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Conference 3016

Monday–Thursday 10–13 February 1997 • SPIE Proceedings Vol. 3016

Human Vision and Electronic Imaging II

Conference Chairs: **Bernice E. Rogowitz,** IBM Thomas J. Watson Research Ctr.;
Thrasyvoulos N. Pappas, Lucent Technologies, Bell Labs.

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Univ.; **Christine I. Podilchuk, Robert J. Safranek,** Lucent Technologies, Bell Labs.

Monday 10 February

SESSION 1 . . Mon.10:10 am to 12:10 pm

Perceptual Models for Image Processing
Chair: **Bernice E. Rogowitz,**
IBM Thomas J. Watson Research Ctr.

Digital images and human vision *(Invited Paper),*
A. B. Watson, NASA Ames Research Ctr. . . . [3016-01]

Five types of visual masking *(Invited Paper),* S. A. Klein,
Univ. of California/Berkeley; T. Carney, Univ. of
California/Berkeley and Neurometrics Institute;
L. Barghout-Stein, Univ. of California/Berkeley and
Smith-Kettlewell Eye Research Institute; C. W. Tyler,
Smith-Kettlewell Eye Research Institute . . . . [3016-02]

**Partitioning mechanisms of masking: contrast
transducer versus divisive inhibition,** L. Barghout-Stein,
Smith-Kettlewell Eye Research Institute and Univ. of
California/Berkeley; C. Tyler, Smith-Kettlewell Eye
Research Institute; S. A. Klein, Univ. of California/
Berkeley . . . . [3016-62]

**Image discrimination models: detection in fixed and
random noise,** A. J. Ahumada, Jr., NASA Ames
Research Ctr.; B. L. Beard, Univ. of California/
Berkeley . . . . [3016-03]

**Image discrimination models predict signal detection
in natural medical image backgrounds,** M. P. Eckstein,
Cedars-Sinai Medical Ctr.; A. J. Ahumada, Jr.,
A. B. Watson, NASA Ames Research Ctr. . . . [3016-04]

Lunch Break

SESSION 2 . . . . . . Mon. 1:50 to 3:10 pm

Image Quality and Multiresolution Models
Chair: **Thrasyvoulos N. Pappas,**
Lucent Technologies, Bell Labs.

**Image quality assessment with a Gabor pyramid model
of the human visual system,** C. Taylor, Z. Pizlo,
J. P. Allebach, C. A. Bouman, Purdue Univ. . [3016-05]

Quality metrics for low-bit-rate coding, T. Eude, Univ.
de Bourgogne (France); H. Cherifi, CNRS-TSI
(France) . . . . [3016-07]

Biologically inspired analog wavelet analyzer,
G. W. Brooks, Air Force Wright Lab. and Florida State
Univ. . . . . [3016-08]

Rules for invisible sampling, A. Pelah, Univ. of
Cambridge (UK) . . . . [3016-09]

SESSION 3 . . . . Mon. 3:30 to 4:30 pm

Perception and Watermarking
Chair: **Thrasyvoulos N. Pappas,**
Lucent Technologies, Bell Labs.

**Review of watermarking and the importance of
perceptual modeling** *(Invited Paper),* I. J. Cox, J. Kilian,
NEC Research Institute; F. T. Leighton, Massachusetts
Institute of Technology; T. Shamoon, NEC Research
Institute . . . . [3016-10]

Digital image watermarking using visual models,
C. I. Podilchuk, Lucent Technologies, Bell Labs.;
W. Zeng, Princeton Univ. . . . . [3016-11]

Panel Discussion
Mon. 4:50 to 6:30 pm

Perceptual Models: What's Next?
Panel Moderator:
Bernice E. Rogowitz,
IBM Thomas J. Watson Research Ctr.

Tuesday 11 February

SESSION 4 . . . . . . Tues. 8:10 to 10:10 am

Color Image Coding and Quality
Chair: **Bernice E. Rogowitz,**
IBM Thomas J. Watson Research Ctr.

