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Image Processing, Analysis, Measurement, and Quality

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IMAGE PROCESSING, ANALYSIS, MEASUREMENT, AND QUALITY

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Session 4—Color Vision and Color Sampling
Bernice E. Rogowitz, IBM/Thomas J. Watson Research Center

Session 5—Spatial/Temporal/Color Interactions
Bernice E. Rogowitz, IBM/Thomas J. Watson Research Center

INTRODUCTION

In Image Science we share a common goal. Whether we work in creating, processing, compressing, encoding, transmitting, or displaying images, our goal is to make images that "look good." It is this common focus that unified the three sessions in the Image Measurement and Quality symposium. In this symposium, we explored the relationship between the physical properties of visual displays and how we perceive them. This is the classic problem of visual psychophysics, to uncover the laws that relate the physical energies of our world, on the one hand, and human sensation and perception, on the other.

Visual psychophysics provides a body of knowledge about the perception of stimuli that vary in luminance, contrast, spatial frequency, velocity, hue, etc. This descriptive and predictive understanding can often be applied directly to improving image quality. Visual psychophysics also provides a repertoire of experimental and theoretical tools that can contribute to the development and evaluation of new technologies (e.g., television, HDTV, coding algorithms). None of these psychophysical models, however, can simply predict the visual response to the complex spatial, temporal, and chromatic images produced on our digital displays. The new image technologies ask questions to which visual psychophysics has no answers. The purpose of the Image Measurement and Quality symposium was to explore these questions.

In organizing these sessions, my goal was to encourage an intellectual dialogue between scientists in visual psychophysics, display technology, and image processing. The papers in this proceedings are organized under three topics: Spatial Vision and Spatial Sampling, Color Vision and Color Sampling, and Spatial/Temporal/Color Interactions. Each session focuses on a topic that relates to a broad range of technologies and brings together speakers from a wide range of disciplines.

Session 3, Spatial Vision and Spatial Sampling, is primarily concerned with the visual effects of spatial sampling. Here, papers explore the physics and psychophysics of sampled images, developed metrics based on linear systems analysis to characterize image quality, and considered the particular constraints imposed by LCD, TFT-LCD, and CRT technologies for text and image display.

The Color Vision and Color Sampling, Session 4, is concerned with color representation on sampled, dynamic, and photographic displays. In this session, papers develop algorithms for minimizing the effects of color sampling, for representing image on output devices with different color gamuts, and for improving the uniformity of color spaces.

Session 5, Spatial/Temporal/Color Interactions, is concerned with interactions in the processing of spatial, temporal, luminance, and color information. In this session, new psychophysical results are presented on the importance of luminance edges for color perception, various interaction effects are discussed, and a display system based on the spatio/temporal sensitivity of human observers is presented.

I want to thank all the speakers for their contributions. The papers attracted a large, steady audience and generated interesting questions and lively discussions. I am sure you will find the written papers equally stimulating. I also want to thank Dr. Peter Haubner from Siemens for his unscheduled presentation on international visual standards for display terminals.

In many ways, the Image Measurement and Quality symposium was unusual. The attendees represented many disciplines in the Image Science community, and although many of the participants worked mainly on one technology, the concepts presented were largely technology-independent. In each session, we heard papers from several different perspectives. Each paper helped define the area of research on the frontier between vision science and image/display technology.

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