

Reproduction of Perceptual Reality in Standard-Dynamic-Range (SDR) Environments Using High-Dynamic-Range (HDR) Images Compressed by Global Tone Mapping

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Abstract

In the real world, human observers perceive various objects under a wide range of luminance values from low to high [1]. Images that try to reproduce the same range end up looking overexposed, underexposed, or both. This is because our visual systems can capture a full range of tones in high contrast scenes. In order to display HDR images or videos, quite dark rooms are conventionally required to avoid the picture quality degradation caused by viewing flare from illumination in the room. The next step is therefore, converting HDR images/videos into Standard-Dynamic-Range (SDR) images/videos that retain their Perceptual Reality (PR), i.e., reducing the impairments caused by flare, for comfortably utilizing HDR contents in daily life often. Tone Mapping Operators (TMOs) are now being used to compress HDR into SDR images. However, there is no evidence that all the conditions, separately or jointly, provide satisfactory results from the human perspective.

Our physiological experiments in a real HDR environment confirmed that (1) most observers maybe able to judge the luminance differences in global luminance perception except for specific lighting cases, e.g., the object is to be viewed against a strong light-source like the sun, and (2) JND (Weber-ratio) in luminance perception increases, i.e., luminance sensitivity decreases, except for between highlight and middle tone in a scene.

Based on subjective assessments conducted in a real HDR environment, our proposal demonstrates that the global tone mapping technique is quite effective in reproducing HDR images (Contrast Ratio (CR) > 1000:1) in normal or SDR environments with typical viewing flare (CR < 20:1).

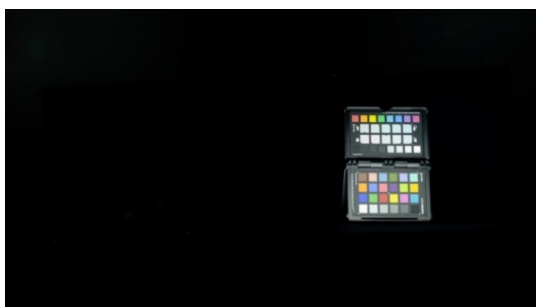


Figure1. Original HDR image

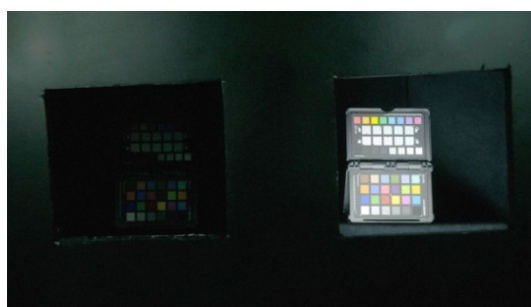


Figure2. SDR image by our proposal (CR < 20:1)

References

- 1) D. Nightingale: "Practical HDR: A complete guide to creating High Dynamic Range images with your digital SLR," Focal Press, 2011.

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