Disentangling object color from illuminant color
The role of color shifts

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Contributed Session III: Disentangling object color from illuminant color: The role of color shifts

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Abstract

Research has shown that disentangling surface and illuminant colors was possible based on various scene statistics. This study investigates the statistical cues induced by the chromatic effects of interreflections. We present a numerical analysis of ambiguous spectral pairs, in which the spectral power distribution of the illuminant in one scene matched the surface reflectance function in the other scene and vice versa. If the scenes are flat or convex and perfectly matte (Lambertian), the reflected light spectra of both cases are identical. However, the incident light undergoes interreflections for concave scenes. The spectral power of interreflections will be absorbed spectrally in an exponential way, dependent on the number of interreflections. We found that this causes systematic shifts towards the spectral reflectance peaks, resulting in brightness, saturation and hue shifts. Those paired cases' color differences (CIEDE2000) are so large that humans would be able to observe them if viewed simultaneously. In addition, we find that the color shifts cause qualitatively different gradients for chromatic materials and achromatic light and vice versa. Further psychophysical testing is necessary to see whether the different color shifts for the two cases can be recognized in isolation due to material or light properties. Moreover, the light densities and light vectors are spectrally different for these cases, creating different appearances of 3D objects in non-empty rooms.

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