**Predicting just-noticeable hue differences from cone
excitation,** R. Munger, A. R. Robertson, National
Research Council Canada . . . . [3016-12]

**Optimal quantization of true-color images in
MacAdam uniform color space,** I. M. Bockstein,
Institute for Information Transmission Problems (Russia);
F. J. Firneis, Institute for Information Process
(Austria) . . . . [3016-13]

**Evaluation of the effects of image compression on the
quality of images on a soft display,** R. E. Jacobson,
A. M. Ford, G. G. Attridge, Univ. of Westminster
(UK) . . . . [3016-14]

Perceptually lossy compression of documents,
G. B. Beretta, V. Bhaskaran, K. Konstantinides, B. K.
Natarajan, Hewlett-Packard Labs. . . . . [3016-15]

Developing color metrics for printer characterization,
J. Zable, D. J. Adams, IBM Corp. . . . . [3016-16]

Human sensitivity to within-page color uniformity,
N. B. Goodman, Xerox Corp. . . . . [3016-17]

SESSION 5 . . . . . . Tues.10:40 am to Noon

Image Quality: Grayscale and Resolution
Chair: **Thrasyvoulos N. Pappas,**
Lucent Technologies, Bell Labs.

Grayscale and resolution tradeoffs in image quality,
J. E. Farrell, Hewlett-Packard Labs. . . . . [3016-18]

**Improving the appearance of LCD displays using
multibit color error diffusion,** J. L. Gille, Western
Aerospace Labs.; J. O. Larimer, NASA Ames Research
Ctr. . . . . [3016-19]

Contrast detection in halftone image, X. Feng, Xerox
Corp. . . . . [3016-20]

**Evaluation of image quality for high-quality digital
halftoning: image analysis and evaluation of multilevel
error diffusion,** K. Miyata, M. Saito, Mitsubishi Electric
Corp. (Japan); N. Tsumura, Y. Miyake, Chiba Univ.
(Japan) . . . . [3016-21]

Lunch/Exhibit Break

SESSION 6 . . . . Tues. 1:30 to 4:40 pm

Region of Interest
Chair: **Jan P. Allebach,** Purdue Univ.

**Distribution of visual attention in static and dynamic
displays** *(Invited Paper),* J. W. Senders, Univ. of Toronto
(Canada) . . . . [3016-22]

**Multiresolution edge detection based on position-
dependent sampling and selective attention
mechanism,** F. Long, N. Zheng, A. Wang, Xi'an Jiaotong
Univ. (China) . . . . [3016-23]

Region-based DCT image coding scheme, A. J. Maeder,
M. S. Baker, Univ. of Ballarat (Australia) . . . . [3016-24]

**Modeling the lateral cortical connections and feedback
from the primary visual cortex to the LGN for
producing attention and contextual effects,** D. L. Enke,
C. H. Dagli, Univ. of Missouri/Rolla . . . . [3016-25]

Using graphical overlays to direct user's attention,
J. D. Wright, R. J. Barber, T. Selker, S. Zhai, S.-A. Kelin,
IBM Almaden Research Ctr. . . . . [3016-26]

**Design and development of human equivalent
inspection system,** I. Hermanto, P. Hearn,
E. M. Reimer, A. Mazour, S. King, Canpolar East Inc.
(Canada) . . . . [3016-27]

**Fuzzy logic system able to automatically detect
interesting areas of a video sequence,** B. M. Macq,
C. De Vleeschouwer, T. Delmot, X. Marichal, Univ.
Catholique de Louvain (Belgium) . . . . [3016-28]

Plenary Speaker
Tuesday • 5:15 to 6:00 pm

**Riding the New Integrated
Media Systems Wave**
Dr. Chrysostomos L. (Max) Nikias,
Univ. of Southern California

**Electronic Imaging
Working Group Meeting**
Tuesday 11 February • 7:30 to 9:30 pm

Chair: **Arthur R. Weeks,** Univ. of Central Florida

Wednesday 12 February

SESSION 7 . . . . . . Wed. 8:50 am to Noon

Color Motion and Video
Chair: **Christine I. Podilchuk,**
Lucent Technologies, Bell Labs.

