Corrected version of paragraphs of section 3.3 in "Capturing and Viewing Gigapixel Images", SIGGRAPH 2007

We measure both the key and range based on the input luminance histogram of the pixels in the current view. The key, k_{in}, is determined as the average of the 99^{th} and 1^{st} percentiles, and the range, s_{in}, is the difference between the 99^{th} and 1^{st} luminance percentiles.

At each frame, we *stretch and bias* the histogram: we move the key of the histogram towards middle-gray to brighten dark regions or darken light regions. At the same time, we also stretch the histogram to enhance contrast.

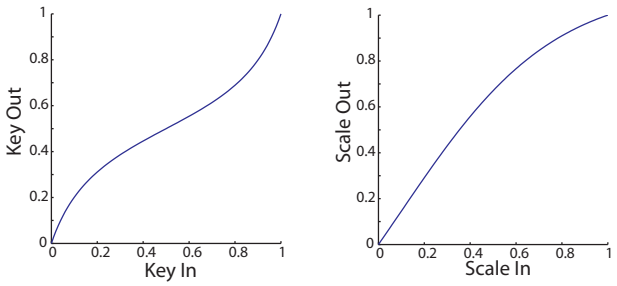

Figure 10: Histogram stretch and bias curves. Left: key bias; the curve always moves the key towards middle gray level. Right: scale stretch; the curve always enhances the scale slightly.

Figure 10 show the functions we use to stretch and bias the histogram. The key function is based on a tangent curve, and the scale function is a sigmoid. More specifically, the key curve is defined as follows:

$$k_{out} = 0.5 + c\ \tan(d \cdot (2k_{in} - 1)), \tag{7}$$

where c and d are chosen so that the curve can be controlled with a single parameter $p_k \in [0,1]$: $d = 0.5\pi \cdot \log(20p_k + 1)/log(21)$ and $c = \frac{1}{2\tan(d)}$. If $p_k = 0$ then the key is unchanged, if $p_k = 1$ then the output key is always middle gray. In between (our default is 0.4), dark and light keys are smoothly brought towards middle gray based on their distance from middle gray.

The stretch curve is defined as:

$$s'_{out} = \frac{1}{1 + \exp(-b \cdot (s_{in} + a))},$$
$$s_{out} = \begin{cases} \frac{s'_{out} - s_{out}(0)}{s_{out}(1) - s_{out}(0)}, \text{if} p_s > 0 \\ s_{in}, \text{if} p_s = 0 \end{cases} \tag{8}$$

where $a = -0.1$ and $b = 10p_s$ to control the curve with a single parameter $p_s \in [0,1]$.