NPR for HDR: Stylizing with High Dynamic Range Photographs

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This work addresses the stylization, or Non-Photorealistic Rendering (NPR), of HDR images, and since depiction is limited to LDR prints and displays, we also consider the stylization of LDR depictions that result from tone mapping. The benefits of stylizing HDR images and their displayable counterparts echo the benefits of all image stylization: to create an abstraction or impression of the original, and to create efficient imagery that emphasizes important visual information. The contribution of our work is two-fold: we present the merits of NPR performed directly on HDR, and we stylize the LDR tone mapping by performing NPR techniques according to the original HDR data.

Enhancing Tone Mapped HDR Images with Colour Contrast

Enhance Global Contrast: original LDR (left), enhanced by countershading along horizon (right).

Detail Restoration: original LDR (left), restored and enhanced disappeared details (right).

Tone mapping may result in lost overall global contrast or the disappearance of details. We restore losses with new colour contrasts by chroma scaling in CIE $L^*u^*v^*$ space. The result is natural looking enhanced images.

1. Measure HDR to LDR luminance distortion.
2. Restore global contrast with countershading.
3. Restore and enhance details with a per pixel chroma scaling.

Details in *Beyond Tone Mapping: Enhanced Depiction of Tone Mapped HDR Image*, Eurographics 2006 [1].

NPR Depiction of HDR Information
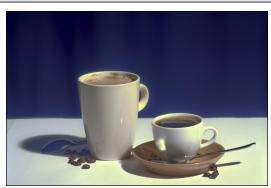
To visualize the undisplayable wide value range, we communicate the original HDR values using NPR techniques, like colour temperatures. We apply an HDR-specific algorithm [2] to determine the extreme dark and bright regions of the HDR and use hue shifts to emphasize the difference between the two regions. The luminance preserving hue changes are done with statistical colour shifts as in [3].

Image Processing for NPR on HDR
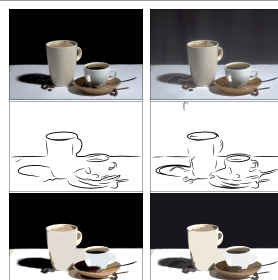
LDR (left) vs. HDR (right).

Image processing (used in stylization) should be performed directly on the HDR image. We perform edge detection and segmentation on HDR input with a localized version of *EDISON System*. Observe the shadow regions of both cups: the spoon and coffee beans that are evident in the HDR results are missing from the LDR results.

1. K. SMITH, G. KRAWCZYK, K. MYSZKOWSKI, and H.-P. SEIDEL. Beyond Tone Mapping: Enhanced Depiction of Tone Mapped HDR Images. *The European Association for Computer Graphics 27th Annual Conference EUROGRAPHICS 2006*, September 2006.

2. G. KRAWCZYK, K. MYSZKOWSKI, and H.-P. SEIDEL. Lightness Perception in Tone Reproduction for High Dynamic Range Images. *The European Association for Computer Graphics 26th Annual Conference EUROGRAPHICS 2005*, August 2005.

3. E. REINHARD, M. ASHIKHMIN, and B. GOOCH, P. SHIRLEY. *Color transfer between images.* IEEE Comput. Graph. Appl., 2001.

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