



Visual Models for Realistic Image Synthesis

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4pm, Tuesday, April 10, 2007

***Color Science Building 18, Franc Grum Learning Center**

Abstract

The goal of realistic image synthesis is to produce computer graphics images that are faithful representations of real or modeled scenes. Over the past 30 years great progress has been made toward this goal with the development of physically-based algorithms that accurately simulate the interactions of light and objects in complex environments. Physically-based image synthesis has the potential to revolutionize the use of computer graphics in science, engineering, medicine, and other fields, because the images can be both accurate physical simulations and predictive visual representations of important phenomena. Unfortunately several problems have limited its wider acceptance. First, modeling a scene can be a difficult and labor intensive process. Second, rendering algorithms are computationally expensive and often take hours to generate even a single image. Finally, once an image has been generated, there is often no way to accurately present it on conventional display devices. In this talk I will first describe research that addresses these problems by incorporating psychophysical models of human vision into the image synthesis process. I will then discuss how these image synthesis methods can be used to create new tools for the detection, simulation, and remediation of visual impairments.

Biography

James A. Ferwerda received the B.A. in Psychology (1980), M.S. in Computer Graphics (1987), and Ph.D. in Experimental Psychology (1998), all from Cornell University. He is currently a Research Associate in the Program of Computer Graphics at Cornell where he leads projects in the areas of computer graphics, digital imaging, visualization, and human-computer interaction. The focus of his research is on building computational models of human vision from psychophysical experiments, and developing advanced graphics algorithms based on these models. Current research interests include: high dynamic range imaging; perceptually-based rendering; perception of material properties; and low vision and assistive technologies. In 1992 he received the IEEE Computer Society Paper of the Year Award, and in 2003 he was selected for the National Academy of Engineering Frontiers of Engineering Program. He is an Associate Editor of ACM Transactions on Applied Perception, served as Guest Editor for a special edition of IEEE Computer Graphics and Applications on Applied Perception, and serves as a member of CIE Technical Committee TC8-08 on High Dynamic Range Imaging.