

Simulating low vision in high dynamic range scenes

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Abstract: Previous work [Peli91] has demonstrated the value of using digital techniques to simulate the appearance of images to low vision observers. However unlike images, real scenes often have high dynamic ranges of intensities that can produce serious visual impairments in people with low vision. Existing simulation techniques do not account for these effects. In this work we present a new algorithm for simulating the appearance of high dynamic range scenes to normal and low vision observers. As input, the algorithm takes a stream of high dynamic range images captured by a digital camera or generated by a computer graphics system. The images are processed through a computational model of vision that accounts for the changes in glare, contrast and color sensitivity, visual acuity, and dark adaptation that occur under varying illumination conditions for normal and low vision observers. The output is a stream of low dynamic range images that simulate for a display observer what the scene looks like to the scene observer. To demonstrate the utility of the method we generate image sequences that simulate the dramatic differences in glare susceptibility and dark adaptation that are experienced by young and old observers in high dynamic range scenes.

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