

INTRODUCTION TO PRACTICAL ISSUES IN COLOR REPRODUCTION AND SELECTION

COURSE # 10

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Introduction to Practical Issues in Color Reproduction and Selection

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Course Abstract

The introduction of raster graphics technology has made color an integral part of computer graphics. Since color first appeared much practical information has been assembled by the computer graphics community about how to calibrate color reproduction devices and use color effectively in computer graphics applications. This tutorial will bring this information together and present it at an introductory level to SIGGRAPH attendees.

The first third of the tutorial will be an introduction to color perception and color measurement. Color will be presented as a sensation that depends not only upon the wavelength composition of the light reaching the eye, but also upon such dimensions of the stimulus as spatial distribution and time variation. The physiology of the human color vision system that has evolved to process the light reaching the eye will be reviewed, and the color naming conventions that have been adopted to describe our response to the color stimulus will be discussed. Color science will be introduced as a color measurement system that can be used to solve color reproduction problems.

The second third of the tutorial will be an overview of additive and subtractive color reproduction techniques. The emphasis will be on practical calibration procedures that the attendees can use to obtain satisfactory color reproduction on the most commonly available color reproduction devices. Color television colorimetry will be presented, and the techniques necessary for basic monitor calibration will be covered. The nonlinear nature of subtractive color reproduction systems used in film and printing will be discussed, and recently developed procedures for calibrating these types of media will be described. The thorny problem of obtaining satisfactory color hard copy from a color television picture will be addressed.

The final third of the tutorial will take a look at two different ways of generating color in computer graphics. First, color synthesis as part of realistic image production will be discussed. The causes of the colors in nature that one might want to synthesize will be reviewed, and techniques for efficiently computing the spectral energy distributions that are necessary to create these colors will be described. Second, the selection of color for user interfaces will be covered. To accomplish this, color appearance issues will be re-examined, the criteria for selecting colors will be discussed, and techniques for controlling color will be introduced.

Speaker Biographies

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William Cowan is currently an associate professor in the Computer Science Department and director of the Computer Graphics Laboratory at the University of Waterloo. He received a PhD in statistical physics from McGill University in 1976, then learned colour psychophysics while working with the late Gunter Wyszecki at the National Research Council of Canada. He has been at the University of Waterloo since July 1988. His research interests lie mainly in areas of colour and computer graphics, colour appearance, colour reproduction, colour design, colour standards and image quality. In addition he actively works on operating systems and programming principles for multi-processor real-time systems, one of which is the human brain. His particular interest is the development of the architecture of the visual cortex. In his spare time he lives beside a lake with one wife, three children and no dog.

Gary W. Meyer
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Gary Meyer is an assistant professor in the department of computer and information science at the University of Oregon. His research interests include color reproduction and color selection for the human-computer interface, perceptual issues related to synthetic image generation, and the application of computer graphics to scientific computing.

Meyer has been a member of the technical staff at Bell Telephone Laboratories. He has received a BS from the University of Michigan, an MS from Stanford University, and a PhD from Cornell University.

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Maureen C. Stone is a member of the research staff in the Electronic Documents Laboratory at the Xerox Palo Alto Research Center, where she has worked for the last 10 years. Her professional interests are color, color reproduction, spline curves and interactive graphics. She recently spent six months on sabbatical leave at the computer Graphics Laboratory at the University of Waterloo.

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Brian Wandell is a Professor in the Psychology Department at Stanford University, where he has taught for the last ten years. He is an editor of *Vision Research*, a member of the Association for Research in Vision and Ophthalmology, the IEEE, and the Optical Society of America. He has worked on theoretical topics regarding the estimation of surface and light wavelength functions in computer vision, and he has done a variety of empirical investigations in spatial pattern vision, color discrimination, and color appearance. He shared the 1986 Troland Research Award from the U.S. National Academy of Sciences for his work in color vision.

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