination) bitrate.

Example 1

So in the case of 32-bit to 8-bit transformation, we would have: $\frac{\lceil \frac{A}{2^{32-1}} \rceil - 1}{2^{8-1}}$

Using this approach, we have the following result:

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Figure 1: Quantizing Operator
<http://cnx.org/content/m14248/1.2/>

Now that we have explored the most basic operator that just takes the HDR image straight back down to the LDR range without any intelligent methods to preserve the most information and dynamic range, we can explore more advanced operators in the following modules. For example, one way to improve upon this is to "move" the average brightness around of the entire image, so that if it is overexposed, we can correct to some extent to preserve the most amount of detail in the resulting LDR image. Beyond that, we can look at regions of the HDR image and map them down in an intelligent manner as to preserve the most amount of information in small areas of the resultant LDR image.