Continuous assessment of time-varying image quality
(Invited Paper), R. Hamberg, H. de Ridder, Institute for
Perception Research (Netherlands) . . . . [3016-29]

**Spatiotemporal model of human vision for digital video
compression,** S. J. P. Westen, R. L. Lagendijk,
J. Biemond, Delft Univ. of Technology
(Netherlands) . . . . [3016-30]

**Test patterns and quality metrics for digital video
compression,** C. Fenimore, C. Van Degrift, B. F. Field,
National Institute of Standards and
Technology . . . . [3016-31]

**Spatiotemporal multiplexing: color decoding from
single-array image representations,** E. Martinez-
Uriegas, H. D. Crane, J. D. Peters, SRI
International . . . . [3016-32]

**Application of temporal error diffusion to motion
JPEG,** J. B. Mulligan, NASA Ames Research
Ctr. . . . . [3016-33]

**Perceived image quality of MPEG-2 stereoscopic
sequences,** W. J. Tam, L. B. Stelmach, Communications
Research Ctr. (Canada) . . . . [3016-34]

**Assessing the similarity of mechanisms in motion and
color processing for synchronization of visual
pathways,** H. K. Rising III, Iterated Systems,
Inc. . . . . [3016-35]

Lunch/Plenary Break

Plenary Speaker
Wednesday • 1:00 to 1:45 pm

**Digital Libraries for the
Past, Present, and Future**
Dr. Fredrick Mintzer,
IBM Thomas J. Watson Research Ctr.

SESSION 8 . . . . . . Wed. 2:00 to 3:00 pm

Emotion and Expression
in Electronic Imaging
Chair: **Bernice E. Rogowitz,**
IBM Thomas J. Watson Research Ctr.

**Seeing and scribbling: a computer representation of
the relationship between perception and action in
young children's drawing,** E. Burton, Middlesex Univ.
(UK) . . . . [3016-36]

**Analysis of perplex situations in word processor work
using facial image sequence,** T. Kamitani,
M. Yamamoto, Y. Marutani, Osaka Sangyo Univ.
(Japan) . . . . [3016-37]

**Human sense utilization method on real-time
computer graphics,** H. Maehara, H. Ohgashi, T. Hirata,
Mitsubishi Electric Corp. (Japan) . . . . [3016-38]

SESSION 9 . . . . Wed. 3:30 to 5:50 pm

Computer Vision Approaches to
Characterizing Images
Chair: **Thrasyvoulos N. Pappas,**
Lucent Technologies, Bell Labs.

**Role of brightness distortions in shape-from-shading
and the perceived quality of materials,** C. W. Tyler,
Smith-Kettlewell Eye Research Institute . . . . [3016-39]

**Effect of lighting direction on the perception of shape
in graphics displays,** R. A. Browse, J. C. Rodger,
R. Adderley, Queen's Univ. (Canada) . . . . . . [3016-40]

Detection of color transparency, P. Colantoni, Univ. de
Saint Etienne (France); M. D'Zmura, Univ. of California/
Irvine; K. Knoblauch, B. Laget, Univ. de Saint Etienne
(France) . . . . [3016-41]

Photometric stereo without multiple images,
M. S. Drew, Simon Fraser Univ. (Canada) . . . [3016-42]

Wayfinding and eye movements, N.-G. Kim, Univ. of
Connecticut . . . . [3016-43]

Image features from phase congruency, P. Kovesi, Univ.
of Western Australia (Australia) . . . . [3016-44]

Unified theory for statistical modeling of texture,
S. C. Zhu, Brown Univ.; Y. Wu, Harvard Univ.;
D. Mumford, Brown Univ. . . . . [3016-45]

Discussion Session . . . . Wed. 6:00 to 7:30 pm

Thursday 13 February

Plenary Speaker
Thursday • 8:30 to 9:15 am

**Object-Based Video: Compression,
Manipulation, and Indexing**
Prof. A. Murat Tekalp, Univ. of Rochester

SESSION 10 . Thurs. 9:30 am to 12:20 pm

Perceptual Organization
of Spatial Information
Chair: **Bernice E. Rogowitz,**
IBM Thomas J. Watson Research Ctr.

**Gestalt laws of grouping revisited and
quantified** *(Invited Paper),* M. Kubovy, Univ. of
Virginia . . . . [3016-46]

Visual segmentation of sampled contours,
L. T. Maloney, A. K. Hon, M. S. Landy, New York
Univ. . . . . [3016-47]

**Grouping in sparse random-dot patterns: linear and
nonlinear,** R. S. Kashi, Lucent Technologies, Bell Labs.;
T. V. Papathomas, Rutgers Univ.; A. Gorea, Univ. Rene
Descartes (France) . . . . [3016-48]

**What is the visual information loss in a spatial point
pattern statistical characterization?,** C. Dussert,
INSERM (France) . . . . [3016-49]

Generation of blue noise arrays by genetic algorithm,
J. L. Newbern, V. M. Bove, Jr., MIT Media
Lab. . . . . [3016-50]

Dynamic visualization of hierarchical data, H. Senay,
J. Saltz, JP Morgan . . . . [3016-51]

SESSION 11 . . . . . Thurs. 1:30 to 6:00 pm

Object Similarity, Characterization,
and Retrieval
Chair: **John C. Dalton,** Apple Computer, Inc.

Image representations for graphics and recognition
(Invited Paper), T. A. Poggio, MIT AI Lab. . . . [3016-52]

Representation of scenes from collections of images
(Invited Paper), J. R. Bergen, David Sarnoff Research
Ctr. . . . . [3016-53]

**Representation of three-dimensional object similarity
in human vision,** F. Cutzu, M. Tarr, Brown
Univ. . . . . [3016-54]

**Methodology for designing image similarity metrics
based on human visual system models,** T. Frese,
C. A. Bouman, J. P. Allebach, Purdue Univ. . [3016-55]

**Synthetic characterization of appearance and its
application to image retrieval,** R. Manmatha,
S. S. Ravela, Univ. of Massachusetts/
Amherst . . . . [3016-56]

Image retrieval based on image similarity,
R. J. Safranek, Lucent Technologies, Bell Labs. [3016-57]

Tools for texture/color-based search of images,
W. Y. Ma, B. S. Manjunath, Univ. of California/Santa
Barbara . . . . [3016-58]

Perceptual techniques for visualizing metadata,
B. E. Rogowitz, D. A. Rabenhorst, E. B. Kalin,
IBM Thomas J. Watson Research Ctr. . . . . . . [3016-59]

Computer vision for a robot sculptor, M. Brand, MIT
Media Lab. . . . . [3016-60]

**Image similarity models and the perception of artistic
representations of natural images,** J. C. Dalton, Apple
Computer, Inc. . . . . [3016-61]

Panel Discussion
Thurs. 6:20 to 7:30 pm

**Perceptual Approaches
to Image Retrieval Systems**
Panel Moderators:
Bernice E. Rogowitz,
IBM Thomas J. Watson Research Ctr.;
Thrasyvoulos N. Pappas,
Lucent Technologies, Bell Labs.

Panel Members:
Christine I. Podilchuk,
Lucent Technologies, Bell Labs.;
John C. Dalton, Apple Computer, Inc.;
Robert J. Safranek,
Lucent Technologies, Bell Labs.;
Dragutin Petkovic,
IBM Almaden Research Ctr.;
Ramesh Jain,
Univ. of California/San Diego

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SPIE Proceedings Volume 3016

Short Course of Related Interest

**SC50 Attention and Cognition:
Implications for Display Design**
Presented by: **John W. Senders,**
Sunday, 8:30 am to 5:30 pm

Paper #   #3016-01

Digital Images and Human Vision

Andrew B. Watson

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Processing of digital images destined for visual consumption raises many interesting questions regarding human visual sensitivity. This talk will survey some of these questions, including some that have been answered and some that have not. There will be an emphasis upon visual masking, and a distinction will be drawn between masking due to contrast gain control processes, and due to processes such as hypothesis testing, pattern recognition, and visual search.